ADAMAS UNIVERSITY

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

UNDERGRADUATE PROGRAM

Course Structure and Syllabus

B. Tech (Computer Science and Engineering)

W.e.f. AY 2022-23

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 (Computer Science and Engineering)

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO 01: To prepare students to excel in Computer Science and Engineering post graduate programs, to succeed in computing industry profession or successful entrepreneurs through quality education.

PEO 02: To provide students an ability to analyse and solve computer science and engineering problems through application of fundamental knowledge of math's, science and engineering.

PEO 03: To train students with good Computer Science and Engineering breadth, so as to comprehend, analyse, design and create innovative computing products and solutions for real life problems.

PEO 04: To inculcate in students professional and ethical attitude, communication skills, teamwork skills, lifelong learning, multidisciplinary approach and an ability to relate computer engineering issues with social awareness.

PEO 05: To equip students with excellent academic environment for a successful carrier as engineers, scientist, technocrats, administrators and entrepreneurs.

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 (Computer Science and Engineering)

GRADUATE ATTRIBUTES/PROGRAMME OUTCOMES

GA 01 / PO 01: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
GA 02 / PO 02: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
GA 03 / PO 03: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
GA 04 / PO 04: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
GA 05 / PO 05: 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 06 / PO 06: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
GA 07 / PO 07: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
GA 08 / PO 08: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
GA 09 / PO 09: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
GA 10 / PO 10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
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 / PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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 (Computer Science and Engineering)

PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO 01: Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient computer-based systems of varying complexity.

PSO 02: The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success, real world problems and meet the challenges of the future.

PSO 03: Ability to analyse the impact of computer science and engineering solutions in the societal and human context, design, model, develop, test and manage complex software and information management systems.

HEAD OF THE DEPARTMENT	DEAN / SCHOOL CONCERNED

ADAMAS UNIVERSITY
SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
UG Program: B.Tech (Computer Science and Engineering)

COURSE STRUCTURE

FIRST YEAR
(Common for all streams)

SEMESTER I							
S.No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**H**	**C**
1	MTH11501	Engineering Mathematics-I	3	1	0	4	4
2	PHY11201	Applied Science	3	0	0	3	3
3	CSE11001 / GEE11001	Introduction to Programming/ Electrical and Electronics Technology	3	0	0	3	3
4	ENG11053	English Communication	3	0	0	3	3
5	BIT11003	Life Sciences	3	0	0	3	3
6	DGS11001	Design Thinking	2	0	0	2	2
7	PHY12202	Applied Science Lab	0	0	2	2	1
8	CSE12002 / GEE12002	Programming Lab/ Electrical and Electronics Technology Lab	0	0	3	3	2
9	CEE12001/ MEE12001	Engineering Drawing and CAD/ Engineering Workshop	0	0	4	4	2
10	ENG11043	Communication and Collaboration Skill –I	0	0	2	2	1
Total			**17**	**1**	**11**	**29**	**24**

SEMESTER II							
S.No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**H**	**C**
1	MTH11502	Engineering Mathematics– II	3	1	0	4	4
2	GEE11001/ CSE11001	Electrical and Electronics Technology/ Introduction to Programming	3	0	0	3	3
3	MEE11002	Engineering Mechanics	3	0	0	3	3
4	EVS11107	Environmental Science	3	0	0	3	3
5	GEE11011	Basic Civil and Mechanical Engineering	3	0	0	3	3
6	GEE12002/ CSE12102	Electrical and Electronics Technology Lab/ Programming Lab	0	0	3	3	2
7	MEE12001/ CEE12001	Engineering Workshop/ Engineering Drawing and CAD	0	0	4	4	2
8	ENG11044	Communication and Collaboration Skill -II	0	0	2	2	1
9	EIC11001	Venture Ideation	2	0	0	2	2
Total			**17**	**1**	**9**	**27**	**23**

1st Year Credits = 47

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	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	1
8	MTH12531	Numerical Techniques Lab	0	0	2	2	1
9	IDP14001	Interdisciplinary Project	0	0	5	5	3
10	SOC14100	Community Service #	0	0	0	0	1
Total			**15**	**1**	**11**	**27**	**23**

#Community Service will be taken up during the summer break after 2th 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** Design and Analysis of Algorithms	3	0	0	3	3
4	CSE11111	**Professional Core -VII** Formal Language and Automata	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	1
8	CSE12114	**Professional Core Lab – IV** Object Oriented Programming Lab	0	0	2	2	1
Total			**17**	**0**	**4**	**21**	**19**

2nd Year Credits : 42

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		**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					
5		**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					
6	CSE12128	**Professional Core Lab – V** Computer Networks Lab	0	0	2	2	1
7	CSE12129	**Professional Core Lab – VI** Computer Organization and Architecture Lab	0	0	2	2	1
8	CSE12130	**Professional Core Lab – VII** Applied Computing Lab	0	0	2	2	1
Total			**15**	**0**	**6**	**21**	**18**

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	**Professional Core Lab – IX** 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					
Total			**18**	**0**	**6**	**24**	**21**

3rd Year Credits : 39

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	1
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
Semester VII Total			**15**	**0**	**10**	**25**	**22**

#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	CSE14164	Industry Work experience/SIRE*/Major Project	0	0	12	12	6
2	CSE15165	Comprehensive Viva Voce	0	0	0	0	2
Semester VIII Total			**0**	**0**	**12**	**12**	**8**

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

4th Year Credits: 30

CREDIT DISTRIBUTION (SEMESTER-WISE)

SEM I	SEM II	SEM III	SEM IV	SEM V	SEM VI	SEM VII	SEM VIII	TOTAL
24	**23**	**23**	**19**	**18**	**21**	**22**	**8**	**158**

CREDIT DISTRIBUTION(YEAR-WISE)

YEAR I	YEAR II	YEAR III	YEAR IV	TOTAL
47	**42**	**39**	**30**	**158**

Year- I

Semester-I

MTH11501	Engineering Mathematics-I	L	T	P	C
Version 1.0		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 in advanced 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 skills if 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 PublishingHouse, 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)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Develop the idea of basic concepts of abstract algebra and geometrical idea of vector analysis with real world applications.	**PO2, PO3, PO4, PO12**
CO2	Explain the fundamental concepts of Differential Calculus and apply these topics in real life problems	**PO2, PO3, PO4, PO12**
CO3	Illustrate the fundamental concepts of Integral Calculus and apply these topics in real life problems.	**PO2, PO3, PO4, PO12**
CO4	Understand and apply the various solution procedures of Ordinary Differential equations in engineering problems.	**PO2, PO3, PO4, PO12**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming…	The ability to understand the evolutionary changes in …	Ability to analyze the impact of computer science and …
Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
MTH11501	Engineering Mathematics-I	-	3	3	3	-	-	-	-	-	-	-	3	-	-	-

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

Course Objectives

1. To develop the capability of the students for understanding fundamental aspects of physics.
2. To give students theoretical background, the key prerequisite for performing laboratory experiments.
3. To build up the foundations for further studies in physics and engineering.
4. Learn to analyze and evaluate various thermodynamic cycles used for energy production -work and heat, within the natural limits of conversion
5. 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 of this 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 prismand 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, 2nd law of thermodynamics, Idea of Chemical potential, Equilibrium conditions for closed systems.

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

Rate laws, 1stOrder reaction & 2ndorder reaction, Arrhenius equation, Mechanism and Theories of reaction 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 (1st Edition), Cambridge University Press
7. P. W. Atkins, Physical Chemistry, ELBS/Oxford, 10th 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)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Understand the basics of vector calculus, its application in mechanics, and different harmonic motions.	**PO1, PO12**
CO2	Demonstrate the knowledge of physical optics and related application.	**PO1**
CO3	Develop the basic concepts of electromagnetic theory and e-mwave.	**PO1, PO5, PO6**
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.	**PO1, PO2, PO4, PO12**
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, calculate the cell potential for a nonstandard cell.	**PO1, PO2, PO4**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming…	The ability to understand the evolutionary changes in …	Ability to analyze the impact of computer science and …
Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
PHY11201	Applied Science	3	2	-	3	2	2	-	-	-	-	-	1	-	-	-

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

CSE11001	**Introduction to Programming**	**L**	**T**	**P**	**C**
Version 1.0		**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

1. To understand the nature of programming as human activity.
2. To practice the programming construct to solve multi-dimensional problems.
3. To relate and implement mathematical concepts through programming in order to solve computational problems.
4. To enable students to acquire structure and written expression required for their profession.
5. 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 of Programming.
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 a program.
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

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

Reference Books

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

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)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Define basics concepts of programming structure and implement the basics concepts of Programming.	**PO4**
CO2	Solve various problems using programming language and select the best solution.	**PO1, PO3**
CO3	Apply the modularized solution and design such programs to appraise the solution	**PO1, PO9**
CO4	Understand the basic usage of memory and construct such memory in terms of array in a program. Students will also be able to define user defined data types using structure and Union. Create and manipulate permanent storage access through File Handling.	**PO1, PO5**
CO5	Define different data structures for various collection of data	**PO1, PO11**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming…	The ability to understand the evolutionary changes in …	Ability to analyze the impact of computer science and …
Course Code	**Course Title**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11001	Introduction to Programming	3	-	1	2	2	-	-	-	1	-	1	-	-	-	-

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

Course Objectives

1. To familiarize with passive components, active components and measuring instruments.
2. To familiarize the working of diodes, transistors, MOSFETS and integrated circuits.
3. To implement mini projects based on concept of electronics circuit concepts.
4. To understand d-c network theorems and apply these theorems to calculate the voltage, current and power for a given circuit.
5. 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 aboutbasic 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 PNJunction 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 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

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 nodal analysis, 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 Fermi Level; Electron and Hole Concentrational Equilibrium; Temperature Dependence of Carrier Concentration; Drift and 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, Conversions and codes, Logic gates and truth tables.

Text book:

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

Reference book:

1. Electronic Circuits, Discrete and Integrated- Charles Belove and Donald L.Schilling
2. PrinciplesofElectricalEngineeringandElectronics-VKMehta,RohitMehta, SChand and Company, New Delhi
3. Solid State Electronic Devices- Ben G. Streetman and Sanjay Kumar Banerjee,PHI.
4. Fundamental of Digital Circuits by Anand Kumar 2nd Edition,PHI Learning Pal, Rajendra and Korlahalli,
5. Theodore Wildi,*ElectricMachines, Drives and Power Systems*, Pearson,2005.
6. Vincent Del Toro, *Electrical Engineering Fundamentals*, 2^{nd} Ed., Prentice Hall India Learning Pvt. Ltd.,1989.

7. J. Millman, C. Halkias and C. D. Parikh, *Millman's Integrated Electronics: Analog and DigitalCircuits and Systems*, 2nd Ed., McGraw Hill Education,2017.
8. D.P.Leach,A.P.MalvinoandG.Saha,*DigitalPrinciplesandApplications*,8thEd.,McGraw Hill Education,2014.

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)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Apply** knowledge about different passive components used in electronic industry for common application.	**PO3, PO8**
CO2	**Illustrate** with the working of different active components to **demonstrate** basic electronic circuits.	**PO2, PO9, PO10, PO11**
CO3	**Design** circuits using passive and active components for strengthening fundamental idea about basic electronics.	**PO1, PO4, PO5, PO6, PO7**
CO4	**Describe** the basic construction of measuring instruments used in electronic measurements	**PO12**
CO5	**Apply** the Network theorems to calculate the voltage, current and power for a given circuit.	**PO1**
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	**PO2**
CO7	**Understand** the three-phase power measurement.	**PO3**
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.	**PO4**
CO9	**Demonstrate** digital logic circuit and switching circuits using MOSFET.	**PO1**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming…	The ability to understand the evolutionary changes in …	Ability to analyze the impact of computer science and …
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
GEE11001	Electrical and Electronics Technology	3	2	3	3	2	2	2	1	1	1	1	2	-	-	-

1=weakly mapped

2= moderately mapped

3=strongly mapped

ENG11053	**English Communication**	**L**	**T**	**P**	**C**
Version 1.0		**3**	**0**	**0**	**3**
Pre-requisites/Exposure	**12^{th} level English**				
Co-requisites	**--**				

Course Objectives

1. To know the importance and techniques of communication skills in order to improve professionalskills
2. To enhance the knowledge of the students on vocabulary, syntax, and grammatical skills
3. To improve writing skills by applying writing techniques, tools in practice sessions
4. 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 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 organisation and outside the organisation 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 partin all group activities and to give an oral group presentation. Students will be expected to interact withmedia 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:

1. Lewis, Norman. Word Power Made Easy. Anchor: 2014.
2. Riordan, Daniel G & Pauley Steven A. :Technical Report Writing Today. 2004.
3. Hamp-Lyons and Heasely, B . Study Writing; A Course in Written English. For Academic andProfessional Purposes, Cambridge Univ. Press, 2006.
4. Quirk R., Greenbaum S., Leech G., and Svartik, J. A Comprehensive Grammar of the Englishlanguage, Longman:London, 1985.
5. 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)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Understand the basics of communication processes and to know the practical implications and its challenges at the workplace	**PO10**
CO2	Spell out the practical uses of English grammar and to use grammar correctly and unambiguously	**PO10**
CO3	Demonstrate different formats of business communication like reports, letters, and other technical writings	**PO6, PO8**
CO4	Develop competence in speaking, reading, listening and writing in English	**PO7, PO8, PO9, PO12**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming…	The ability to understand the evolutionary changes in …	Ability to analyze the impact of computer science and …
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
ENG11053	English Communication	-	-	-	-	-	2	2	3	2	3	-	2	-	-	-

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

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

Course Objectives:

1. To acquire the knowledge about the cell structure and interaction with neighboring cells in biological system.
2. To gain the knowledge about the genetic switches and oscillators and evolutionary dynamics.
3. To acquire the knowledge about the transport of molecules in different cellular compartments.
4. To gain the knowledge about dynamics of different systems in human body.
5. To understand the application and significance of different techniques of medical biotechnology.

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 which can 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 and biomaterials.

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 neuronto 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

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

Reference Books

1. Applied Cell and Molecular Biology for Engineers by Gabi Nindl Waite and Lee R. Waite. McGraw-Hill Education, 1 edition, 2007.
2. 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)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcome**
CO1	**Explain** the structure and functions cell organelles and their interrelationship.	**PO9, PO12, PSO1, PSO2**
CO2	**Analyze** the genetic switches and evolutionary dynamics of livingsystem.	**PO2, PO5, PO6**
CO3	**Determine** the mode of transport of molecules in biological systemnumerically.	**PO2, PO3, PO5, PO8, PSO1, PSO2**
CO4	**Contrast** between the different networks of human body and other physiological systems and can summarize consequences of physiological disorders.	**PO1, PO2, PO3, PO5, PO6,PO12,PSO1, PSO2**
CO5	**Choose** different techniques of medical biotechnology on human body to analyze the malfunction of different human system duringdiseased conditions.	**PO1, PO2, PO3, PO5, PO6, PO8, PO12,PSO1, PSO2**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming…	The ability to understand the evolutionary changes in …	Ability to analyze the impact of computer science and …
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BIT11003	Life Sciences	2	2	1	-	3	2	-	1	1	-	-	2	3	3	-

DGS11001	**Design Thinking**	**L**	**T**	**P**	**C**
Version 1.0		**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

1. To enable students to acquire knowledge, imagination and be more assertive on opinions on problems in society.
2. To enable students to learn basics of research, data collection, analysis, brainstorming to find solutions to issues.
3. To make them understand Design Thinking methodologies to problems in field of study and other areas as well.
4. 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 design thinking

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: **2 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: **2 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

1. Brown, Tim. "What We Can Learn from Barn Raisers." Design Thinking: Thoughts by Tim Brown. Design Thinking, 16 January 2015. Web. 9 July 2015.
2. Knapp, Jake. "The 8 Steps to Creating a Great Storyboard." Co.Design. Fast Company & Inc., 21 Dec. 2013. Web. 9 July 2015.

3. van der Lelie, Corrie. “The Value of Storyboards in the Product Design Process.” Journal of Personal and Ubiquitous Computing 10.203 (2006): 159–162. Web. 9 July 2015. [PDF].
4. 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)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Examine design thinking concepts and principles	**PO1, PO11**
CO2	Practice the methods, processes, and tools of design thinking	**PO1, PO2**
CO3	Apply the Design Thinking approach and model to real worldscenarios.	**PO1, PO2, PO4**
CO4	Analyze the role of primary and secondary research in the discovery stage of design thinking	**PO1, PO5**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming…	The ability to understand the evolutionary changes in …	Ability to analyze the impact of computer science and …
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
DGS11001	Design Thinking	3	2	-	1	2	-	-	-	-	-	2	-	-	-	-

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

Course Objectives

1. To understand the experiments on general properties of matter.
2. To apply the knowledge of physical optics in different practical experiments.
3. To analyse different experiments on electrical and electronic science.
4. To explore different experiments related to fundamental knowledge on quantum mechanics.
5. To impart a scientific approach and to familiarize the applications of chemistry in the field of technology
6. 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 experiments related 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

1. Determination of Young’s Modulus of a Beam by traveling microscope by FLEXUREmethod.
2. Carry Foster’s Method to Determine Resistance of a Given Coil.
3. Determination of the Coefficient of viscosity of water by Poiseulle’s Capillary Flow method.
4. To determine the wavelength of sodium light by forming Newton’s Ring.
5. Determination of Rigidity Modulus by dynamical method.
6. Determine the Plank’s constant using photocell.
7. To verify Stefan’s law by electrical method.
8. To study the temperature dependence of reverse saturation current in a junction diode andhence to determine the Band gap.
9. Determination of specific charge (e/m) of electron by J.J. Thomson’s method.
10. Determination of the Rydberg constant by studying hydrogen or helium spectrum.
11. Determination of dielectric constant of a given dielectric material.
12. Determination of Hall coefficient of Semiconductor.
13. Study current – voltage characteristic load response of photovoltaic solar cells.

Experiments: Chemistry (Any Four)

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

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

Components	Class Assessment	End Term
Weightage (%)	50	50

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

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Understand about the elastic and other general properties of matter and their measurements.	**PO1,**
CO2	Illustrate the knowledge of physical optics and experimental techniques to verify them.	**PO1**
CO3	Develop the basic concepts related to electrical circuits.	**PO1, PO5**
CO4	Outline the fundamental knowledge of basic quantum mechanics and few experiments related to it.	**PO1**
CO5	Illustrate the basic information about semiconductor material and devices.	**PO1, PO5, PO2**
CO6	Develop the qualitative idea of thermo-electric currents and technique to measure it.	**PO1**
CO7	Understand and practice different techniques of quantitative chemical analysis generate experimental skills and apply these skills to various analyses	**PO1, PO2, PO3**
CO8	Analyze the quality of water by determining its hardness & alkalinity.	**PO3, PO9**
CO9	Utilize the fundamental laboratory techniques for analyses	**PO2, PO3**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming…	The ability to understand the evolutionary changes in …	Ability to analyze the impact of computer science and …
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
PHY12202	Applied Science Lab	3	2	2	-	2	-	-	-	2	-	-	-	-	-	-

CSE12002	**Programming Lab**	**L**	**T**	**P**	**C**
Version 1.0		**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

1. To comprehend the practical nature of programming by solving through computer systems.
2. To practice the programming construct to solve multi-dimensional problems.
3. To relate and implement mathematical concepts through programming in order to solve computational problems.
4. To enable students to acquire structure and written expression required for their profession.
5. 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 differentiate among 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 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 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:

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

Text Books

1. Balagurusamy, E., n.d. Programming In ANSI C. 5th ed. Bangalore: McGraw-hill.
2. Gotfreid (196) *Schaum's Outline of Programming with C*, 2nd ed., USA: McGraw-Hill
3. Brian W. Kernighan, Dennis Ritchie (1988) *C Programming Language*, 2nd ed., : Prentice Hall.
4. Das Sumitabha, UNIX Concepts and Applications, 4th Ed., New Delhi, Tata McGraw-Hill

Reference Books

1. 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)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	List and memorize various Unix commands. Also, students be able to construct various basic programs and appraise them.	**PO3**
CO2	Design and execute iterative statement in a program. Also, students be able to differentiate among different iterative structure.	**PO1, PO4**
CO3	Construct such programs that used to define user definedfunctions and to design library functions.	**PO1, PO7**
CO4	Apply array concept in 1-Dimensional and 2-Dimensional construct. Hence be able to design string functions to cater to various character array related problem.	**PO1, PO2, PSO1**
CO5	Apply the concept of Stack, Queue, and Linked List and appraise them in different cases.	**PO1, PO5, PO11**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming…	The ability to understand the evolutionary changes in …	Ability to analyze the impact of computer science and …
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE12002	Programming Lab	3	1	1	2	2	-	1	-	-	-	1	-	1	-	-

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

Course Objectives

1. To study basic electronic components
2. To observe characteristics of electronic devices
3. 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 understandnetwork theorems.
CO2.**Apply** the characteristics of different semiconductor devices like diode, BJT, FET etc andcarbon 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):

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

List of experiments (Electronics Part):

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

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)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Show** different meters and instruments for measurement of electronic quantities and understand network theorems.	**PO1**
CO2	**Apply** the characteristics of different semiconductor devices like diode, BJT, FET etc and carbon tungsten filament lamps experimentally.	**PO3**
CO3	**Demonstrate** various application circuits using diodes.	**PO3**
CO4	**Experiment with** the R-L-C circuits	**PO1**
CO5	**Illustrate** three phase circuits	**PO1**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming…	The ability to understand the evolutionary changes in …	Ability to analyze the impact of computer science and …
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
GEE12002	Electrical and Electronics Technology Lab	3	-	3	-	-	-	-	-	-	-	-	-	-	-	

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

Course Objectives:

1. To develop a skill in dignity of labour, precision, safety at work place, team working and development of right attitude.
2. To acquire skills in basic engineering practice
3. To identify the hand tools and instruments
4. To gain measuring skills
5. 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

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

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

Components	Class Assessment	End Term
Weightage (%)	50	50

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

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Demonstrate the basic operations in pattern and mold making	**PO1, PO2, PO9PSO1**
CO2	Experiment with different metal fitting works	**PO1, PO9, PSO1**
CO3	Show basic forging and welding works	**PO1, PO9, PSO1**
CO4	Understand the operations of machine tools	**PO1, PO2, PO9, PSO1**
CO5	Select the appropriate tools required for specific operation	**PO1, PO9, PSO1**
CO6	Understand the safety measures required to be taken while using the tools	**PO1, PSO1**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming…	The ability to understand the evolutionary changes in …	Ability to analyze the impact of computer science and …
Course Code	**Course Title**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
MEE12001	EngineeringWorkshop	3	1	-	-	-	-	-	-	3	-	-	-	3	-	

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

Course Objectives

1. To comprehend general projection theory, with an emphasis on the use of orthographic projection to represent three-dimensional objects in two-dimensional views.
2. To understand the application of industry standards and techniques applied in engineering drawing.
3. To apply auxiliary or sectional views to most practically represent engineered parts.
4. To Dimension and explain two-dimensional engineering drawings.
5. 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

CO1. **Identify** the principle and significance of engineering drawing along with all the possible geometrical shapes.
CO2. **Infer** the principle and concept of projection of Points, Lines and Planes over Auxiliary Planes.
CO3. **Demonstrate** the principle and concept of Projection of Regular Solids.
CO4. **Illustrate** Sections and Sectional Views of Right Angular Solids and Regular Solids.
CO5. **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

Mapping between COs, POs and PSOs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Identify** the principle and significance of engineering drawing along with all the possible geometrical shapes.	**PO2, PO3, PO12, PSO2**
CO2	**Infer** the principle and concept of projection of Points, Lines and Planes over Auxiliary Planes.	**PO2, PO9, PO3, PO12**
CO3	**Demonstrate** the principle and concept of Projection of Regular Solids.	**PO3, PO9, PSO2, PO12**
CO4	**Illustrate** Sections and Sectional Views of Right Angular Solids and Regular Solids.	**PO3, PO9, PO12, PSO2**

CO5	**Interpret** Isometric projection.	**PO2, PO9, PO12**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming…	The ability to understand the evolutionary changes in …	Ability to analyze the impact of computer science and …
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CEE12001	Engineering Drawing & CAD	-	3	3	-	-	-	-	-	3	-	-	3	-	3	-

		L	T	P	C
ENG11043	**Communication and Collaboration Skill -I**	**L**	**T**	**P**	**C**
Version 1.0		**0**	**0**	**2**	**1**
Pre-requisites/Exposure	**12^{th} level English**				
Co-requisites	**--**				

Course Objectives:

1. To learn how to form and maintain a team.
2. To develop skills in collaboration in a project setting.
3. To develop Brainstorm alternatives effectively.
4. To identify the team's strengths and resources.
5. To manage conflict collaboratively by creating a system for dealing with the most common problems that may create conflict.

Course Outcomes:

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

CO1 Organize emotions to become highly motivated individuals exercising empathy.
CO2 Build teams and communicate effectively and clearly
CO3 Develop skills like writing, speaking, presentation and exercise time management

Catalog Description

Through Communication and Collaboration students will learn how to collaboratively work in a group. It is a place where students will engage in active listening, accustomed in diverse and multi-lingual environments, and understanding verbal and non-verbal communication. They will also develop the ability to work in diverse international teams, including learning from and contributing to the learning of others, assuming shared responsibility, cooperating, leading, delegating and compromising to produce new and innovative ideas and solutions.

Course Content

List of Experiments (Any ten)	
1	The students are introduced to Emotional Intelligence and the need for it.
2	Self evaluation / assessment happens through a peer-peer / group activity.
3	The groups will form a team to make a movie.
4	They will play the roles of director, producer, editor, actors, stuntmen etc.
5	They learn to team up and communicate. A jury will be elected by the students.
6	The jury will select the "AdOSCARS" winners. The winners are required to make the speech accepting the award.
7	3 to 4 groups will be formed who will publish a magazine selecting a specific theme.
8	They will take multiple roles in this game.
9	Every class, the groups will do news broadcast on their chosen theme.
10	Video recording will be done, with follow up discussion on body language, tone etc.

Reference Books

1. Stephen R Covey, Seven Habits of Highly Effective People, Free Press, 1989
2. Carnegie Dale, How to win Friends and Influence People, New York: Simon & Schuster,1998
3. Daniel Goleman, Emotional Intelligence, Bantam Book, 2006
4. Innovation and Entrepreneurship (1985) by Peter F. Drucker.

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

Components	Presentation/Assignment/ etc.	ETE
Weightage (%)	**50**	**50**

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

Mapping between COs and POs		
	Course Outcomes (COs)	**pped ProgramOutcomes**
CO1	Organize emotions to become highly motivated individuals exercising empathy.	**P02, PO9, PO10, PSO1, PSO2**
CO2	Build teams and communicate effectively and clearly.	**PO9, PO10, PSO1, PSO2**
CO3	Develop skills like writing, speaking, presentationand exercise time management.	**PO2, PO9, PSO1, PSO2**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming…	The ability to understand the evolutionary changes in …	Ability to analyze the impact of computer science and …
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
ENG11043	Communication and CollaborationSkill - I	-	1	-	-	-	-	-	-	3	3	-	-	-	-	-

Year- I

Semester-II

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

Course Objectives

1. To help the student to understand the basic concepts of matrix theory with its uses in engineering science.
2. 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.
3. To help the student to understand the use of vector calculus in engineering.
4. 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.
5. 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:

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

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

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

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

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Apply the knowledge of matrix theory for finding solution of a related engineering problem	**PO3, PO4**
CO2	Illustrate the Eigen value(s) and Eigen vector(s) of a matrix	**PO4**
CO3	Explain the concept of vector space and linear transformation between the vector spaces	**PO4, PO12**
CO4	Build the knowledge of vector calculus and apply it for solving related problems	**PO1, PO7**
CO5	Develop the concept of complex variable and its application	**PO2**
CO6	Outline the Fourier series representation of a function	**PO1, PO3**
CO7	Make use of appropriate transformation technique for solving differential equation or difference equation	**PO1, PO5, PO12**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming…	The ability to understand the evolutionary changes in …	Ability to analyze the impact of computer science and …
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
MTH11502	Engineering Mathematics II	3	1	3	3	2	-	1	-	-	-	-	1	-	-	-

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

Course Objectives

1. To familiarize with passive components, active components and measuring instruments.
2. To familiarize the working of diodes, transistors, MOSFETS and integrated circuits.
3. To implement mini projects based on concept of electronics circuit concepts.
4. To understand d-c network theorems and apply these theorems to calculate the voltage, current and power for a given circuit.
5. 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 aboutbasic 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 PNJunction 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 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

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 nodal analysis, 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 Fermi Level; Electron and Hole Concentrational Equilibrium; Temperature Dependence of Carrier Concentration; Drift and 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, Conversions and codes, Logic gates and truth tables.

Text book:

6. Electronic Devices & Circuit Theory: Boyelstad &Nashelsky
7. Electronics Fundamental and application: D.Chattopadhyay and P CRakshit

8. Electronic Principle: Albert PaulMalvino
9. Digital circuits and design by S Salivahanan and SArivazhagan
10. V. N. Mittal and A. Mittal, *Basic Electrical Engineering*, Tata McGraw-Hill Publishing Company Ltd,2006

Reference book:

9. Electronic Circuits, Discrete and Integrated- Charles Belove and Donald L.Schilling
10. PrinciplesofElectricalEngineeringandElectronics-VKMehta,RohitMehta, SChandandCompany,New Delhi
11. Solid State Electronic Devices- Ben G. Streetman and Sanjay Kumar Banerjee,PHI.
12. 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.
13. Theodore Wildi,*ElectricMachines, Drives and Power Systems*, Pearson,2005.
14. Vincent Del Toro, *Electrical Engineering Fundamentals*, 2^{nd} Ed., Prentice Hall India Learning Pvt. Ltd.,1989.
15. J. Millman, C. Halkias and C. D. Parikh, *Millman's Integrated Electronics: Analog and DigitalCircuits and Systems*, 2^{nd} Ed., McGraw Hill Education,2017.
16. D.P.Leach,A.P.Malvino and G.Saha, *Digital Principles and Applications*, 8^{th}Ed.,McGraw HillEducation, 2014.

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)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Apply** knowledge about different passive components used in electronic industry for common application.	**PO3, PO8**
CO2	**Illustrate** with the working of different active components to **demonstrate** basic electronic circuits.	**PO2, PO9, PO10, PO11**
CO3	**Design** circuits using passive and active components for strengthening fundamental idea about basic electronics.	**PO1, PO4, PO5, PO6, PO7**
CO4	**Describe** the basic construction of measuring instruments used in electronic measurements	**PO12**
CO5	**Apply** the Network theorems to calculate the voltage, current and power for a given circuit.	**PO1**
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	**PO2**
CO7	**Understand** the three-phase power measurement.	**PO3**

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.	**PO4**
CO9	**Demonstrate** digital logic circuit and switching circuits using MOSFET.	**PO1**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming…	The ability to understand the evolutionary changes in …	Ability to analyze the impact of computer science and …
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
GEE11001	Electrical and Electronics Technology	3	2	3	3	2	2	2	1	1	1	1	2	-	-	-

1=weakly mapped

2= moderately mapped

3=strongly mapped

CSE11001	**Introduction to Programming**	**L**	**T**	**P**	**C**
Version 1.0		**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

a. To understand the nature of programming as human activity.
b. To practice the programming construct to solve multi-dimensional problems.
c. To relate and implement mathematical concepts through programming in order to solve computational problems.
d. To enable students to acquire structure and written expression required for their profession.
e. 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 of Programming.
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 a program.
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

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

Reference Books

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

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)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Define basics concepts of programming structure and implement the basics concepts of Programming.	**PO4**
CO2	Solve various problems using programming language and select the best solution.	**PO1, PO3**
CO3	Apply the modularized solution and design such programs to appraise the solution	**PO1, PO9**
CO4	Understand the basic usage of memory and construct such memory in terms of array in a program. Students will also be able to define user defined data types using structure and Union. Create and manipulate permanent storage access through File Handling.	**PO1, PO5**
CO5	Define different data structures for various collection of data	**PO1, PO11**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming…	The ability to understand the evolutionary changes in …	Ability to analyze the impact of computer science and …
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE11001	Introduction to Programming	3	-	1	2	2	-	-	-	1	-	1	-	-	-	-

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

Course Objectives

1. To enable learners to solve force problems related to practical world.
2. To be able to determine the centroid, centre of gravity and moment of inertia.
3. To learn the effect of friction on equilibrium.
4. To learn kinematics, kinetics of particle and rigid body, related principles.
5. 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 statics problem.

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 and energy, impulse and momentum, impact of bodies.

Text Books

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

Reference Books

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

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)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Apply conditions of equilibrium of bodies subjected to forces	**PO1,PO2**
CO2	Determine the centroid, center of gravity and moment of inertia of various one dimensional and two dimensional objects	**PO1,PO2**
CO3	Analyze motion under the effect of dry friction	**PO1,PO2**
CO4	Apply the concept of virtual work for bodies in equilibrium	**PO1,PO2**
CO5	Apply the D'Alembert's Principle for reducing the problem of kinetics to equivalent statics problem.	**PO1,PO2,**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming…	The ability to understand the evolutionary changes in …	Ability to analyze the impact of computer science and …
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
MEE11002	Engineering Mechanics	3	3	-	-	-	-	-	-	-	-	-	-	-	--	-

1=weakly mapped

2= moderately mapped

3=strongly mapped

EVS11107	Environmental science	L	T	P	C
Version 1.1		**3**	**0**	**0**	**3**
Pre-requisites/Exposure	**Basic physics, chemistry, mathematics of +2 level.**				
Co-requisites	**--**				

Course Objectives

1. To understand the intrinsic relation between humans and environment, our position in the ecosystem around us
2. To comprehend the significance of the biodiversity surrounding us.
3. To figure out the importance and need for energy resources, various sources of energy, renewable and non-renewable sources, conventional and unconventional sources.
4. To have basic concepts about sustainability, our dependence on nature and the consequences of overexploitation.
5. To enable students to appreciate the importance and how much we owe to the earth systems for our survival.
6. To have a basic concept about the types of pollution and mitigation procedures.
7. 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

CO1 Distinguish between various types of ecosystems, ecosystem dynamics, perceive and appreciatethe surrounding nature.

CO2 Show the intrinsic relation between humans and environment, our position in the ecosystemaround us, and importance of biodiversity.

CO3Understand the presence of various pollutants, their significance, and impacts, and develop theunderlying concepts involved in various air pollution prevention and mitigation measures.

CO4 Understand the basic science which can explain the phenomena occurring around us. CO5 Build the in-depth knowledge about natural resources including energy resource.

CO6 Understand the legal framework in our country for safeguarding the environment includingpollution prevention, control, management, and wildlife management.

Catalog Description

To distinguish between various types of ecosystems, ecosystem dynamics, perceive and appreciate thesurrounding nature and feel connected, develop the concept of 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 about 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, and understand the need of the 5Rs of waste management, importance of waste minimization.

Course Content

Module 1: Basics of Environmental Sciences: (5 hrs)
Definition, Scope and objectives, classification of environment, interrelationship between the components, ecology and ecosystem, structural and functional component of ecosystem, energy flow in an ecosystem, biogeochemical cycles, human impact on the environment, The IPAT equation, Ecological foot print, ecology and environment, ecosystem concept, energy flow in an ecosystem.

Module 2: Energy Resources: (10 hrs)
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 it is generated, advantages and disadvantages, Biomass energy: various types, generations of biofuel, Biomass direct combustion – Biomass gasifiers – Biogas plants – Digesters – Ethanol production – Bio diesel, Geothermal Energy: source, various methods of extraction: wet steam, dry steam and hot water flashed, advantages and disadvantages

Module 3: Air Pollution and Control: (10 hrs)
Classification of air pollutants, Criteria air pollutants and their impacts, Major global impacts of air pollution on man: Global warming, Ozone layer depletion, Acid rain; Air quality standards, Air pollution control methods, Methods of reducing air pollutants from IC engines, particulate pollutant and gaseous pollutant.

Module 4: Water Pollution Fundamentals and Control Strategies: (5 hrs)
Water quality: physical, chemical and biological characteristics, drinking water quality standard, effluent water quality, waste water sources and constituents, waste water treatment: preliminary treatment, primary treatment, secondary treatment, sedimentation, coagulation, floatation, aerobic and anaerobic biological treatment, activated sludge process, lagoons, trickling filters, rotating biological contractor.

Module 5: Solid Waste Management: (5 hrs)
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. Hazardous Wastes Management and Handling Rules, 1989

Module 6: Environmental Impact Assessment: (5 hrs)
Introduction to Environmental Impact Analysis. Environmental Impact Statement andEnvironmental Management Plan. EIA guidelines 1994, Notification of Government of India. Impact Assessment Methodologies. Generalized approach to impact analysis. Procedure for reviewing Environmental impact analysis and statement. Guidelines for Environmental audit.

Text Books:

1. W.P. Cunningham and M. A. Cunningham, Principles of Environmental Science, 3rd Ed., McGraw-Hill Higher Education, 2005.
2. Mackenzie Davis and David Cornwell, Introduction to Environmental Engineering (The McGraw-Hill Series in Civil and Environmental Engineering), 2ndEd., McGraw Hill Education, 2012.

Reference Books:

1. Gilbert M. Masters and Wendell P. Ela, Introduction to Environmental Engineering and Science, 3rd Ed., Prentice Hall India Learning Private Limited, 2008.
2. Metcalf and Eddy, Wastewater Engineering: Treatment and Reuse, 4thEd., McGraw HillEducation, 2002.

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 Outcomes (COs)	**Mapped Program Outcomes**
CO1	Distinguish between various types of ecosystems, ecosystem dynamics, perceive and appreciate the surrounding nature.	**PO2, PO3, PO6, PO7, PO8**
CO2	Show theintrinsic relationbetween humans and environment, our position in the ecosystem around us, and importance of biodiversity.	**PO2, PO3, PO7, PO11**
CO3	Understand the presence of various pollutants, their significance, and impacts, and develop the underlying concepts involved in various air pollution prevention and mitigation measures.	**PO2, PO6, PO7**
CO4	Understand the basic science which can explain the phenomena occurring around us.	**PO1, PO3, PO6, PO7, PO11**
CO5	Build the in-depth knowledge about natural resources including energy resource.	**PO1, PO2, PO3, PO6, PO7**
CO6	Understand the legal framework in our country for safeguarding the environment including pollution prevention, control, management, and wildlife management.	**PO6, PO7, PO8**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming…	The ability to understand the evolutionary changes in …	Ability to analyze the impact of computer science and …
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
EVS11107	Environmental science	1	3	3	-	3	3	2	-	-	1	-	-	-	--	-

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

GEE11011	**Basic Civil and Mechanical Engineering**	**L**	**T**	**P**	**C**
Version 1.0		**3**	**0**	**0**	**3**
Pre-requisites/Exposure	**11th level Physics**				
Co-requisites	**Engineering Mechanics, Engineering Drawing and CAD**				

Course Objectives

1. To study about different materials and their properties
2. To know about engineering aspects related to buildings
3. To understand the importance of surveying and the transportation systems
4. To get exposed to the rudiments of engineering related to dams, water supply, and sewage disposal

Course Outcomes

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

CO1. Define civil engineering and different building materials.
CO2. Describe various engineering properties and components of a building.
CO3. Explain the basics of surveying and transportation system.
CO4. Identify different components of power plant and automobile sectors
CO5. Demonstrate the capabilities of robotic system in industry.

Catalog Description

This course covers the basic introduction of civil engineering and mechanical engineering. Demonstration of various engineering system and other elements will be provided by pictorial representations as per requirements. Numerical problems will be solved in connection with the several aspects of civil and mechanical engineering. Classes will be conducted by lectures as well as power point presentation as per the requirements. Discussions related to development of various empirical equations regarding water resources engineering will be done as well. Students will be subjected to class tests, assignments and tutorials problems and solving by course coordinator. Through these teaching methods students will have a strong understand regarding the fundamental concepts of this course and will be able apply these concepts in the working field in future.

Course Content

Unit I: 7 Lecture Hours

Introduction to Civil Engineering: Basic introduction, broad disciplines of civil engineering, importance, possible scopes for a career.

Building Materials: Stones, bricks, mortars, Plain, Reinforced & Prestressed Concrete, Construction Chemicals; Structural Steel, Carbon Composites; Plastics in Construction; 3D printing; Recycling of Construction & Demolition wastes.

Unit II: 10 Lecture Hours

Material Properties: Stress – strain – types, Hook's law, three moduli of elasticity, poisons ratio, relationship – factor of safety. Centroid - center of gravity. Moment of inertia, parallel, perpendicular axis theorems and radius of gyration (definitions only)

Building Components: Building- classification, components. Foundations – functions, classifications, bearing capacity. Flooring – requirements, selection, types, cement concrete, marble, terrazzo flooring. Roof – types and requirements.

Unit III: 11 Lecture Hours

Surveying and Transportation: Surveying – objectives, classification, principles of survey. Transportation – classification, cross section and components of road , classification of roads. Railway – cross section and components of permanent way, functions. Water way – docks and harbor, classifications, components. Bridge – components of bridge.

Water Supply and Sewage Disposal: Dams – purpose, selection of site, types, gravity dam (cross section only). Water supply – objective, quantity of water, sources, standards of drinking water, distribution system. Sewage – classification, technical terms, septic tank, components and functions.

Unit IV: 9 Lecture Hours

Introduction to Mechanical Engineering: Basic introduction, broad disciplines of mechanical engineering, importance, possible scopes for a career.

Power-Plant Engineering: Introduction of the power plant and power plant components, boilers, turbines, pumps, cooling towers.

Automobile Engineering: Introduction of automobile engineering, an aerodynamic study in automobile, selection criteria of automobiles based on individual requirements, Performance, and safety parameters.

Unit V: 8 Lecture Hours

Introduction to Mechanism of Robots

Basics of Robotics Degree of freedom of robots, Higher DOF robots,Vector transformation, Homogeneous transformation matrices, DH parameters, Introduction to kinematics & Dynamics, Introduction to actuators, sensors medical robots, space robots, underwater robots, and agriculture robots, Introduction to Roboanalyzer software

Reference Books

1. Raju .K.V.B, Ravichandran.P.T, "Basics of Civil Engineering", Ayyappa Publications, Chennai, 2012.
2. Rangwala .S.C," Engineering Material"s, Charotar Publishing House, Anand, 2012.
3. Rajput, R. K. A text book of automobile engineering. Firewall Media, 2008.

4. Ramakrishna, K., 2012. Automobile engineering. PHI Learning Pvt. Ltd..
5. Drbal, Larry, Kayla Westra, and Pat Boston, eds. Power plant engineering. Springer Science & Business Media, 2012.
6. Elliott, Thomas C. "Standard handbook of powerplant engineering." (1989).
7. Saha, Subir Kumar. Introduction to robotics. Tata McGraw-Hill Education, 2014.
8. Craig, John J. Introduction to robotics: mechanics and control. Pearson Educacion, 2005.

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)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Define civil engineering and different building materials.	**PO1, PO7, PSO1**
CO2	Describe various engineering properties and components of a building.	**PO1, PO7, PSO1**
CO3	Explain the basics of surveying andthe transportation system.	**PO1, PO7, PSO1**
CO4	Identify different components of the power plant and automobile sectors	**PO1, PO5**
CO5	Demonstrate the capabilities of robotic system in the industry.	**PO1, PO5**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming…	The ability to understand the evolutionary changes in …	Ability to analyze the impact of computer science and …
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3

GEE11011	Basic Civil and Mechanical Engineering	3	-	-	-	2	-	-	-	-	-	-	-	3	-	-

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

EIC11001	**Venture Ideation**	**L**	**T**	**P**	**C**
Version 1.0		**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

1. To help the students understand the way to be an Entrepreneur
2. To identify the right business opportunity
3. To empower students to perform a technical feasibility study and therebydeveloping a prototype
4. To help students in identifying their customers using primary and secondaryresearch methods.
5. 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.
6. 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, interviewing customer, 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 the chasm, 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)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Assess personal capacity in the context of the entrepreneurial process	**PO6, PO11**
CO2	Assess characteristics of successful entrepreneurs and entrepreneurial forms and processes	**PO6, PO11**
CO3	Apply resources, research and tools for Entrepreneurial ventures	**PO6, PO8,PO11**
CO4	Analyze and apply opportunity identification techniques, feasibility terminology, processes and models	**PO6, PO8,PO11**
CO5	Develop Ideation and planning documents for entrepreneurial venture	**PO6, PO8,PO11**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming…	The ability to understand the evolutionary changes in …	Ability to analyze the impact of computer science and …
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
EIC11001	Venture Ideation	-	-	-	-	-	3	-	3	-	-	3	-	-	-	-

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

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

Course Objectives

1. To study basic electronic components
2. To observe characteristics of electronic devices
3. 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 understandnetwork theorems.
CO2. **Apply** the characteristics of different semiconductor devices like diode, BJT, FET etc andcarbon 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):

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

List of experiments (Electronics Part):

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

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)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Show** different meters and instruments for measurement of electronic quantities and understand network theorems.	**PO1**
CO2	**Apply** the characteristics of different semiconductor devices likediode, BJT, FET etc and carbon tungsten filament lamps experimentally.	**PO3**
CO3	**Demonstrate** various application circuits using diodes.	**PO3**
CO4	**Experiment with** the R-L-C circuits	**PO1**
CO5	**Illustrate** three phase circuits	**PO1**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming…	The ability to understand the evolutionary changes in …	Ability to analyze the impact of computer science and …
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
GEE12002	Electrical and Electronics Technology Lab	3	-	3	-	-	-	-	-	-	-	-	-	-	-	-

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

CSE12002	**Programming Lab**	**L**	**T**	**P**	**C**
Version 1.0		**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

1. To comprehend the practical nature of programming by solving through computer systems.
2. To practice the programming construct to solve multi-dimensional problems.
3. To relate and implement mathematical concepts through programming in order to solve computational problems.
4. To enable students to acquire structure and written expression required for their profession.
5. 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 differentiate among 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 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 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:

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

Text Books

1. Balagurusamy, E., n.d. Programming In ANSI C. 5th ed. Bangalore: McGraw-hill.
2. Gotfreid (196) *Schaum's Outline of Programming with C*, 2nd ed., USA: McGraw-Hill
3. Brian W. Kernighan, Dennis Ritchie (1988) *C Programming Language*, 2nd ed., : Prentice Hall.
4. Das Sumitabha, UNIX Concepts and Applications, 4th Ed., New Delhi, Tata McGraw-Hill

Reference Books

1. 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)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	List and memorize various Unix commands. Also, students be able to construct various basic programs and appraise them.	**PO3**
CO2	Design and execute iterative statement in a program. Also, students be able to differentiate among different iterative structure.	**PO1, PO4**
CO3	Construct such programs that used to define user definedfunctions and to design library functions.	**PO1, PO7**
CO4	Apply array concept in 1-Dimensional and 2-Dimensional construct. Hence be able to design string functions to cater to various character array related problem.	**PO1, PO2, PSO1**
CO5	Apply the concept of Stack, Queue, and Linked List and appraise them in different cases.	**PO1, PO5, PO11**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming…	The ability to understand the evolutionary changes in …	Ability to analyze the impact of computer science and …
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE12002	Programming Lab	3	1	1	2	2	-	1	-	-	-	1	-	1	-	-

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

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

Course Objectives:

1. To develop a skill in dignity of labor, precision, safety at work place, team working and development of right attitude.
2. To acquire skills in basic engineering practice
3. To identify the hand tools and instruments
4. To gain measuring skills
5. 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

1. 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)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Demonstrate the basic operations in pattern and mold making	**PO1, PO2, PO9 PSO1**
CO2	Experiment with different metal fitting works	**PO1, PO9, PSO1**
CO3	Show basic forging and welding works	**PO1, PO9,PSO1**
CO4	Understand the operations of machine tools	**PO1, PO2, PO9, PSO1**
CO5	Select the appropriate tools required for specific operation	**PO1, PO9,PSO1**
CO6	Understand the safety measures required to be taken while using the tools	**PO1, PSO1**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming…	The ability to understand the evolutionary changes in …	Ability to analyze the impact of computer science and …
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
MEE12001	EngineeringWorkshop	3	1	-	-	-	-	-	-	3	-	-	-	3	-	-

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

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

Course Objectives

1. To comprehend general projection theory, with an emphasis on the use of orthographic projection to represent three-dimensional objects in two-dimensional views.
2. To understand the application of industry standards and techniques applied in engineering drawing.
3. To apply auxiliary or sectional views to most practically represent engineered parts.
4. To Dimension and explain two-dimensional engineering drawings.
5. 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

CO1. **Identify** the principle and significance of engineering drawing along with all the possible geometrical shapes.
CO2. **Infer** the principle and concept of projection of Points, Lines and Planes over Auxiliary Planes.
CO3. **Demonstrate** the principle and concept of Projection of Regular Solids.
CO4. **Illustrate** Sections and Sectional Views of Right Angular Solids and Regular Solids.
CO5. **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

Mapping between COs, POs and PSOs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Identify** the principle and significance of engineering drawing along with all the possible geometrical shapes.	**PO2, PO3, PO12, PSO2**
CO2	**Infer** the principle and concept of projection of Points, Lines and Planes over Auxiliary Planes.	**PO2, PO9, PO3, PO12**
CO3	**Demonstrate** the principle and concept of Projection of Regular Solids.	**PO3, PO9, PSO2, PO12**
CO4	**Illustrate** Sections and Sectional Views of Right Angular Solids and Regular Solids.	**PO3, PO9, PO12, PSO2**
CO5	**Interpret** Isometric projection.	**PO2, PO9, PO12**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming…	The ability to understand the evolutionary changes in …	Ability to analyze the impact of computer science and …
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CEE12001	Engineering Drawing and CAD	-	3	3	-	-	-	-	-	3	-	-	3	-	3	-

1=weakly mapped

2= moderately mapped

3=strongly mapped

ENG11044	**Communication and Collaboration Skill -II**	**L**	**T**	**P**	**C**
Version 1.0		**0**	**0**	**2**	**1**
Pre-requisites/Exposure	**12th level English, Communication and Collaboration Skill-I**				
Co-requisites	**--**				

Course Objectives:

1. To develop an understanding of the process of oral communication
2. To acquire critical thinking and analytical skills
3. To obtain a basic understanding of how communication is related to "being human"
4. Become more knowledgeable about audience centred speaking
5. To Improve listening, observational skills, and problem solving capabilities.

Course Outcomes:

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

CO1 Develop Public speaking skills and develop confidence.

CO2 Demonstrate the critical thinking skills, oral communication skills and leadership qualities.

CO3 Show creative thinking, willingness to work co-operatively and independently, and stressmanagement.

Catalog Description:

Through Communication and Collaboration students will learn how to articulate and make and make an impact among the group members. They will also gain knowledge about formal and informal distinction. Through this course, students will learn about time management, conflict resolution, negotiation techniques, and how to capture attention of the audience.

Course Content

List of Experiments (Any ten)	
1	Individuals will be chosen + volunteers who will do ADA-TEDX talks on chosen subject of interest – current affairs / latest trends / technology / engineering / specific company.
2	Voting for the best speaker.
3	Group will present why they liked a specific speaker. Students will learn how to prepare, create impact and public speaking.
4	The groups will be given debate topics
5	They will be required to prepare. Everyone gets to speak on the topic for / against.
6	Audience gets to vote for winners.
7	Drama / Stand-up comedy topics will be chosen by students
8	They can pick from any source – movies, books etc.
9	Everyone in the groups must have a role to play/act.
10	The audience gets to vote for winners.

Reference Books

1. Stephen R Covey, Seven Habits of Highly Effective People, Free Press, 1989
2. Carnegie Dale, How to win Friends and Influence People, New York: Simon & Schuster,1998
3. Daniel Goleman, Emotional Intelligence, Bantam Book, 2006
4. Innovation and Entrepreneurship (1985) by Peter F. Drucker.

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

Components	Class Assessment	End Term
Weightage (%)	**50**	**40**

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

Mapping between COs and POs		
	Course Outcomes (COs)	**pped ProgramOutcomes**
CO1	Develop Public speaking skills and developconfidence.	**P08,PO10,PSO1,PSO2**
CO2	Demonstrate the critical thinking skills, oral communication skills and leadership qualities	**PO9,PSO1,PSO2**

CO3	Show creative thinking, willingness to work co-operatively and independently, and stress management.	**PO2,PO9,PO10,PSO1,PSO2**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming…	The ability to understand the evolutionary changes in …	Ability to analyze the impact of computer science and …
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
ENG11044	Communicationand Collaboration Skill-II	-	1	-	-	-	-	-	2	3	3	-	-	3	3	-

1=weakly mapped

2= moderately mapped

3=strongly mapped

Year II
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:

1. To introduce the concepts of descriptive statistics
2. To reinforce the concepts of probability
3. To demonstrate the applications of sampling and statistical inference
4. 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)

Mapping between COs and POs		
Course Outcomes (COs)		**Mapped Program Outcomes**
CO1	Formulate descriptive statistics for real world problems	PO1, PO2, PO3, PO4, PSO1, PSO2
CO2	Explain the concepts of probability	PO1, PO2, PO3, PO4, PSO1, PSO2
CO3	Apply sampling and statistical inference in several problems	PO1, PO2, PO3, PO4, PSO1, PSO2
CO4	Compute significance based on hypothesis testing during experiments	PO1, PO2, PO3, PO4, PSO1, PSO2

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and	The ability to understand the evolutionary changes in computing, apply standard	Ability to analyse the impact of Computer Science and Engineering solutions in the
Course Code	**Course Title**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
SDS11510	Engineering Mathematics III-C	3	3	3	3	-	-	-	-	-	-	-	-	3	3	-

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:

1. To introduce the concepts of logic
2. To reinforce the concepts of set theory
3. To demonstrate the applications of permutations and combinations
4. 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)

Mapping between COs and POs		
Course Outcomes (COs)		**Mapped Program Outcomes**
CO1	Formulate propositional and first order logic	PO1, PO2, PO3, PO4, PSO1, PSO2
CO2	Explain the concepts of set theory	PO1, PO2, PO3, PO4, PSO1, PSO2
CO3	Apply permutation and combinations in several problems	PO1, PO2, PO3, PO4, PSO1, PSO2
CO4	Develop algorithms for graphs and trees	PO1, PO2, PO3, PO4, PSO1, PSO2

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context,
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
MTH11534	Discrete Structures and Logic	3	3	3	3	-	-	-	-	-	-	-	-	3	3	-

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

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:

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

Course Outcomes:

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

CO1: Discuss fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
CO2: Understand fundamentals of object-oriented programming in C++, including defining classes, invoking methods, using class libraries, etc.
CO3: Explain important topics related to functions and pointers.
CO4: Understand the scope of variables and utility of exception handling.
CO5: 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: 1. Bjrane Stroustrup, “C++ Programming language” , Pearson education Asia **Reference Books:** 1. Yashwant Kenetkar,”Let us C++”,Oxford University Press 2. 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)

Mapping between COs and POs		
Course Outcomes (COs)		**Mapped Program Outcomes**
CO1	**Discuss** fundamentals of programming such as variables, conditional and iterative execution, methods, etc.	PO1, PSO1,PO12
CO2	**Understand** fundamentals of object-oriented programming in C++, including defining classes, invoking methods, using class libraries, etc.	PO1, PO2, PO3, PSO1, PS03
CO3	**Explain** important topics related to functions and pointers.	PO1, PO2, PO3, PSO1,PO12
CO4	**Understand** the scope of variables and utility of exception handling.	PO1, PO2, PSO1,PSO3
CO5	**Utilise** the OOP knowledge to create, debug and run simple C++ programs.	PO1, PO12, PO3, PSO1, PSO3

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design	The ability to understand the evolutionary changes in computing, apply standard practices and	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE 11103	Principles of programming language	3	3	3	-	-	-	-	-	-	-	-	3	3	-	3

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

		L	T	P	C
CSE11003	**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:

1. Introduce the fundamental concept of data structures
2. To emphasize the importance of data structures in developing and implementing efficient algorithms.
3. 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

CO1: Define the concept of Dynamic memory management, data types, and algorithms.

CO2: Illustrate advantages and disadvantages of specific algorithms and data structures.

CO3: Solve bugs in program, recognize needed basic operations with data structures.

CO4: Interpret algorithms and data structures in terms of time and memory complexity of basic operations.

CO5: 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:

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

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

Mapping between COs and POs		
Course Outcomes (COs)		**Mapped Program Outcomes**
CO1	Define the concept of Dynamic memory management, data types, and algorithms.	PO1, PO2, PO3, PO4, PSO1, PSO2, PSO3
CO2	Illustrate advantages and disadvantages of specific algorithms and data structures.	PO1, PO2, PO3, PO4, PSO1, PSO2, PSO3
CO3	Solve bugs in program, recognize needed basic operations with data structures.	PO1, PO2, PO3, PO4, PSO1, PSO2, PSO3
CO4	Interpret algorithms and data structures in terms of time and memory complexity of basic operations.	PO1, PO2, PO3, PO4, PSO1, PSO2, PSO3
CO5	Compare the computational efficiency of the principal algorithms for sorting, searching, and hashing.	PO1, PO2, PO3, PO4, PSO1, PSO2, PSO3

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design	The ability to understand the evolutionary changes in computing, apply standard practices and	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE 11104	Data Structures and Algorithms	3	3	3	3									3	3	3

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

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

Course Objectives:

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

Course Outcomes:

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

CO1: **Understand** and construct the basic design principles of logic gate.

CO2: **Understand** the different fabrication techniques used in Bipolar, CMOS and PLA.

CO3: **Formaliz**e with Mealy and Moore machine.

CO4: **Construct** ROM design.

CO5: **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: 1. H. Taub and D. Schilling, Digital Integrated Electronics, McGraw-Hill. **Reference Books:** 1. Z. Kohavi, Switching and Finite Automata Theory, Tata McGraw-Hill 2. 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)

Mapping between COs and POs		
Course Outcomes (COs)		Mapped Program Outcomes
CO1	**Understand** and construct the basic design principles of logic gate.	PO1,PO2,PO3
CO2	**Understand** the different fabrication techniques used in Bipolar, CMOS and PLA.	PO1,PO3, PO2, PO6, PO7
CO3	**Formaliz**e with mealy and Moore machine.	PO1,PO2, PO6, PO7,PO12
CO4	**Construct** ROM design.	PO1,PO3,PO2
CO5	**Realize** the ASM Charts	PO2, PO6, PO7, PO8

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design	The ability to understand the evolutionary changes in computing, apply standard practices and	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE 11105	Switching Circuit and Logic Design	3	2	3	3	3	3	3	3	-	-	2	3	3	2	2

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:

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

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: **Apply** fundamentals of object-oriented programming in C++, including defining classes, invoking methods, using class libraries, etc.

CO3: **Explain** important topics related to functions and pointers.

CO4: **Understand** the scope of variables and utility of exception handling..

CO5: **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:

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

Reference Books:

3. Yashwant Kenetkar,"Let us C++",Oxford University Press
4. 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)

Mapping between COs and POs		
Course Outcomes (COs)		**Mapped Program Outcomes**
CO1	**Define** classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem.	PO1, PSO1
CO2	**Apply** fundamentals of object-oriented programming in C++, including defining classes, invoking methods, using class libraries, etc.	PO1, PO2, PO3, PSO1, PS03
CO3	**Explain** important topics related to functions and pointers.	PO1, PO2, PO5, PSO1
CO4	**Understand** the scope of variables and utility of exception handling..	PO1, PO2, PSO1
CO5	**Utilise** the OOP knowledge to create, debug and run simple C++ programs.	PO1, PO2, PO3, PSO1, PSO3

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning newprogramming environments, analyse and	The ability to understand the evolutionary changes in computing, apply standard practices and	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE 12106	Principles of programming language lab	3	3	3	-	3	-	-	-	-	-	-	-	3	-	3

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)

Mapping between COs and POs		
Course Outcomes (COs)		**Mapped Program Outcomes**
CO1	**Explain** asymptotic performance of the algorithms.	**PO1, PO2, PSO2, PSO3**
CO2	**Illustrate** Linear data structures and their applications such as Stacks, Queues and Lists	**PO1, PO2, PO3, PO4, PSO1, PSO2, PSO3**
CO3	**Solve** and understand Non-Linear Data Structures and their Applications such as Trees and Graphs	**PO1, PO2, PO3, PO4, PSO1, PSO2, PSO3**
CO4	**Interpret** searching and sorting algorithms	**PO1, PO2, PO3, PSO1, PSO2, PSO3**
CO5	**Explain** asymptotic performance of the algorithms.	**PO1, PO2, PSO2, PSO3**

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning newprogramming environments, analyse and	The ability to understand the evolutionary changes in computing, apply standard practices and	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE 12107	Data Structures and Algorithms Lab	3	3	3	2	-	-	-	-	-	-	-	-	3	3	3

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

CO1. Numerically solve non-linear equations related to univariate problems
CO2. Numerically solve system of linear equation related to multivariate problems
CO3. Obtain interpolated value of a function that is known at a finite number of points
CO4. Numerically compute values of any definite integrals
CO5. 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:

1. The root of non-linear equation using Bisection method.
2. The root of non-linear equation using false position method.
3. The root of non-linear equation using Newton Raphson method.
4. Interpolate values using Newton‘s forward Interpolation method.
5. Interpolate values using Newton‘s backward Interpolation method.
6. Interpolate values using Lagrange‘s interpolation method.
7. Solve a system of linear equation using gauss-elimination method.
8. Solve a system of linear equation using gauss-seidel method.
9. Evaluate the integral using different numerical integration rules.

10. Solve an ordinary differential equation using different numerical methods.

Text Books

1. 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
2. T. Veerarajan, T. Ramachandran , Numerical Methods with Programs in C , Tata McGraw-Hill Publications.
3. S. Dey, S. Gupta , Numerical Methods, McGraw Hill Education.

Reference Books

1. B.S. Grewal, Numerical Methods in Engineering & Science: with Programs in C & C++, 11th Ed., Khanna Publishers, 2013.

2. 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)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Numerically solve non-linear equations related to univariate problems	**PO1, PO2, PSO2, PSO3**
CO2	Numerically solve system of linear equation related to multivariate problems	**PO1, PO2, PO3, PO4, PSO1, PSO2, PSO3**
CO3	Obtain interpolated value of a function that is known at a finite number of points	**PO1, PO2, PO3, PO4, PSO1, PSO2, PSO3**
CO4	Numerically compute values of any definite integrals	**PO1, PO2, PO3, PSO1, PSO2, PSO3**
CO5	Solve initial value problems representing systems with spatial/temporal variations	**PO1, PO2, PSO2, PSO3**

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning newprogramming environments, analyse and	The ability to understand the evolutionary changes in computing, apply standard practices and	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
MTH12531	Numerical Techniques Lab	3	3	3	2	-	-	-	-	-	-	-	-	3	3	3

Year II
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:

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

Course Outcomes:

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

1. **Describe** the characteristics of database and the architecture of Database system.
2. **Model** the elements used in Entity- Relationship diagram.
3. **Summarize** relational model concept and illustrate the relational constraints.
4. **Build** Structured Query Language (SQL) and apply to query a database and **Define** normalization for relational databases.
5. **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:

1. "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:

1. "Fundamentals of Database Systems", 5th Edition by R. Elmasri and S. Navathe, Pearson Education
2. "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)

Mapping between COs and POs		
Course Outcomes (COs)		**Mapped Program Outcomes**
CO1	**Describe** the characteristics of database and the architecture of Database system.	PO1, PO2, PSO1
CO2	**Model** the elements used in Entity- Relationship diagram.	PO2, PO3, PO4, PSO1
CO3	**Summarize** relational model concept and illustrate the relational constraints.	PO1, PO2, PO4, PSO2
CO4	**Build** Structured Query Language (SQL) and apply to query a database and **Define** normalization for relational databases.	PO2, PO3, PO4, PO5, PO6, PSO3
CO5	**Develop** some Standalone (Example)/ Mobile/ Web Application DB on real world case studies.	PO3, PO5, PSO3

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software project	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context, design,
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE11108	Database Management Systems	2	3	2	3	2	1	-	-	-	-	-	-	2	1	1

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: 1. Java Fundamentals - A Comprehensive Introduction, Illustrated Edition ByDaleskrien, Herbert Schildt, Mcgraw-Hill Education. **Reference Books:** 1. Java For Programmers, 2nd Edition By Paul Deitel And Harvey Deitel, Pearson Education. 2. 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)

Mapping between COs and POs		
Course Outcomes (COs)		Mapped Program Outcomes
CO1	**Interpret** fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.	PO1, PSO1,PO12
CO2	**Construct** programming solutions with exception handling and multi-threading concept	PO1, PO2, PO3, PSO2, PS03
CO3	**Develop** programming solutions using database connection	PO1, PO2, PSO1
CO4	**Solve** GUI program with proper event handling techniques	PO1, PO12, PO3, PSO1, PSO3
CO5	**Develop** programming solutions to real world problems effectively.	PO1, PO2, PO3, PSO1, PSO3,PO12

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning newprogramming environments, analyse and	The ability to understand the evolutionary changes in computing, apply standard practices and	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE 11109	Object oriented programming	3	3	2	-	-	-	-	-	-	-	-	3	3	1	1

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:

1. To introduce problem solving approach through design.
2. To develop students to analyse the existing algorithms and approach for improvement.
3. To introduce the students a perspective to different design and analysis approach for algorithm(s) to solve a problem.
4. 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

CO1: **Understand** the basics about algorithms and learn how to analyse and design algorithms

CO2: **Choose** brute force, divide and conquer, dynamic programming and greedy techniques methods to solve computing problems

CO3: **Understand** the approach for solving problems using iterative method.

CO4: **Describe** the solution of complex problems using backtracking, branch and bound techniques.

CO5: **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:

1. Introduction to Algorithms, 4TH Edition, Thomas H Cormen, Charles E Lieserson, Ronald L Rivest And Clifford Stein, MIT Press/ Mcgraw-Hill.
2. Fundamentals of Algorithms – E. Horowitz Et Al.
3. Algorithm Design, 1ST Edition, Jon Kleinberg and Évatardos, Pearson.
4. Book 3 – Author – Publisher

Reference Books:

1. Algorithm Design: Foundations, Analysis, And Internet Examples, Second Edition, Michael T Goodrich And Roberto Tamassia, Wiley.
2. 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)

Mapping between COs and POs		
Course Outcomes (COs)		Mapped Program Outcomes
CO1	**Understand** the basics about algorithms and learn how to analyse and design algorithms	PO1, PO, PO3, PO4, PSO1, PSO2
CO2	Choose brute force, divide and conquer, dynamic programming and greedy techniques methods to solve computing problems	PO1, PO, PO3, PO4, PSO1, PSO2
CO3	Understand the approach for solving problems using iterative method.	PO1, PO, PO3, PO4, PSO1, PSO2
CO4	Describe the solution of complex problems using backtracking, branch and bound techniques.	PO1, PO, PO3, PO4, PSO1, PSO2
CO5	Classify the different Computability classes of P, NP, NP-complete and NP-hard.	PO1, PO, PO3, PO4, PSO1, PSO2

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE 11110	Design and Analysis of Algorithms	3	3	3	3	-	-	-	-	-	-	-	-	3	3	-

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

CSE11005	**Formal Language and Automata**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**NIL**				
Co-requisite	**NIL**				

Course Objectives:

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

Course Outcomes:

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

CO1: Define the basic concepts in formal language theory, grammars, automata theory, computability theory, and complexity theory.
CO2: 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
CO3: Prove and disprove theorems establishing key properties of formal languages and automata.
CO4: Acquire a fundamental understanding of core concepts relating to the theory of computation and computational models including (but not limited to) decidability and Intractability.
CO5: 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: 1. Introduction to Automata Theory, Languages, and Computation, 3rd Edition, John E. Hopcroft Rajeev Motwani and Jeffrey D. Ullman, Pearson Education. 2. Michael Sipser, Introduction to the Theory of Computation, PWS Publishing 3. An Introduction To Formal Languages And Automata, Peter Linz Reference Books: 1. Harry R. Lewis and Christos H. Papadimitriou, Elements of the Theory of Computation,Pearson Education Asia. 2. 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)

Mapping between COs and POs		
Course Outcomes (COs)		**Mapped Program Outcomes**
CO1	Define the basic concepts in formal language theory, grammars, automata theory, computability theory, and complexity theory.	PO1, PO, PO3, PO4, PSO1, PSO2
CO2	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	PO1, PO, PO3, PO4, PSO1, PSO2
CO3	Prove and disprove theorems establishing key properties of formal languages and automata.	PO1, PO, PO3, PO4, PSO1, PSO2
CO4	Acquire a fundamental understanding of core concepts relating to the theory of computation and computational models including (but not limited to) decidability and Intractability.	PO1, PO, PO3, PO4, PSO1, PSO2
CO5	Solve fundamental problems related to Computational Model.	PO1, PO, PO3, PO4, PSO1, PSO2

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE11111	Formal Language and Automata Theory	3	3	3	3	-	-	-	-	-	-	-	-	3	3	-

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:

1. To provide the most fundamental knowledge of AI.
2. To make a computer that can learn, plan, and solve problems autonomously.
3. To give the students a perspective on the main research topics in AI i.e. problem solving, reasoning, planning, etc.
4. 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

CO1: **Define** Artificial Intelligence and its approach.
CO2: **Describe** propositional logic and inference engine.
CO3: **Execute** Planning with state-space search.
CO4: **Construct** Bayesian networks and other temporal models.
CO5: **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:

Unit-I	10 Lecture Hours
Introduction: Introduction, Agents, Problem formulation, Uninformed search strategies, Heuristics, Informed search strategies, Satisfying constraints. Logical agents, Propositional logic, Inference rules, First-order logic, Inferences in first order logic, Forward and backward chaining, Unification, Resolution.	
Unit-II	**8 Lecture Hours**
Search in State Space and Planning: 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, Characteristics, Ontology Engineering	
Unit-IV	**9 Lecture Hours**
Communication and Integration: The perceptron algorithm, various activation functions and their differentiability, multilayer perceptrons, back-propagation, nonlinear regression, multiclass discrimination, training procedures, Case Study Bayesian Learning, Decision Tree.	
Unit-V	**9 Lecture Hours**
Various wings of AI: Functional and geometric margins, optimum margin classifier, constrained optimization, Lagrange multipliers, KKT conditions, soft margins, kernels. Dimensionality Reduction: Feature Selection, Principle Component Analysis (PCA).	
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.	

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

Examination Scheme:

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

PSG11021	Human Values and Professional Ethics	L	T	P	C

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

Mapping between COs and POs		
Course Outcomes (COs)		Mapped Program Outcomes
CO1	**Define** Artificial Intelligence and its approach.	PO1, PO2, PSO1
CO2	**Describe** propositional logic and inference engine.	PO2, PO3, PO4, PSO1
CO3	**Execute** Planning with state-space search.	PO1, PO2, PO4, PSO2
CO4	**Construct** Bayesian networks and other temporal models.	PO2, PO3, PO4, PO5, PO6, PSO3
CO5	**Explain** the types of Learning.	PO3, PO5, PSO3

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient computer-based systems of varying	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software project development using open-	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context, design, model, develop, test and manage
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE 11112	Introduction to Artificial Intelligence	2	3	2	3	2	1	-	-	-	-	-	-	2	1	1

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

Version 1.0	**Contact Hours -45**	**3**	**0**	**0**	**3**
Pre-requisites/Exposure	**Basic human ethics**				
Co-requisites	**--**				

Course Objectives:

1. 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.
2. 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.
3. 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;
CO2. **Develop** an increased personal understanding of issues related to ethics.
CO3. **Develop** an increased personal understanding of issues related the law
CO4. **Analyze** one's own ethical decision-making processes.
CO5. **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)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Explain** the morals, values, ethics, and the law and to explore how they impact professional practice	**PO2, PO7, PO8**
CO2	**Develop** an increased personal understanding of issues related to ethics.	**PO8, PO3, PO4**
CO3	**Develop** an increased personal understanding of issues related the law.	**PO2, PSO3**
CO4	**Analyze** one's own ethical decision-making processes.	**PO11, PO12**
CO5	**Plan** guidelines for enhancing one's ability to generate ethical behavior and solutions to conflicts arising in the practice.	**PSO1, PSO2**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient computer-based systems of varying complexity.	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software project development using open-ended	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context, design, model, develop, test and manage complex
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
PSG11021	Human Values and Professional Ethics	-	2	-	-	-	-	3	2	-	-	2	3	2	2	2

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

		L	T	P	C
CSE12113	**Database Management Systems Lab**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours -30**	**0**	**0**	**2**	**1**
Pre-requisites/Exposure	**Basic human ethics**				
Co-requisites	**--**				

Course Objectives:

1. To explain basic database concepts, applications, data models, schemas and instances.
2. To demonstrate the use of constraints and relational algebra operations.
3. To describe the basics of SQL and construct queries using SQL.
4. To emphasize the importance of normalization in databases.
5. To facilitate students in Database design
6. To familiarize issues of concurrency control and transaction management.

Course Outcomes:

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

CO1. **Organize** the basic concepts of Database Systems and Applications.
CO2. **Construct** the basics of SQL and construct queries using SQL in database creation interaction.
CO3. **Define** a commercial relational database system (Oracle, MySQL) by writing SQL using the system.

Catalog Description:

This course introduces the core principles and techniques required in the design and implementation of database systems. This introductory application-oriented course covers the relational database systems RDBMS - the predominant system for business scientific and engineering applications at present. It includes Entity-Relational model, Normalization, Relational model, Relational algebra, and data access queries as well as an introduction to SQL. It also covers essential DBMS concepts such as: Transaction Processing, Concurrency Control and Recovery. It also provides students with theoretical knowledge and practical skills in the use of databases and database management systems in information technology applications.

Course Content:

Experiment 1:
Familiarization of structured query language.

Experiment 2:
Table Creation.

Experiment 3:
Insertion, Updation, Deletion of tuples.

Experiment 4:
Executing different queries based on different functions.

Experiment 5:
Performing joining operations.

Experiment 6:
Nested Queries.

Experiment 7:
Use of aggregate functions.

Experiment 8:
Use of group functions.

Experiment 9:

Use of order by functions.

Experiment 10:

Arithmetic operations.

Experiment 11:

Trigger using SQL.

Experiment 12:

Introduction to PL/SQL.

Experiment 13:

Report generation of various queries.

Experiment 14:

Merging Data Bases with front end using ODBC connection.

Experiment 15:

SQL Injection on a non-harmful test page.

Text Books:

1. 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:

1.Fundamentals of Database Systems, 5th Edition by R. Elmasri and S. Navathe, Pearson Education
2.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	Continious Assessment	ETE
Weightage (%)	50	50

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

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Organize the basic concepts of Database Systems and Applications.	**PO1, PO12,PSO3**
CO2	Construct the basics of SQL and construct queries using SQL in database creation interaction.	**PO1, PO3, PSO2**
CO3	Design a commercial relational database system (Oracle, MySQL) by writing SQL using the system.	**PO2, PO3, PO4, PSO1**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient computer-based systems of varying complexity.	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software project development using open-ended programming environments to	The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, lifelong learning and a zest for higher studies and
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE12113	Database Management Systems Lab	2	3	2	3	-	-	-	-	-	-	-	3	2	2	3

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: 2. Java Fundamentals - A Comprehensive Introduction, Illustrated Edition ByDaleskrien, Herbert Schildt, Mcgraw-Hill Education. **Reference Books:** 3. Java For Programmers, 2nd Edition By Paul Deitel And Harvey Deitel, Pearson Education. 4. 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)

Mapping between COs and POs		
Course Outcomes (COs)		**Mapped Program Outcomes**
CO1	**Define** classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem.	PO1, PSO1
CO2	**Illustrate** object oriented modelling techniques like classes and Instances modelling techniques	PO1, PO2, PO3, PSO1, PS03
CO3	**Interpret** fundamentals of object-oriented programming in Java, including defining Classes, invoking methods, using class libraries, etc.	PO1, PO2, PSO1
CO4	**Construct** programming solutions with exception handling and multi-threading concept	PO1, PO2, PO3, PSO1, PSO3
CO5	**Solve** GUI program with proper event handling techniques.	PO1, PO2, PO3, PSO1, PSO3

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning newprogramming environments, analyse and	The ability to understand the evolutionary changes in computing, apply standard practices and	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE12114	Object Oriented Programming Lab	3	3	3	-	3	-	-	-	-	-	-	-	3	-	3

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

Year III
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	**--**				

Course Objectives:

1. To give a brief overview of fundamentals of computer network
2. To conceptualize understanding in transmission media and data communication.
3. To propagate a functional overview of addressing techniques and protocols
4. 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

CO1: Explain key networking concepts, principles, design issues and techniques at all protocol layers.
CO2: 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.
CO3: Describe different types of networked applications and what underlying network protocols are needed to meet their diverse requirements.
CO4: Distinguish between control and data planes in computer networks, and their corresponding architectures in real-world networks (including the Internet).
CO5: 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:

1. . Computer Networking -Top Down Approach- James F. Kurose and Keith W. Ross-- Pearson 2013, sixth Edition
2. 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)

Mapping between COs and POs		
Course Outcomes (COs)		Mapped Program Outcomes
CO1	Explain key networking concepts, principles, design issues and techniques at all protocol layers.	**PO1, PO2,PSO1,PSO2**
CO2	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.	**PO1, PO2, PO3, PO10,PO11,PO12**
CO3	Describe different types of networked applications and what underlying network protocols are needed to meet their diverse requirements.	**PO1, PO2,PO3,PO4,PO6**
CO4	Distinguish between control and data planes in computer networks, and their corresponding architectures in real-world networks (including the Internet).	**PO3, PO5 ,PO6,PO10,PO11,PO12**
CO5	Illustrate reliable transport protocols and networked system architectures via implementation using Socket APIs, measurement and analysis.	**PO5, PO6 , PO7,PO10,PO11,PO12PSO1,PSO2**

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design	The ability to understand the evolutionary changes in computing, apply standard practices and	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE11115	Computer Networks	3	3	-	3	-	-	-	2	-	-	-	-	3	-	3

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

CO1: Define functional block of a computer and relate data representation

CO2: Explain and understand memory hierarchy design, memory access time formula, performance improvement techniques, and trade-offs.

CO3: Analyze the concepts of memory utilization in a computer system.

CO4: Analyze the concepts of memory utilization in a computer system.

CO5: 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:

1. Computer Organization 1.and Design: The Hardware/Software Interface, 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.
2. Computer Organization and Embedded Systems, 6th Edition by Carl Hamacher, McGraw Hill Higher Education.

Reference Books:

1. Computer Architecture and Organization, 3rd Edition by John P. Hayes, WCB/McGraw-Hill
2. Computer Organization and Architecture: Designing for Performance, 10th Edition by William Stallings, Pearson Education.
3. .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)

Mapping between COs and POs		
Course Outcomes (COs)		**Mapped Program Outcomes**
CO1	Define functional block of a computer and relate data representation	**PO1, PO2 , PO3, PO4, PSO1, PSO2**
CO2	Explain and understand memory hierarchy design, memory access time formula, performance improvement techniques, and trade-offs.	**PO1, PO2 , PO3, PO4, PSO1, PSO2**
CO3	Analyze the concepts of memory utilization in a computer system.	**PO1, PO2 , PO3, PO4, PSO1, PSO2**
CO4	Analyze the concepts of memory utilization in a computer system.	**PO1, PO2 , PO3, PO4, PSO1, PSO2**
CO5	Define the implementation of parallel processors and analyze the synchronization techniques	**PO1, PO2 , PO3, PO4, PSO1, PSO2**

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE11116	Computer Organization and Architecture	3	3	3	3	-	-	-	-	-	-	-	-	3	3	-

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

		L	T	P	C
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	**--**				

Course Objectives:

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**

S**oftware 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:

1. 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)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Interpret** the impact of software engineering.	**PO1, PO11,PO10**
CO2	Communicate with proper software model paradigm to pupils.	**PO1, PO2, PO5, , PSO1, PSO2**
CO3	Enhancement of software metric engineering application in industry.	**PO1, PO5, PO12, PSO2**
CO4	Effectively analyse testing and maintenance of software project.	**PO1, PO6, PO8, PO9, PO12, PSO3**
CO5	**Illustrate** software modelling Structure and software metric Procedures to the Project.	**PO1, PO6, PO8, PO9, PO12, PSO2**

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient computer-based systems of	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software project development using	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context, design, model, develop
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11117	Software Engineering	3	2	-	-	2	2	-	-	-	-	-	3	2	3	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**, e**xpressions, 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)

Mapping between COs and POs		
Course Outcomes (COs)		**Mapped Program Outcomes**
CO1	Understand the basic concepts of python	PO1, PO3, PO4, PSO1, PSO2, PSO3
CO2	Understand database management using python	PO1, PO3, PO4, PSO1, PSO2, PSO3
CO3	Apply numerical computation with python	PO1, PO3, PO4, PSO1, PSO2, PSO3
CO4	Compare scientific computation methods with python	PO1, PO3, PO4, PSO1, PSO2, PSO3
CO5	Visualize trends in the data with python	PO1, PO3, PO4, PSO1, PSO2, PSO3

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning			

Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE11118	**Introduction to Python**	3	3	3	3	-	-	-	-	-	-	-	-	3	3	3

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:

1. Formulate an equilibrium-finding problem of certain games as a CP/VI or an
2. MPEC
3. Rigorously analyze the existence and uniqueness of solutions to CPs, VIs and
4. MPECs, and hence able to prove the existence and uniqueness of Nash equilibrium
5. to certain games
6. Understand and utilize various algorithms to solve CPs, VIs and MPECs
7. Understand the basic formulation and theories of optimization under uncertainty
8. 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:

<table>
<tr><td>Unit-I</td><td>10 Lecture Hours</td></tr>
<tr><td colspan="2">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</td></tr>
<tr><td>Unit-II</td><td>10 Lecture Hours</td></tr>
<tr><td colspan="2">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</td></tr>
<tr><td>Unit-III</td><td>15 Lecture Hours</td></tr>
<tr><td colspan="2">Nonlinear complementarity problems and variational inequalities
- Problem definitions and application areas
– Solution analysis
– Algorithms for CPs
– Algorithms for VIs</td></tr>
<tr><td>Unit-IV</td><td>10 Lecture Hours</td></tr>
<tr><td colspan="2">Mathematical problems with equilibrium constraints
- Extensive-form games and Stackelberg games
- MPECs : Formulation, Solution existence, constraint qualifications, and optimality conditions, Algorithms for MPECs</td></tr>
<tr><td>Unit-V</td><td>5 Lecture Hours</td></tr>
<tr><td colspan="2">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</td></tr>
<tr><td colspan="2">Text Books:
1. Computer Organization 1.and Design: The Hardware/Software Interface, 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.
2. Computer Organization and Embedded Systems, 6th Edition by Carl Hamacher, McGraw Hill Higher Education.

Reference Books:
1. Computer Architecture and Organization, 3rd Edition by John P. Hayes, WCB/McGraw-Hill
2. Computer Organization and Architecture: Designing for Performance, 10th Edition by William Stallings, Pearson Education.
3. .Computer System Design and Architecture, 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education</td></tr>
</table>

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)

Mapping between COs and POs		
Course Outcomes (COs)		**Mapped Program Outcomes**
CO1	Explain basic concepts of linear algebra, real analysis and nonlinear programming	**PO1, PO2 , PO3, PO4, PSO1, PSO2, PSO3**
CO2	Understand Game theory and linear complementarity problems	**PO1, PO2 , PO3, PO4, PSO1, PSO2, PSO3**
CO3	Formulate nonlinear complementarity problems and variational inequalities	**PO1, PO2 , PO3, PO4, PSO1, PSO2, PSO3**
CO4	Solve mathematical problems with equilibrium concepts	**PO1, PO2 , PO3, PO4, PSO1, PSO2, PSO3**
CO5	Decide under uncertainty and competition	**PO1, PO2 , PO3, PO4, PSO1, PSO2, PSO3**

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE11119	Optimization and Game Theory	3	3	3	3									3	3	3

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

CO1: Define Understand the limitations of data sets based on their contents and provenance
CO2: Understand data organization, management, preservation, and reuse
Knowledge of what statistical analysis techniques to choose, given particular demands of inference and available data
CO3: Explain of general linear models and cluster analysis methods for statistical analysis
CO4: Demonstrate Skills and knowledge in preparing data for analysis, including cleaning data, manipulating data, and dealing with missing data
CO5: 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

Unit-II **10 Lecture Hours**

Data Modelling and Relationship, Data Structure and Variables.

Unit-III **10 Lecture Hours**

Descriptive Statistics, Sampling Distributions, Big Data and Statistics

Unit-IV **10 Lecture Hours**

Linear Regression, Cluster Analysis, Similarity Metrics, Dimensionality Reduction

Unit-V **10 Lecture Hours**

Text Analysis(Unstructured Data), Relevant Issues in Data Science

Text Books:

1. **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)

Mapping between COs and POs		
Course Outcomes (COs)		**Mapped Program Outcomes**
CO1	Understand the limitations of data sets based on their contents and provenance	**PO1, PO2, PO3, PO4, PSO1, PSO2, PSO3**
CO2	Understand data organization, management, preservation, and reuse	**PO1, PO2, PO3, PO4, PSO1, PSO2, PSO3**
CO3	Knowledge of what statistical analysis techniques to choose, given particular demands of inference and available data	**PO1, PO2, PO3, PO4, PSO1, PSO2, PSO3**
CO4	Explain of general linear models and cluster analysis methods for statistical analysis	**PO1, PO2, PO3, PO4, PSO1, PSO2, PSO3**
CO5	Demonstrate Skills and knowledge in preparing data for analysis, including cleaning data, manipulating data, and dealing with missing data	**PO1, PO2, PO3, PO4, PSO1, PSO2, PSO3**

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE11120	Introduction to Data Science	3	3	3	3	-	-	-	-	-	-	-	-	3	3	3

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:

1. To explain the evolving computer model called cloud computing.
2. To introduce the various levels of services that can be achieved by cloud.
3. To describe the security aspects in cloud.
4. 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

CO1: Explain distributed system models and cloud service & deployment models.

CO2: Analyse the need for virtualization in a cloud environment and apply it in compute, memory and storage levels.

CO3: Explain distributed computation model on large datasets using parallel and distributed programming approaches over cloud platforms.

CO4: Analyse the security issues on SPI infrastructure and explain the need for Homomorphic encryption.

CO5: 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:

1. Cloud Computing: Principles and Paradigms – Rajkumar Buyya, James Broberg and Andrzej M. Goscinski – Wiley
2. Distributed and Cloud Computing – Kai Hwang, Geoffery C. Fox, Jack J. Dongarra – Elsevier

Reference Books:

1. Cloud Computing : A Practical Approach – Anthony T.Velte, Toby J.Velte, Robert Elsenpeter – Tata McGraw Hill
2. Enterprise Cloud Computing – Gautam Shroff – Cambridge University Press
3. Cloud Computing: Implementation, Management and Security – John W. Rittinghouse, James F. Ransome – CRC Press
4. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud – George Reese – O'Reilly
5. 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)

Mapping between COs and POs		
Course Outcomes (COs)		Mapped Program Outcomes
CO1	Explain distributed system models and cloud service & deployment models.	**PO1, PO3**
CO2	Analyse the need for virtualization in a cloud environment and apply it in compute, memory and storage levels.	**PO1, PO12**
CO3	Explain distributed computation model on large datasets using parallel and distributed programming approaches over cloud platforms.	**PO1, PO11**
CO4	Analyse the security issues on SPI infrastructure and explain the need for Homomorphic encryption.	**PO12, PSO2**
CO5	Explain the role of trust and energy efficiency in cloud.	**PO11, PO12, PSO2**

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design	The ability to understand the evolutionary changes in computing, apply standard practices and	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE 11121	Distributed Systems and Cloud	3	-	2	-	-	-	-	-	-	-	2	2	-	3	-

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:

1. To understand basics of Cyber Security.
2. To be able to secure a message over insecure channel by various means.
3. To learn about how to maintain the Confidentiality, Integrity and Availability of a data.
4. 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

CO1. **Define** the basics of Cyber security and types of existing malware.
CO2. **Understand** and identify the cyber security breaches and cyber attacks.
CO3. **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 defense 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: 1. "Network Security: Private Communication in Public World", Charlie Kaufman, RadiaPerman, Mike Speciner, 2nd Edition, Pearson Education, 2011. **Reference Books:** 1. "Cryptography and Network Security", Atulkahate, TMH, 2003. 2. "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)

Mapping between COs and POs		
Course Outcomes (COs)		**Mapped Program Outcomes**
CO1	**Define** the basics of Cyber security and types of existing malware.	**PO1, PO2,PO12,PO3**
CO2	**Understand** and identify the cyber security breaches and cyber attacks.	**PO2,PO3, PSO1**
CO3	**Explain** the preventive measures for cyber fraud	**PO1, PO5,PSO1**
CO4	**Examine** the basics concept of Social Network Security and Web Security.	**PO1, PO2, PO3,PO12, PSO2**
CO5	**Appraise** the recent threats and attacks against the technical world and design some effective prevention scheme.	**PO5, PSO3,PO12,PSO2**

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning newprogramming environments, analyse and	The ability to understand the evolutionary changes in computing, apply standard practices and	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE 11122	Introduction to Cyber Security	3	3	3	-	3	-	-	-	-	-	-	3	2	2	-

1 = Weakly Mapped

2 = Moderately Mapped

3 = Strongly Mapped

		L	T	P	C
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:

1. To enhance software development capability of students
2. To familiarize students with modern software development technologies
3. 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,	
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.	
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)

Mapping between COs and POs		
Course Outcomes (COs)		Mapped Program Outcomes
CO1	Understand the concepts of full stack development	**PO2, PO3, PO4, PO5, PO6, PO11, PSO2, PSO3**
CO2	Explain the uses of front end libraries and frameworks	**PO2, PO3, PO4, PO5, PO6, PO11, PSO2, PSO3**
CO3	Understand principles of backend development	**PO2, PO3, PO4, PO5, PO6, PO11, PSO2, PSO3**
CO4	Explore database management solutions	**PO2, PO3, PO4, PO5, PO6, PO11, PSO2, PSO3**
CO5	Compare several popular stacks	**PO2, PO3, PO4, PO5, PO6, PO11, PSO2, PSO3**

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context,
Course Code	**Course Title**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11123	Full Stack Software Development		3	3	3	3	3	-	-	-	-	3	-	-	3	3

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:

1. To familiarize concepts of pattern recognition systems
2. 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:

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)

Mapping between COs and POs		
Course Outcomes (COs)		**Mapped Program Outcomes**
CO1	Discuss components of a pattern recognition system	PO2, PO3, PO4, PO5, PO6, PSO2, PSO3
CO2	Explore dimensionality reduction and classification techniques	PO2, PO3, PO4, PO5, PO6, PSO2, PSO3
CO3	Validate clustering techniques	PO2, PO3, PO4, PO5, PO6, PSO2, PSO3
CO4	Explain concepts of representation learning	PO2, PO3, PO4, PO5, PO6, PSO2, PSO3
CO5	Compare Hard and Soft computing methodologies	PO2, PO3, PO4, PO5, PO6, PSO2, PSO3

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context,
Course Code	**Course Title**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11124	Pattern Recognition and Soft Computing	-	3	3	3	3	3	-	-	-	-	-	-	-	3	3

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:

1. Introduce data mining principles and techniques.
2. Introduce data mining as a cutting edge business intelligence tool.
3. Develop and apply critical thinking, problem solving and decision making skills.
4. Introduce the concepts of Data Warehousing, difference between database and data warehousing
5. Describe and demonstrate basic data mining algorithms, methods, tools.
6. 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

CO1: Design a data mart or data warehouse for any organization

CO2: Develop skills to write queries using DMQL

CO3: Extract knowledge using data mining techniques

CO4: Adapt to new data mining tools

CO5: 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:

1. Data Mining: Concepts and Techniques – Jiawei Han, Micheline Kamber, Jian Pei – Elsevier, United States of America
2. Data Mining: Introductory and Advanced Topics – H. Dunham – Pearson Education
3. Data Warehousing in the Real World : A Practical Guide for Building Decision Support Systems – Sam Anahory, Dennis Murray – Pearson Education

Reference Books:

1. Data Warehousing System – Mallach – McGraw –Hill
2. Data Warehousing – Amitesh Sinha – Thomson Learning, India
3. 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)

Mapping between COs and POs		
Course Outcomes (COs)		Mapped Program Outcomes
CO1	Design a data mart or data warehouse for any organization	**PO1, PO3, PO4**
CO2	Develop skills to write queries using DMQL	**PO1, PO12, PSO1**
CO3	Extract knowledge using data mining techniques	**PO1, PSO1, PSO 2**
CO4	Adapt to new data mining tools	**PO1, PO3, PO12**
CO5	Apply the techniques of Data Mining	**PO3, PO4, PO12**

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design	The ability to understand the evolutionary changes in computing, apply standard practices and	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE 11125	Data Mining and Warehousing	3	-	2	2	-	-	-	-	-	-	-	3	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:

1. To understand core cloud computing concepts and fundamental principles, including standard delivery models and service designs
2. To understand the foundational security practices that are required to secure modern cloud computing infrastructures.
3. To enable the students to analyse the differences between traditional data security practices and cloud-based data security methodologies.
4. To allow students to identity and access management practices of both cloud providers and consumers
5. 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

CO1: **Understand** the differences between deployment models and service models of cloud computing

CO2: **Explain** how cloud computing changes the traditional enterprise security considerations compared to on premise

CO3: **Distinguish** different types of security risk and challenges occurred in cloud Computing.

CO4: **Understand** different types of data security in Cloud Computing and how to handle it.

CO5: **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:

1. Tim Mather, Subra Kumaraswamy, and Shahed "Latif Cloud Security & Privacy" First Edition, O Reilly Media, 2009
2. Vic (J.R) Winkler, Securing the Cloud: Cloud Computer Techniques and Tactics": Syngress (Elsevier), 2011
3. Ronald L.Krutz, "Cloud Security: A Comprehensive Guide to Secure Cloud Computing ", Wiley Publishing, 20210

Reference Books:

1. John W Rittinghouse, Jhon F. Ransome, "Cloud Computing: Implementation Management & Security ", CRC Press, 2009.
2. Rajkumar Buyya, James Broberg, "Cloud Computing: Principles, Systems, and Paradigm", Andrzej M Goscinski, Wile, 2011.
3. 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)

Mapping between COs and POs		
Course Outcomes (COs)		Mapped Program Outcomes
CO1	**Understand** the differences between deployment models and service models of cloud computing	PO1,PO2,PSO1,PSO2
CO2	**Explain** how cloud computing changes the traditional enterprise security considerations compared to on premise	PO2,PO3,PO4,PSO3
CO3	**Distinguish** different types of security risk and challenges occurred in cloud Computing	PO3,PO4,PSO2
CO4	**Understand** different types of data security in Cloud Computing and how to handle it.	PO1,PO5,PSO1
CO5	**Analyze** complex technologies leading to the development of current and future cloud Computing security.	PO2,PO3,PO5,PSO3

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient computer-based systems of varying	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software project development using open-	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context, design, model, develop, test and manage
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE11126	Cloud Security	2	3	2	2	2	-	-	-	-	-	-	-	2	2	2

1 = Weakly Mapped
2 = Moderately Mapped
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:

1. To understand the different types of cybercrimes and cyber laws in India and abroad
2. To impart sufficient knowledge on the fundamental legal issues in internet archiving.
3. To expose to ethical issues in today's computer based environment
4. 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

CO1: **Understand** Cyber laws

CO2: **Describe** Information Technology act and Related Legislation.

CO3: **Demonstrate** Electronic business and legal issues.

CO4: **Capability** to reason out different situations of ethics faced in the cyber world.

CO5: **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: 1. Debby Russell and Sr. G. T Gangemi, "Computer Security Basics (Paperback), 2nd Edition, O Reilly Media, 2006. 2. Thomas R. Peltier, Information Security policies and procedures: A Practitioners Reference, 2nd Edition Prentice Hall, 2004. 3. Information Technology Act, 2000, S. R. Bhansali,, University Book House Pvt. Ltd., Jaipur (2003). **Reference Books:** 4. Cyber Laws: Intellectual property & E Commerce, Security- Kumar K, dominant Publisher 5. Hon C Graff, Cryptography and E-Commerce - A Wiley Tech Brief, Wiley Computer Publisher, 2001 6. 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)

Mapping between COs and POs		
Course Outcomes (COs)		**Mapped Program Outcomes**
CO1	**understand** Cyber laws	**PO1, PO7**
CO2	**Describe** Information Technology act and Related Legislation.	**PO1, PO2,PO12**
CO3	**Demonstrate** Electronic business and legal issues.	**PO2, PO11**
CO4	**Capability** to reason out different situations of ethics faced in the cyber world.	**PO1, PO7**
CO5	**Interpret** Cyber Ethics	**PO1, PO12**

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design	The ability to understand the evolutionary changes in computing, apply standard practices and	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE11127	Cyber Law and Governance	3	2	-	-	-	-	2	-	-	-	-	2	-	-	-

1 = Weakly Mapped
2 = Moderately Mapped
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:

1. To introduce the idea of Network components like router, switch ,gateway
2. To develop a Network topology in packet tracer
3. To inculcate a concept of addressing mode and subnetting
4. To analyse socket concept between client and server

Course Outcomes:

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

CO1: Design a LAN Topology in Packet tracer with example

CO2: Develop a network using distance vector routing protocol

CO3: Apply the understanding in LAN Topology in Packet tracer with example
CO4: Connectionless Iterative Echo-server, date and time, character generation using user-defined port

CO5: 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)

Mapping between COs and POs		
Course Outcomes (COs)		**Mapped Program Outcomes**
CO1	Course Outcome 1 Description	**PO4,PO6,PO10,PO11.PSO2,PSO3**
CO2	Course Outcome 2 Description	**PO4,PO6,PO10,PO11.PSO2,PSO3**
CO3	Course Outcome 3 Description	**PO4,PO6,PO10,PO11.PSO2,PSO3**
CO4	Course Outcome 4 Description	**PO3,PO5,PO8,PO12**
CO5	Course Outcome 5 Description	**PO3,PO5,PO8,PO12,PSO1**

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design	The ability to understand the evolutionary changes in computing, apply standard practices and	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE11128	Computer Networks Lab	3	3	3				2			3	3		3	2	1

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

		L	T	P	C
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

CO1: Define functional block of a computer and relate data representation

CO2: Explain and understand memory hierarchy design, memory access time formula, performance improvement techniques, and trade-offs.

CO3: Analyze the concepts of memory utilization in a computer system.

CO4: Analyze the concepts of memory utilization in a computer system.

CO5: 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	**10 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	**10 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:

1. Computer Organization 1.and Design: The Hardware/Software Interface, 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.
2. Computer Organization and Embedded Systems, 6th Edition by Carl Hamacher, McGraw Hill Higher Education.

Reference Books:

1. Computer Architecture and Organization, 3rd Edition by John P. Hayes, WCB/McGraw-Hill
2. Computer Organization and Architecture**:** Designing for Performance, 10th Edition by William Stallings,

Pearson Education.

3. .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)

Mapping between COs and POs		
Course Outcomes (COs)		Mapped Program Outcomes
CO1	Course Outcome 1 Description	**PO1, PO2 , PO3, PO4, PSO1, PSO2**
CO2	Course Outcome 2 Description	**PO1, PO2 , PO3, PO4, PSO1, PSO2**
CO3	Course Outcome 3 Description	**PO1, PO2 , PO3, PO4, PSO1, PSO2**
CO4	Course Outcome 4 Description	**PO1, PO2 , PO3, PO4, PSO1, PSO2**
CO5	Course Outcome 5 Description	**PO1, PO2 , PO3, PO4, PSO1, PSO2**

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE12129	Computer Organization and Architecture Lab	3	3	3	3	-	-	-	-	-	-	-	-	3	3	-

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

CSE12130	**Applied Computing Lab**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 30**	**0**	**0**	**2**	**1**
Pre-requisite/Exposure	**Knowledge of programming basics & algorithms**				
Co-requisite	**NIL**				

Course Objectives:

1. To enable students to equip them with adequate programming skills.
2. To enable students to analyze a programming problem
3. To explain the benefits of one algorithm over another
4. To construct efficient solutions to solve real life problems.

Course Outcomes:

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

CO1: Understand the applications of array and strings to solve problems effectively.

CO2: Apply search and sort techniques using recursion

CO3: Analyze the outcome of applying fundamental data structures to various use cases.

CO4: Apply advanced algorithms to solve real life problems effectively

CO5: Understand the implications of using algorithms to solve use cases.

Course Description:

This course of Applied Computing Lab helps to equip students with adequate programming skills and application of the concepts and algorithms that they learnt till now. They become able to analyse problems efficiently and design effective solution to real world problems.

Course Content:

Unit-I	06 Lecture Hours
Write a program to find the first repeating element in an array of integers. Write a program to find the factorial of a large number. Given a array of N strings, find the longest common prefix among all strings present in the array.	
Unit-II	**06 Lecture Hours**
Write a program to implement recursive bubble sort. Write a program to implement recursive insertion sort. Write a program to find the length of a string using Recursion.	
Unit-III	**06 Lecture Hours**
Write a program to reverse a stack using recursion. Write a program to delete a linked list using recursion. Write a program to print all the leaf nodes of a binary tree from left to right.	
Unit-IV	**06 Lecture Hours**
Write a program to print all longest common sub-sequences in lexicographic order. Write a recursive program for Tower of Hanoi.	
Unit-V	**06 Lecture Hours**
Write a program to print all possible permutations of a given string. Write a program to print all solutions in a N-Queen problem. Write a program to construct full binary tree from given preorder and postorder traversals.	

Text Books:

1. Bjrane Stroustrup, “C++ Programming language” , Pearson education Asia
2. Java Fundamentals - A Comprehensive Introduction, Illustrated Edition ByDaleskrien, Herbert Schildt, Mcgraw-Hill Education.

Reference Books:

1. Yashwant Kenetkar,”Let us C++”,Oxford University Press
2. B.A. Forouzan and R.F. Gilberg,CompilerScience,”A structured approach using C++” Cengage Learning, New Delhi.

3. Java For Programmers, 2^{nd} Edition By Paul Deitel And Harvey Deitel, Pearson Education.
4.Thinking In Java”, Low Price Edition By Bruce Eckel, Pearson Education

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

CSE11131	Web Technology	L	T	P	C

Examination Scheme:

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

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

Mapping between COs and POs		
Course Outcomes (COs)		**Mapped Program Outcomes**
CO1	**Understand** the applications of array and strings to solve problems effectively	**PO1, PO2,PO5,PO12,PSO1**
CO2	**Apply** search and sort techniques using recursion	**PO1, PO2,PO5,PO3**
CO3	**Analyze** the outcome of applying fundamental data structures to various use cases.	**PO1, PO2,PO5, PSO1,PSO3**
CO4	**Apply** advanced algorithms to solve real life problems effectively	**PO1, PO2,PO12,PO3, PSO1**
CO5	**Understand** the implications of using algorithms to solve use cases.	**PO1, PO2,PO12,PO3**

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning newprogramming environments, analyse and	The ability to understand the evolutionary changes in computing, apply standard practices and	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE12130	Applied Computing Lab	3	3	3	-	3	-	-	-	-	-	-	3	3	-	1

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

Version 1.0	**Contact hour -45**	**3**	**0**	**0**	**3**
Pre-requisites/Exposure	**Browser compatibility knowledge /HTML**				
Co-requisites	**--**				
Unit-I		**08 Lecture Hours**			

YEAR III

SEMESTER VI

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.
3. To give the students a perspective of web design language for designing a web site.
4. 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 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: 1. "Web Design The Complete Reference", Thomas Powell, Tata Mcgrawhill **Reference Books:** 1. 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)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Understanding** of E- Mail, Telnet, FTP, E-Commerce, Video Conferencing, E-Business	**PO1,PO2,PO8,PO12, PSO1, PSO3**
CO2	**Formalize** HTML Tag Reference, Global Attributes, Event Handlers, Document Structure	**PO1,PO2,PO8,PO12, PSO1, PSO3**
CO3	**Classify** a detailed analysis of form, frame and CSS in HTML	**PO1,PO2,PO4,PO12,PSO1**
CO4	**Demonstrate** effectively a web page with HTML/JavaScript/XML style.	**PO3,PO4,PO8,PO12,PSO1,PSO3**
CO5	**Create** rich internet application using XML	**PO3,PO5,PO8,PO12,PSO1, PSO3**

		Computational Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex computing problems	Modern tool usage	Professional Ethics	Life-long Learning	Project Management and Finance:	Communication Efficacy	Societal & Environmental Concern:	Individual & Team Work	Innovation and Entrepreneurship	Globally expertise the technological planning and development of software applications in the usage of the modern era	Expertise to communicate in both oral and written forms, demonstrating the practice of professional ethics and the concerns for social welfare.	Ability to enhance and develop techniques for independent and lifelong learning in computer application.
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11131	Web Technology	3	3	-	3	-	-	-	2	-	-	-	-	3	-	3

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:

1. To understand students how the process of language translation process.
2. To interpret students the theory and practice of compiler implementation.
3. 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.
4. To allow the students to identify the various storage allocation, code optimization techniques and code generation.
5. To understand students the use of object code generation process

Course Outcomes:

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

CO1: **Understand** the major phases of compilation, particularly lexical analysis.

CO2: **Understand** the basic concepts of parsing and Design parser for a given language using top down and Bottom-up parser.

CO3: **Demonstrate** the use of formal attributed grammars for specifying the syntax and semantics of Programming languages.

CO4: **Apply** various optimization techniques for the design of a compiler.

CO5: **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: **1.** Compilers, Principles Techniques and Tools- Alfred V Aho, Monica S Lam, Ravi Sethi, Jeffrey D. Ullman,2ndEdition, Pearson,2007. **2.** Compiler construction, Principles and Practice, Kenneth C Louden, 1st Edition, CENGAGE **Reference Books:** **1.** Compiler Design, K. Muneeswaran, Oxford. 2012 **2.** Engineering a compiler, Keith D.Cooper& Linda Torczon, Morgan Kaufman, 2nd edition. MK publishers, 2012. **3.** 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)

Mapping between COs and POs		
Course Outcomes (COs)		Mapped Program Outcomes
CO1	**Understand** the major phases of compilation, particularly lexical analysis.	**PO1,PO3,PSO1**
CO2	**Understand** the basic concepts of parsing and Design parser for a given language using top down and Bottom-up parser.	**PO2,PO3,PSO3**
CO3	**Demonstrate** the use of formal attributed grammars for specifying the syntax and semantics of Programming languages.	**PO2,PO3,,PSO1**
CO4	**Apply** various optimization techniques for the design of a compiler.	**PO1,PO5,PSO1**
CO5	**Understand** the concepts of symbol tables and implement code generation techniques.	**PO2,PO3,PO5,PSO3**

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context,
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE 11132	Compiler Design	2	3	3	-	2	-	-	-	-	-	-	-	3	-	2

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:

1. Encourage students to learn by building increasingly more sophisticated and meaningful mobile applications for Android™ Course Objective 2
2. Enable students to build their own complete Android application incorporating most of the key aspects of the platform Course Objective 4

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:

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	

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)

Mapping between COs and POs		
Course Outcomes (COs)		Mapped Program Outcomes
CO1	Explain concepts of JAVA and SQL	PO2, PO3, PO4, PO5, PO11, PSO2, PSO3
CO2	Understand basic concepts of Android	PO2, PO3, PO4, PO5, PO11, PSO2, PSO3
CO3	Build basic applications, interfaces and UI	PO2, PO3, PO4, PO5, PO11, PSO2, PSO3
CO4	Explore advanced concepts of Android	PO2, PO3, PO4, PO5, PO11, PSO2, PSO3
CO5	Utilize various services provided by android.	PO2, PO3, PO4, PO5, PO11, PSO2, PSO3

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context,
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11133	Mobile Computing and Android	-	3	3	3	3	-	-	-	-	-	-	-	-	3	3

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:

1. Understand the concepts of machine learning.
2. Understand the clustering techniques and their utilization in machine learning.
3. Study the neural network systems for machine learning.
4. Learn and understand the linear learning models in machine learning.
5. 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: **Analyze** fundamental issues and challenges of machine learning.

CO2: **Develop** an appreciation for what is involved in learning from data.

CO3: **Evaluate** the strengths and weaknesses of many popular machine learning approaches.

CO4: **Appreciate** the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning.

CO5: **Apply** the concept of regression methods, classification methods and clustering methods.

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**
Introduction: Machine learning: What and why? Types of Machine Learning - Supervised Learning - Unsupervised Learning – reinforcement, The Curse of dimensionality, Over fitting and linear regression, Bias and Variance, Learning Curve, Classification, Error and noise, Parametric vs. non-parametric models-Linear models.	
Unit-II	**9 Lecture Hours**
Clustering Approaches: Measuring dis-similarity - Evaluating the output of clustering method, Spectral clustering - Graph Laplacian – Normalized graph Laplacian, Hierarchical clustering -Agglomerative clustering —Divisive clustering - Choosing the number of clusters, Bayesian hierarchical clustering, Clustering data points and features, Bi-clustering, Multi-view clustering, K-Means clustering, K-meloids clustering.	
Unit-III	**9 Lecture Hours**
Neural Networks: Biological motivation for Neural Network : Neural network Representation, Perceptions, Feed forward networks, Multilayer Networks and Back Propagation Algorithms, Convergence and local minima and Hidden layer representation in back propagation, Recurrent networks, Application of neural network- Face recognition using neural network, Biological motivation for Neural Network : Neural network Representation, Perceptrons.	
Unit-IV	**9 Lecture Hours**
Linear Models: Linear Regression, Logistic Regression, Maximum Likelihood estimation (least squares), Robust Linear Regression, Ridge Regression, Principal Component Analysis, Bayesian Classifier, Support Vector Machines.	
Unit-V	**9 Lecture Hours**
Tree Learning: Directed and Undirected trees, Decision tree representation, Basic decision tree learning algorithm, Inductive bias in decision tree, Issues in decision tree, Classification and regression trees(CART), Random forest Multivariate adaptive regression trees (MART), Junction tree algorithm.	

Text Books:

1. Kevin P. Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012.
2. Tom Mitchell, *"Machine Learning"*, McGraw-Hill, 1997.
3. Ethem Alpaydin, Introduction to Machine Learning, 3rd Ed., MIT Press, 2014.

Reference Books:

1. Laurene Fausett, *"Fundamentals ofNeural Networks, Architectures, Algorithms and Application,* Pearson Education, 2008.
2. Peter Flach, Machine Learning: The Art and Science of Algorithms that Make Sense of Data, CUP, 2012.
3. 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)

Mapping between COs and POs		
Course Outcomes (COs)		**Mapped Program Outcomes**
CO1	**Analyze** fundamental issues and challenges of machine learning.	**PO2, PO3, PO4, PO5, PO11, PSO2, PSO3**
CO2	**Develop** an appreciation for what is involved in learning from data.	**PO2, PO3, PO4, PO5, PO11, PSO2, PSO3**
CO3	**Evaluate** the strengths and weaknesses of many popular machine learning approaches.	**PO2, PO3, PO4, PO5, PO11, PSO2, PSO3**
CO4	**Appreciate** the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and unsupervised learning.	**PO2, PO3, PO4, PO5, PO11, PSO2, PSO3**
CO5	**Apply** the concept of regression methods, classification methods and clustering methods.	**PO2, PO3, PO4, PO5, PO11, PSO2, PSO3**

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and	The ability to understand the evolutionary changes in computing, apply standard	Ability to analyse the impact of Computer Science and Engineering solutions in the
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE11134	Machine Learning	-	3	3	3	3	-	-	-	-	-	3	-	-	3	3

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

		L	T	P	C
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:

1. To enable students to understand various challenges in real time data processing.
2. To provide the fundamentals of building blocks for real time solution design.
3. To enhance the skill of students to understand speed and complexity issues while designing real time systems.
4. 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

CO1: **Understand** the fundamental of real time processing.

CO2: **Analyze** the different parameters for time series.

CO3: **Explain** various time series models.

CO4: **Evaluate** the results and interpret using machine learning models.

CO5: **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: 1. Andrew C. Harvey. Time Series Models. Harvester wheatsheaf, 1993. 2. P. J. Brockwell, R. A. Davis, Introduction to Time Series and Forecasting. Springer, 1996 **Reference Books:** 1. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, CUP, 2012 2. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.	

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)

Mapping between COs and POs		
Course Outcomes (COs)		Mapped Program Outcomes
CO1	**Understand** the fundamental of real time processing	**PO1, PO2, PO3, PO4, PSO1**
CO2	**Analyze** the different parameters for time series.	**PO1, PO2, PO3, PO4, PSO1, PSO3**
CO3	**Explain** various time series models.	**PO1, PO2, PO3, PO4, PO5, PSO1, PSO2**
CO4	**Evaluate** the results and interpret using machine learning models.	**PO3, PO4, PO5, PSO1, PSO2, PSO3**
CO5	**Develop** some reports along with interpretation results on real world case studies and applications.	**PO3, PO4, PSO2, PSO1, PSO2, PSO3**

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient computer-based systems of varying	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software project development using open-	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context, design, model, develop, test and manage
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE11135	Real-time Analytics	3	3	3	3	3	1	-	-	-	-	-	-	3	3	3

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:

1. To explain the evolving computer model called cloud computing.
2. To introduce the various levels of services that can be achieved by cloud.
3. To describe the security aspects in cloud.

Course Outcomes:

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

CO1: **Understand** the fundamentals of Cloud Computing and Virtualization
CO2: **Analyze** different cloud infrastructure
CO3: **Explain** Various aspects of Virtualization
CO4: **Comparing** different advance virtualization techniques
CO5: **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:

1. David Marshall, Wade A. Reynolds, Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center, Auerbach
2. Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010.

Reference Books:

1. Publications, 2006. Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011
2. 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)

Mapping between COs and POs		
Course Outcomes (COs)		**Mapped Program Outcomes**
CO1	**Understand** the fundamentals of Cloud Computing and Virtualization.	**PO1,PO5**
CO2	**Analyze** different cloud infrastructure	**PO1,PO2**
CO3	**Explain** Various aspects of Virtualization	**PO1,PO2,PO5**
CO4	**Comparing** different advance virtualization techniques	**PO1,PO2,PO5**
CO5	**Developing** software models on different virtualization platforms	**PO3,PO4,PSO2**

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design	The ability to understand the evolutionary changes in computing, apply standard practices and	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context, design, model, develop, test and
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE 11136	Virtualization and Applied Cloud Computing	3	3	1	1	3	-	-	-	-	-	-	-	-	1	-

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:

1. Determine appropriate mechanisms for protecting networked systems by applying various cryptographic techniques.

2. 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

CO1: Identify and describe the common types of security threats are risks to the Computer Systems and the nature of common Information hazards.

CO2: Identify the potential threats to confidentiality, integrity and availability of Computer Systems.

CO3: Describe the working of standard security mechanisms and applied to the external and internal network.

CO4: Define cryptography, describe the elements of the encryption process and select best algorithm to encrypt data and protocols to achieve Computer Security.

CO5: 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:

1. 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
2. Cryptography and Network Security Principles and Practices – Williams Stallings – Pearson Education, Third Edition
3. Computer Security Basics – Deborah Russell G.T. Gangenisr – O'Reilly publication

Reference Books:

1. Cryptography and Network Security Principal and Practices – Atul Kahate – Tata-McGraw-Hill Sixth reprint 2006
2. Cryptography and Network Security – B A Forouzen – TMH
3. 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)

Mapping between COs and POs		
Course Outcomes (COs)		Mapped Program Outcomes
CO1	Identify and describe the common types of security threats are risks to the Computer Systems and the nature of common Information hazards.	**PO1, PO12, PSO1**
CO2	Identify the potential threats to confidentiality, integrity and availability of Computer Systems	**PO1, PO4, PO5**
CO3	Describe the working of standard security mechanisms and applied to the external and internal network	**PO5, PSO1, PSO2**
CO4	Define cryptography, describe the elements of the encryption process and select best algorithm to encrypt data and protocols to achieve Computer Security.	**PO1, PO4, PO5**
CO5	Apply concepts of Public Key Cryptography.	**PO1, PO12, PSO1, PSO2**

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design	The ability to understand the evolutionary changes in computing, apply standard practices and	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE11137	Network Security	3	-	-	2	2	-	-	-	-	-	-	2	3	2	-

1 = Weakly Mapped
2 = Moderately Mapped
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:

1. To allow students to develop desktop applications using python
2. To allow students to develop web applications using python
3. 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:

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.** **2.** **Reference Books:** **1.** **2.**	

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)

Mapping between COs and POs		
Course Outcomes (COs)		**Mapped Program Outcomes**
CO1	Recall concepts of python	**PO2, PO3, PO4, PO5, PO12, PSO1, PSO2, PSO3**
CO2	Compare popular packages in python	**PO2, PO3, PO4, PO5, PO12, PSO1, PSO2, PSO3**
CO3	Understand the concepts of GUI Design with Tkinter	**PO2, PO3, PO4, PO5, PO12, PSO1, PSO2, PSO3**
CO4	Apply Django Framework for web development	**PO2, PO3, PO4, PO5, PO12, PSO1, PSO2, PSO3**
CO5	Implement machine learning systems with sklearn	**PO2, PO3, PO4, PO5, PO12, PSO1, PSO2, PSO3**

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context,
Course Code	**Course Title**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11138	Application Development with Python	-	3	3	3	3	-	-	-	-	-	3	-	3	3	3

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:

1. To enable students to analyze different components of a neural network
2. To provide the fundamentals of building problem specific neural networks
3. To enhance the skill of students to manipulate the parameters of deep learning models
4. 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

CO1: **Understand** the fundamental building blocks neural networks

CO2: **Analyze** the different parameters that controls the performance of neural networks

CO3: **Explain** various types of deep learning techniques

CO4: **Compare** several key deep learning models for different types of problems

CO5: **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: 1. Neural Networks and Learning Machines - Simon Haykin – Pearson Prentice Hall 2. Deep Learning – Ian Goodfellow, Yoshua Bengio, Aaron Courville – MIT Press **Reference Books:** 1. Deep Learning with PyTorch: A 60 Minute Blitz **2.** 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)

Mapping between COs and POs		
Course Outcomes (COs)		**Mapped Program Outcomes**
CO1	**Understand** the fundamental building blocks neural networks	**PO1, PO2, PSO1**
CO2	**Analyze** the different parameters that controls the performance of neural networks	**PO2, PO3, PO4, PSO1**
CO3	**Explain** various types of deep learning techniques	**PO1, PO2, PO4, PSO2**
CO4	**Compare** several key deep learning models for different types of problems	**PO2, PO3, PO4, PO5, PO6, PSO3**
CO5	**Develop** deep learning models by using state-of-the-art tools.	**PO3, PO5, PSO3**

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient computer-based systems of varying	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software project development using open-	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context, design, model, develop, test and manage
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE 11139	Neural Networks and Deep Learning	2	3	2	3	2	1	-	-	-	-	-	-	2	1	1

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

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:

1. To enable students to understand use of statistics in real life.
2. To provide the fundamentals of analysing problem using statistics.
3. To enhance the skill of students to understand whether the problem could be solve using descriptive or inferential statistics.
4. 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

CO1: **Understand** the fundamental of descriptive statistics.

CO2: **Analyze** the different parameters in real world datasets.

CO3: **Explain** various types of inferential techniques to draw insights.

CO4: **Evaluate** the results and interpret with the help of analysis tools.

CO5: **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:

1. Statistics: The conceptual approach, Gudmund R. Iversen, Mary Gergen, Springer; 1997th edition (April 30, 1997)
2. Introduction to Linear Regression Analysis by Douglas C. Montgomery, Elizabeth A. Peck, G. Geoffrey Vining (Wiley), Low price Indian edition is available.
3. 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:

1. Statistics, Data Analysis, and Decision Modeling (5th Edition), James R. Evans
2. 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)

Mapping between COs and POs		
Course Outcomes (COs)		**Mapped Program Outcomes**
CO1	**Understand** the fundamental of descriptive statistics	**PO1, PO2, PO3, PO4, PO5 PSO1, PSO2, PSO3**
CO2	**Analyze** the different parameters in real world datasets.	**PO2, PO3, PO4, PSO1, PSO3**
CO3	**Explain** various types of inferential techniques to draw insights.	**PO1, PO2, PO3, PO4, PSO2**
CO4	**Evaluate** the results and interpret with the help of analysis tools.	**PO2, PO3, PO4, PO5, PSO1, PSO2, PSO3**
CO5	**Develop** some reports along with interpretation results on real world case studies	**PO3, PO4, PSO2, PSO3**

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient computer-based systems of varying	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software project development using open-	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context, design, model, develop, test and manage
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE11140	Statistical Modelling for Data Analytics	3	3	2	3	3	1	-	-	-	-	-	-	2	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:

1. To allow students manage cloud infrastructure
2. 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:

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	

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)

Mapping between COs and POs		
Course Outcomes (COs)		**Mapped Program Outcomes**
CO1	Gain Knowledge of Service, security management in cloud.	**PO2, PO3, PO4, PO5, PO11, PSO2, PSO3**
CO2	Understand the concept of Cloud service management.	**PO2, PO3, PO4, PO5, PO11, PSO2, PSO3**
CO3	Analyze, manage metering and billing of Cloud service application	**PO2, PO3, PO4, PO5, PO11, PSO2, PSO3**
CO4	Understand the concept of Cloud provisioning.	**PO2, PO3, PO4, PO5, PO11, PSO2, PSO3**
CO5	Analyze cloud computing platforms and case studies	**PO2, PO3, PO4, PO5, PO11, PSO2, PSO3**

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context,
Course Code	**Course Title**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11141	Cloud Management	-	3	3	3	3	-	-	-	-	-	3	-	-	3	3

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:

1. To enable students to about the modern malware and anti-malware landscape.
2. To provide the fundamentals of malware functioning and how it infects companies' IT infrastructures through their weakest points, exploiting these weaknesses after infection.
3. To enhance the skill of students to learn all the main methods and malware analysts' routines.
4. To allow students to identify challenging areas of intrusion detection.

Course Outcomes:

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

CO1: **Understand** the fundamental of modern malware and anti-malware.
CO2: **Analyze** the different frameworks of Malware.
CO3: **Explain** various types of intrusion detection techniques.
CO4: **Compare** several modern-day malware and their impact on IT infrastructure.
CO5: **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.

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	

Course Content:

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:

1. Practical Malware Analysis by by Michael Sikorski, Andrew Honig O'Reilly publisher
2. 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)

Mapping between COs and POs		
Course Outcomes (COs)		Mapped Program Outcomes
CO1	**Understand** the fundamental of modern malware and anti-malware.	**PO1,PO3,PO4,PSO2**
CO2	**Analyze** the different frameworks of Malware.	**PO1,PO2,PSO1**
CO3	**Explain** various types of intrusion detection techniques.	**PO2,PO5,PSO2**
CO4	**Compare** several modern-day malware and their impact on IT infrastructure.	**PO2,PO4,PO5,PSO3**
CO5	**Develop** analytical models for detecting intrusions and malware.	**PO3,PO5,PSO1,PSO3**

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient computer-based systems of varying	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software project development using open-	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context, design, model, develop, test and manage
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE11142	Malware Analysis	2	3	2	2	3	-	-	-	-	-	-	-	2	2	2

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

CEE11029	Disaster Management	L	T	P	C
Version 1.0		**3**	**0**	**0**	**3**
Pre-requisites/Exposure	---				
Co-requisites	---				

Course Objectives

1. 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.
2. To enhance the student to make them able to understand the risk scale and develop the strategies for Vulnerability.
3. To prepare students about preparedness to response immediately and execute the plan for search, rescue operations, Logistic Management etc.
4. To make students handling the post disaster situations, accordingly psychological and medical point of views.
5. 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

1. Dr. Mrinalini Pandey, Disaster Management, Wiley India Pvt. Ltd.
2. Jagbir Singh, Disaster Management : Future Challenges and Opportunities, K W Publishers Pvt. Ltd.
3. Shailesh Shukla, Shamna Hussain, Biodiversity, Environment and Disaster Management, Unique Publications.
4. J. P. Singhal, Disaster Management, Laxmi Publications.
5. C. K. Rajan, Navale Pandharinath, Earth and Atmospheric Disaster Management: Nature and Manmade, B S Publication

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)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Show various types of disasters, occurred naturally or mankind will be responsible	**PO1, PO2, PO3, PO4**
CO2	Analyze the Risk and Vulnerability, reduce it using different strategic developments	**PO1, PO2, PO3, PO4**
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	**PO1, PO2, PO3, PO4**
CO4	Assess the damage, rehabilitate, reconstruct it, recover the victims and handle the post-disaster effects.	**PO1, PO2, PO3, PO4**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming environments, analyse and	The ability to understand the evolutionary changes in computing, apply standard	Ability to analyse the impact of Computer Science and Engineering solutions in the
Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CEE11029	Disaster Management	3	3	3	3											

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

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

1. To get basic idea about basic of Signals, Systems and Signal Processing.
2. To analyze discrete time signals using Fourier and Z-Transform
3. To familiarize with the different Structures of Discrete-Time Systems
4. 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:

1. Digital Signal Processing – Principles, Algorithms and Applications by J. G. Proakis and D. G. Manolakis, 4th Edition, Pearson
2. Discrete Time Signal Processing by A.V. Oppenheim, R. W. Schafer, & John R. Buck, , 2nd Edition, Prentice Hall, 1999.

Reference Books:

1. Digital Signal Processing: Fundamentals and Applications – Li Tan, Academic Press, Elsevier.
2. 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)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Illustrate** the basic of Signals, Systems and Signal Processing	**PO1**
CO2	**Examine** the discrete time signals using Fourier and Z-Transform	**PO1, PO2, PSO1**
CO3	**Demonstrate** the different Structures of Discrete-Time Systems	**PO1, PO3**
CO4	**Design** and examine the FIR Filter	**PO1, PO2, PO3, PO12, PSO1**
CO5	**Design** and examine the IIR Filter	**PO1, PO2, PO3, PO12, PSO1**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient computer-based systems of varying complexity	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software project development using open-ended	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context, design, model, develop, test and manage complex software
Course Code	Course Title	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
ECE11046	Digital Signal Processing	3	3	3	-	-	-	-	-	-	-	-	-	3	-	-

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

1. To help to understand the functionality of VLSI design.
2. To familiar with different types of VLSI fabrication technology
3. To explain the use of MOS and CMOS Circuits
4. To acquire the knowledge of fabrication of VLSI chip.
5. 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:

1. Digital Integrated Circuit, J.M.Rabaey, Chandrasan, Nicolic, Pearson Education,2nd edition 2003
2. Weste and Eshrighian, ―Principle of CMOS VLSI Design‖ Pearson Education

Reference Books:

1. Wayne, Walf, “Modern VLSI design: System on Silicon” Pearson Education, 2nd Edition, 1998.
2. 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)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Utilize** the basic design principles of VLSI.	**PO1, PO2, PO3, PSO1**
CO2	**Develop** the concept of the different fabrication techniques.	**PO1, PO2, PO3, PO4,PO12, PSO1**
CO3	**Find** the basics of MOS and CMOS circuit design.	**PO1, PO2, PO3, PO4, PO5,PO6, PO12,PSO1**
CO4	**Illustrate** the necessities of memory devices and able to design various types of semiconductor memories.	**PO1,PO2, PO3, PO4,PO5, PO6, PSO1, PSO2**
CO5	**Find** the concept of VLSI system hardware design	**PO1, PO2, PO3, PO4, PO5, PO6, PO12, PSO1, PSO2**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context
Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
ECE11048	VLSI Systems Design	3	3	3	3	2	2	-	-	-	-	-	1	3	2	-

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:

1. R. Panneersalvam, *Engineering Economics*, 2nd Ed., Prentice Hall of India, 2014.
2. James Riggs, *Engineering Economics*, 4th Ed., McGraw Hill Education, 2004.

Reference Books:

1. Donald G. Newnan, Ted G. Eschenbach and Jerome P. Lavelle, *Engineering Economic Analysis*, 13th Ed., Oxford University Press, 2017.
2. 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)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Illustrate** the basic economic concepts and make economic analyses in the decision making.	**PO2, PO3, PO6, PO12, PSO1. PSO3**
CO2	**Apply** principals of economics to analyze the behaviour of consumers and producers in a well-functioning economy and also in case of market failures.	**PO3, PO4, PO6, PO12, PSO1. PSO3**
CO3	**Develop** the ability to account for time value of money using engineering economy factors and formulas, estimate annual and future worth comparisons for cash flows.	**PO3, PO4, PO11, PO12**
CO4	**Illustrate** how factor market works, identify the manpower and resources management, need of credit/finance for initiating and accelerating projects.	**PO2, PO3, PO11**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	An ability to apply analytical knowledge, and modern hardware and software tools to design and implement complex systems in	An ability to develop their problem-solving skills and assess social, environmental issues with ethics and manage different	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context, design, model, develop,
Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
ECO11505	Economics for Engineers	-	2	3	2	-	2	-	-	-	-	2	3	2	-	2

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

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	---				

Course Objectives:

1. To introduce students how to design static webpage using HTML and CSS
2. 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
3. To provide skills to design interactive and dynamic web sites
4. 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)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Design** a static webpage by applying HTML elements	**PO4,PO6,PO10,PO11.PSO2,PSO3**
CO2	**Apply** CSS concepts for designing HTML web pages	**PO4,PO6,PO10,PO11.PSO2,PSO3**
CO3	**Develop** DHTML pages by using JavaScript with DOM events	**PO4,PO6,PO10,PO11.PSO2,PSO3**
CO4	**Implemen**t a webpage with database connectivity using PhP	**PO3,PO5,PO8,PO12**
CO5	**Create** rich internet application using XML	**PO3,PO5,PO8,PO12,PSO1**

		Computational Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex computing problems	Modern tool usage	Professional Ethics	Life-long Learning	Project Management and Finance:	Communication Efficacy	Societal & Environmental Concern:	Individual & Team Work	Innovation and Entrepreneurship	Globally expertise the technological planning and development of software applications in the usage of the modern era	Expertise to communicate in both oral and written forms, demonstrating the practice of professional ethics and the concerns for social welfare.	Ability to enhance and develop techniques for independent and lifelong learning in computer application.
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE12143	Web Technology Lab	-	-	-	3	-	3	-	2	2	3	3	-	-	3	3

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

		L	T	P	C
CSE15144	**Technical Seminar**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours -45**	**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)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Identify** the advanced technologies and globalization	**PO1, PO2, PO3, PSO2**
CO2	**Develop** communication and representation skills towards becoming a good team leader and manager	**PO4,PO5 PSO2**
CO3	**Plan** for lifelong learning towards industry readiness	**PO12, PSO2**
CO4	**Build** the ability to identify an engineering problem, analyze it and propose a work plan to solve it.	**PO2, PO3, PO4, PO5, PO6, PSO2**

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software project	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context, design,
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE15144	Technical Seminar	3	2	2	3	3	2	-	--	-	-	-	-	-	3	-

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:

1. Know the components and structure of mobile application development frameworks for Android and windows OS based mobiles.
2. Understand how to work with various mobile application development frameworks.
3. Learn the basic and important design concepts and issues of development of mobile applications.
4. 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)

Mapping between COs and POs		
Course Outcomes (COs)		**Mapped Program Outcomes**
CO1	Understand GUI components, Layout Managers and Event Listeners	**PO2, PO3, PO4, PO5, PO11, PSO2, PSO3**
CO2	Create basic applications using databases	**PO2, PO3, PO4, PO5, PO11, PSO2, PSO3**
CO3	Apply Android Service based modules to create advanced applications	**PO2, PO3, PO4, PO5, PO11, PSO2, PSO3**
CO4	Solve issues related to notifications and alert	**PO2, PO3, PO4, PO5, PO11, PSO2, PSO3**

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context,
Course Code	**Course Title**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE12145	Android Application Development Lab	-	3	3	3	3	-	-	-	-	-	3	-	-	3	3

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:

1. Understand the overview of the various machine learning techniques and can able to demonstrate those using python.
2. Make use of Data sets in implementing the machine learning algorithms.
3. Implement the machine learning concepts and algorithms in any suitable language of choice. Learn and understand the linear learning models in machine learning.
4. 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: 3. Kevin P. Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012. 4. Tom Mitchell, *"Machine Learning"*, McGraw-Hill, 1997. 5. Ethem Alpaydin, Introduction to Machine Learning, 3rd Ed., MIT Press, 2014. **Reference Books:** 4. Laurene Fausett, *"Fundamentals of Neural Networks, Architectures, Algorithms and Application,* Pearson Education, 2008. 5. Peter Flach, Machine Learning: The Art and Science of Algorithms that Make Sense of Data, CUP, 2012. 6. 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)

Mapping between COs and POs		
Course Outcomes (COs)		**Mapped Program Outcomes**
CO1	**Understand** complexity of Machine Learning algorithms and their limitations and modern notions in data analysis-oriented computing.	**PO2, PO3, PO4, PO5, PO11, PSO2, PSO3**
CO2	**Develop** an appreciation for what is involved in learning from data.	**PO2, PO3, PO4, PO5, PO11, PSO2, PSO3**
CO3	**Apply confidently** common Machine Learning algorithms in practice and implementing their own.	**PO2, PO3, PO4, PO5, PO11, PSO2, PSO3**
CO4	**Apply** the concept of regression methods, classification methods and clustering methods.	**PO2, PO3, PO4, PO5, PO11, PSO2, PSO3**
CO5	**Design** and perform various experiments in Machine Learning using real-world data	**PO2, PO3, PO4, PO5, PO11, PSO2, PSO3**

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and	The ability to understand the evolutionary changes in computing, apply standard	Ability to analyse the impact of Computer Science and Engineering solutions in the
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE 12146	Machine Learning Lab		3	3	3	3						3			3	3

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

CSE12147	Statistical Modelling for Data Analytics Lab	L	T	P	C
Version 1.0	**Contact Hours – 30**	**0**	**0**	**2**	**1**
Pre-requisite/Exposure	**Basics of Python or R language**				
Co-requisite	**High School Statistics**				

Course Objectives:

1. To enable students to understand use of statistics in real life.
2. To provide the fundamentals of analysing problem using statistics.
3. To enhance the skill of students to understand whether the problem could be solve using descriptive or inferential statistics.
4. 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

CO1: **Understand** the fundamental of statistics and data analysis.

CO2: **Analyze** the results measure of central tendency and variable interactions.

CO3: **Explain** various types of inferential techniques to draw insights.

CO4: **Evaluate** the results and interpret with the help of analysis tools and workflow.

CO5: **Develop** some reports along with interpretation results on real world business use cases.

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.

List of Experiments

1. Study and learn installing procedure of the libraries used for statistics.

2. Study of various data structures to store dataset.

3. Study on importing various format of data.

4. Study of methods and operations used for descriptive statistics.(Any language or statistical tools)

5. Analyze and interpret results using mean, median, mode and standard deviation.

6. Study of IQR(Internal Quartile Range) and outlier detection.

7.Study on random numbers to simulate probability.

8. Study on probability distribution.

9. Study and interpret results on covariance and correlation.

10. Project 1: Analyze, visualize and interpret Titanic dataset.

11. Study on Inferential statistics: Central Limit Theorem

12. Study and implementing hypothesis testing.

13. Practical study on Z-test(One Sample).

14. Practical study on T-test and chi-square test.

15. Study on ANOVA

16. Case Study and Project 2: House Prices Dataset

17. Case Study and Project 3: Analyze and Interpret results from e-commerce, city payroll.

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)

Mapping between COs and POs		
Course Outcomes (COs)		**Mapped Program Outcomes**
CO1	**Understand** the fundamental of statistics and data analysis.	**PO1, PO2, PO3, PO4, PO5 PSO1, PSO2, PSO3**
CO2	**Analyze** the results measure of central tendency and variable interactions.	**PO1, PO2, PO3, PO4, PSO1, PSO3**
CO3	**Explain** various types of inferential techniques to draw insights.	**PO1, PO2, PO3, PO4, PSO2**
CO4	**Evaluate** the results and interpret with the help of analysis tools and workflow.	**PO1, PO2, PO3, PO4, PO5, PSO1, PSO2, PSO3**
CO5	**Develop** some reports along with interpretation results on real world business use cases.	**PO2, PO3, PO4, PSO2, PSO3**

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient computer-based systems of varying	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software project development using open-	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context, design, model, develop, test and manage
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE 12147	Statistical Modelling for Data Analytics Lab	3	3	2	3	3	1	-	-	-	-	-	-	2	2	2

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

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:

1. To enable student to develop a knowledge on virtualization
2. To provide the fundamentals of Virtual Disks
3. To enhance the skill of the students to have a concept on Destop and Server Virtualization
4. To enable students to create Virtual Networks

Course Outcomes:

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

CO1: **Understanding** the Basics of Virtualization

CO2: **Demonstrate** Virtual Storage

CO3: **Explain** Different Destop Virtualization

CO4: **Analyze** Vitrtualization techniques for Servers

CO5: **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:

Unit-I: Basics of Virtualization	6 Lecture Hours
1. Create type 2 virtualization in VMWARE. Allocate memory and storage space as per requirement. Install Guest OS on that VMWARE. 2. 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**
3. Shrink and extend virtual disk 4. Create, Manage, Configure and schedule snapshots 5. Create Spanned, Mirrored and Striped volume 6. Create RAID 5 volume **7.** Sharing and data transfer between the virtual machines	
Unit-III: Desktop Virtualization	**6 Lecture Hours**
8. Desktop Virtualization using VNC **9.** Desktop Virtualization using Chrome Remote Desktop	
Unit-IV: Virtualization on ESXI server	**6 Lecture Hours**
10. Create type 2 virtualization on ESXI 6.5 server 11. Access ESXI server from another VM and create multiple OS on top of ESXI 6.5 server **12.** Create ESXI server as Bare metal OS	
Unit-V: Creating Virtual Networks	**6 Lecture Hours**
13. Create a VLAN in CISCO packet tracer 14. Install KVM in Linux **15.** Create a VPN from one virtual machine to another virtual and pass data secure way	

Text Books:

1. David Marshall, Wade A. Reynolds, Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center, Auerbach

2. Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010.

Reference Books:

1. Publications, 2006. Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011

2. 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	Class Assessment	End Term
Weightage (%)	**50**	**50**

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

Mapping between COs and POs		
Course Outcomes (COs)		Mapped Program Outcomes
CO1	**Understanding** the Basics of Virtualization	**PO1,PO5**
CO2	**Demonstrate** Virtual Storage	**PO1**
CO3	**Explain** Different Destop Virtualization	**PO2, PO5**
CO4	**Analyze** Vitrtualization techniques for Servers	**PO2,PO4,PO5**
CO5	**Develop** Virtual Networks	**PO2, PO3,PO5**

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design	The ability to understand the evolutionary changes in computing, apply standard practices and	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE 12148	Virtualization and Applied Cloud Computing Lab	2	3	1	1	3	-	-	-	-	-	-	-	-	-	-

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:

1. To introduce several modern tools to perform network breaches
2. 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:

1. Perform an experiment to grab a banner with telnet and perform the task using Netcat utility.
2. Using Nmap find open ports on a system
3. Using Nmap find the machines which are active
4. Using Nmap find the version of remote OS on other systems
5. Using Nmap find the version of s/w installed on other system
6. Perform an experiment to demonstrate how to sniff for router traffic by using the tool Wireshark.
7. Perform an experiment to show how to use DumpSec
8. Perform a wireless audit of an access point / router and decrypt WEP and WPA.
9. Perform an experiment to sniff traffic using ARP poisoning.
10. Demonstrate intrusion detection system (ids) using any tool e.g., Snort or any other s/w
11. Install rootkits and study variety of options
12. Generating password hashes with openssl
13. Setup a honey pot and monitor the honeypot on network
14. Install JCrypt tool (or any other equivalent) and demonstrate asymmetric, symmetric crypto algorithm, hash and digital/PKI signature
15. Install IPCop on a linux system and learn all the function available on the software.
16. Use John the ripper to crack password
17. Use IP Spoofing for packet transfer
18. 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)

Mapping between COs and POs		
Course Outcomes (COs)		Mapped Program Outcomes
CO1	Understand the use of Netcat and Nmap	PO1,PO5
CO2	Apply Wireshark and Dumpsec tools	PO1
CO3	Explain wireless audit, ARP poisoning and Intrusion detection	PO2, PO5
CO4	Implement several modern tools for breaching the network	PO2,PO4,PO5
CO5	Understand decryption systems	PO2, PO3,PO5

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context,
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE12149	Network Security Lab	2	3	1	1	3	-	-	-	-	-	-	-	-	-	-

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

Year IV
Semester VII

MGT11402	**Industrial Management**	L	T	P	C
Version 1.0		3	0	0	3
Pre-requisites/Exposure	Basic Calculation Skill				
Co-requisites	-				

Course Objective:

1. To enable students to understand operational complexities of a business.
2. To enable students to conceptualize the process, functions and theories of management.
3. To enable students to provide knowledge about quality control processes.
4. 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 and Updation 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:

1. Arnold, Chapman: Introduction to Materials Management: Pearson, 5th edition, 2008

Reference Books:

1) Gopal Krishnan &Sundarsan: Material Management: An Integrated Approach, Prentice Hallof India Private Limited, New Delhi, 2003
2) Industrial Engineering and Management by OP Khanna, DhanpatRai Publications, Delhi. Management Information Systems by Larry Long (Prentice Hall)
3) Industrial Management by VK Sharma, OP Harkut.

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

Components	Attendance	Internal Assessment	MTE	ETE
Weightage (%)	10	30	20	40

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

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO 1	Understand the concepts related to Industrial Management.	PO6, PO12
CO 2	Demonstrate skills to perform Different Managerial Functions	PO6, PO12
CO 3	Define and analyze the importance of Quality control procedures.	PO1, PO8, PO12
CO 4	Illustrate different techniques to be used in Materials Managementprocess	PO1,PO2, PO12
CO 5	Understand the concepts of production planning and implications of the same in industrial management processes.	PO1, PO12
CO 6	Evaluate importance of project management and its applications through PERT CPM method.	PO1, PO2, PO3, PO8, PO11, PO12

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	An ability to apply analytical knowledge, and modern hardware and software tools to design and implement complex systems in the areas related to Electronics and Communication systems	An ability to develop their problem-solving skills and assess social, environmental issues with ethics and manage different projects in multidisciplinary areas.	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context, design, model, develop, test and manage complex software and information management systems.
Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
MGT11 402	Industrial Management	2	3	3	-		2	-	3	2	2	3	3	-	-	-

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:

1. To understand the students to study the basic principles and functionality of operating systems
2. To provide the students to identify the concepts of CPU scheduling, concurrent processes, deadlock
3. To allow the students to identify the significance of memory management and virtual memory.
4. To enhance the skill of students to identify the disk scheduling, file systems, and device management.
5. 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

CO1: **Understand** functionalities and features of Operating System

CO2: **Analyzing** various scheduling algorithms and threading concepts to identify a suitable algorithm for a Given criteria.

CO3: **Assessing** various solutions for critical Section problem. Applying deadlock avoidance principles and Check for the occurrence of deadlock.

CO4: **Explain** different memory management techniques and its uses. Structuring an overview of file Systems and mass storage

CO5: **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: **3.** Operating System Concepts- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 9th Edition, John Wiley publishers, 2012 **4.** Operating Systems' – Internal and Design Principles, Stallings, Sixth Edition, Pearson education, 2005. **Reference Books:** **3.** Operating System a Design Approach-Crowley, 3 rd Edition, Tata Mcgraw Hill, 2009. **4.** Operating systems- A Concept based Approach-D.M.Dhamdhere, 2nd Edition, Tata Mcgraw Hill, 2012 **5.** 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)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Understand** functionalities and features of Operating System.	PO1, PO12
CO2	**Analyzing** various scheduling algorithms and threading concepts to identify a suitable algorithm for a Given criteria.	PO1, PO2,
CO3	**Assessing** various solutions for critical Section problem. Applying deadlock avoidance principles and check for the occurrence of deadlock.	PO1, PO2 ,PO3
CO4	**Explain** different memory management techniques and its uses. Structuring an overview of file systems and mass storage.	PO2, PO3, PO5 ,PSO3
CO5	**Understand** the functionalities of modern operating system like Android, oxygen, Windows11 etc.	PO1, PO3, PO5,PSO3

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design	The ability to understand the evolutionary changes in computing, apply standard practices and	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE11150	Operating System	3	3	3	-	2	-	-	-	-	-	-	3	-	-	2

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

CSE11151	Advanced Web Technologies	L	T	P	C
Version 1.0	Contact Hours – 45 Hours	3	0	0	3
Pre-requisite/Exposure					
Co-requisite					

Course Objectives:

1. To provide the concepts of full stack web development
2. 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:

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	

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)

Mapping between COs and POs		
Course Outcomes (COs)		Mapped Program Outcomes
CO1	Define basic concepts of HTML and CSS	PO2, PO3, PO4, PO5, PO10, PO11, PSO1, PSO2, PSO3
CO2	Explain concepts of bootstrap, javascript and jquery	PO2, PO3, PO4, PO5, PO10, PO11, PSO1, PSO2, PSO3
CO3	Apply concepts of Node.js to develop backends	PO2, PO3, PO4, PO5, PO10, PO11, PSO1, PSO2, PSO3
CO4	Design databases for web applications	PO2, PO3, PO4, PO5, PO10, PO11, PSO1, PSO2, PSO3
CO5	Build attractive front-end for web applications	PO2, PO3, PO4, PO5, PO10, PO11, PSO1, PSO2, PSO3

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context,
Course Code	**Course Title**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11151	Advanced Web Technologies		3	3	3	3	3				3	3		3	3	3

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:

1. To help the student to acquire knowledge of basics of artificial intelligent computing.
2. To enable students to gain basic knowledge of machine learning.
3. To incorporate the evolutionary computational knowledge.
4. To enable students to acquire various problem solving, learning, and planning ability.
5. 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

CO1: **Understand** applications of Machine Learning in industry scenarios.

CO2: **Analyse** different parameters that control implementation of Machine Learning in a practical scenario.

CO3: **Explain** different data modelling techniques

CO4: **Compare** among different practical implementations and their effects on business

CO5: **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 : Protein Structure Predictions	

Text Books:

1. Neural “Design of Video Quality Metrics with Multi-Way Data Analysis: A data driven approach,“ C. Keimel, Springer Singapore, 2016
2. “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:

1. “Deep learning,” I. Goodfellow, Y. Bengio, A. Courville, Y. Bengio, MIT press, Cambridge, 2016
2. “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)

Mapping between COs and POs		
Course Outcomes (COs)		**Mapped Program Outcomes**
CO1	**Understand** applications of Machine Learning in industry scenarios.	PO1, PO2, PSO1
CO2	**Analyse** different parameters that control implementation of Machine Learning in a practical scenario.	PO2, PO3, PO4, PSO1
CO3	**Explain** different data modelling techniques	PO1, PO2, PO4, PSO2
CO4	**Compare** among different practical implementations and their effects on business	PO2, PO3, PO4, PO5, PO6, PSO3
CO5	**Develop** AI models using state of the art tool.	PO3, PO5, PSO3

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient computer-based systems of varying	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software project development using open-	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context, design, model, develop, test and manage
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE 11152	Applied Machine Intelligence	2	3	2	3	2	1	-	-	-	-	-	-	2	1	1

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:

1. To introduce fundamental concepts of data analysis
2. To develop statistical models to represent data
3. To provide intelligent solutions for data mining processes

Course Outcomes:

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

CO1: **Define** different types of data analysis techniques

CO2: **Compare** various statistical tests

CO3: **Explain** data using different types of data distributions

CO4: **Build** algorithms for data processing

CO5: **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: 1. Data Mining: Concepts and Techniques - Jiawei Han, Jian Pei, Micheline Kamber 2. Data Mining: Practical Machine Learning Tools and Techniques - Ian H. Witten, Eibe Frank, Mark A. Hall **Reference Books:** **6.** Machine Learning and Data Mining - Igor Kononenko, Matjaz Kukar · 2007 **7.** 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)

Mapping between COs and POs		
Course Outcomes (COs)		Mapped Program Outcomes
CO1	**Define** different types of data analysis techniques	PO1, PO2, PSO1
CO2	**Compare** various statistical tests	PO2, PO3, PO4, PSO1
CO3	**Explain** data using different types of data distributions	PO1, PO2, PO4, PSO2
CO4	**Build** algorithms for data processing	PO2, PO3, PO4, PO5, PO6, PSO3
CO5	**Interpret** different types of data visualization.	PO3, PO5, PSO3

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient computer-based systems of varying	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software project development using open-	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context, design, model, develop, test and manage
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE 11153	**Data Analysis**	2	3	2	3	2	1	-	-	-	-	-	-	2	1	1

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:

1. To enable students to have an overview of Cloud based Applkications
2. To provide a concept of different Cloud Architectures
3. To introduce with Delivery models in Cloud Computing
4. To draw a comparison among different Cloud Deployment Models

Course Outcomes:

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

CO1: **Understand** the fundamentals of Cloud Based Applications

CO2: **Explain** different cloud computing architectures

CO3: **Analyzing** the designing code for cloud

CO4: **Evaluating** the Delivery models of Cloud Computing

CO5: **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:

1. Guo Ning Liu, Qiang Guo Tong, Harm Sluiman, Alex Amies, "Developing and Hosting Applications on the Cloud", IBM Press (2012)
2. Chris Hay, Brian Prince, Azure in Action [ISBN: 978-1935182481],2018
3. 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:

1. Eugene Ciurana, Developing with Google App Engine
2. 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)

Mapping between COs and POs		
Course Outcomes (COs)		Mapped Program Outcomes
CO1	**Understand** the fundamentals of Cloud Based Applications	PO1,PSO1
CO2	**Explain** different cloud computing architectures	PO1
CO3	**Analyzing** the designing code for cloud	PO1,PO2,PO3
CO4	**Evaluating** the Delivery models of Cloud Computing	PO1,PO2,PO3
CO5	**Compare** different Cloud Deployment Models	PO1,PO2,PO4,PSO2

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design	The ability to understand the evolutionary changes in computing, apply standard practices and	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE11154	Cloud Architecture and Deployment	3	3	2	1	-	-	-	-	-	-	-		1	1	-

1 = Weakly Mapped
2 = Moderately Mapped
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:

1. To enable students to identify different security needs for different applications.
2. To provide the fundamentals of E-Commerce application security requirements.
3. To enhance the skill of students to identify security requirements of Web Applications.
4. 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

CO1: **Describe** web-based applications and associated threats and differentiate them from mainframe, client-server, applications.

CO2: **Understand** the role of web-based applications in E-commerce transactions.

CO3: **Explain** social networking and evaluate associated risks.

CO4: **Evaluate** web application security vulnerabilities.

CO5: **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: **1.** Harwood, M., Goncalves, M., and Pemble, M. (2010) Security Strategies in Web Applications and Social Networking (Information Systems Security & Assurance), Sudbury, MA. Jones & Bartlett + 2. 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)

Mapping between COs and POs		
Course Outcomes (COs)		**Mapped Program Outcomes**
CO1	**Describe** web-based applications and associated threats and differentiate them from mainframe, client-server, applications.	PO1,PO2,PSO1,PSO2
CO2	**Understand** the role of web-based applications in E-commerce transactions.	PO2,PO3,PO4,PSO3
CO3	**Explain** social networking and evaluate associated risks.	PO3,PO4,PSO2
CO4	**Evaluate** web application security vulnerabilities	PO1,PO5,PSO1
CO5	**Design** a web – application Vulnerability and Security Assessment Test Plan.	PO2,PO3,PO5,PSO3

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient computer-based systems of varying	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software project development using open-	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context, design, model, develop, test and manage
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE 11155	Application Security	2	3	2	2	2	-	-	-	-	-	-	-	2	2	2

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:

1. To understand and apply different types of imaging modalities used for non-invasive diagnosis
2. To understand various image processing techniques for enhancement, and visualization
3. To compare normal and abnormal images with scientific aptitudes and design the solution accordingly.
4. To apply computer-assisted detection, diagnosis, and decision support

Course Outcomes:

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

CO1: Demonstrate on different medical imaging techniques.

CO2: Apply the fundamentals of digital image and its properties.

CO3: Illustrate the basics of digital image processing to improve image quality.

CO4: 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:

3. **Paul Suetens, "Fundamentals of Medical Imaging", Second Edition, Cambridge University Press.**
4. **J. Michael Fitzpatrick and Milan Sonka, "Handbook of Medical Imaging, Volume 2. Medical Image Processing and Analysis", SPIE Publications.**
5. **Geoff Dougherty, "Digital Image Processing for Medical Applications", First Edition, Cambridge University Press.**
6. **Hand Book of Biomedical Instrumentation, R. S. Khandpur**

Reference Books:

3. **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)

Mapping between COs and POs		
Course Outcomes (COs)		**Mapped Program Outcomes**
CO1	Demonstrate on different medical imaging techniques.	PO1, PO5, PO8, PO12
CO2	Apply the fundamentals of digital image and its properties.	PO1, PO2, PO5
CO3	Illustrate the basics of digital image processing to improve image quality.	PO1, PO2, PO3, PO5, PO8
CO4	Analyse clinical information through computational techniques in digital image processing.	PO1, PO2, PO3, PO4, PO5, PO6, PO8, PO9

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design	The ability to understand the evolutionary changes in computing, apply standard practices and	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
PHY 11203	**Medical Image Processing and Analysis**	3	2	2	1	3	1	-	3	1	-	-	1	3	2	2

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

ECE11047	**Sensors, Devices 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

1. To study basic concepts of various sensors and actuators.
2. To develop knowledge in selection of suitable sensor based on requirement and application.
3. To understand the operation of resistive, inductive, capacitive, magnetic, thermal, radiation and piezoelectric sensors for the identification of appropriate sensors.
4. To introduce the concept of M2M (machine to machine) with necessary protocols.
5. 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 ofthe 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

1. Ernest Doebelin and Dhanesh N. Manik, Doebelin's Measurement Systems, 6th Ed., McGraw Hill Education, 2017.
2. Ian Sinclair, Sensors and Transducers, Elsevier, 2011.
3. D. Patranabis, Sensors and Transducers, 2nd Ed., Prentice Hall of India Learning Pvt. Ltd., 2003.
4. Internet of Things - A Hands-on Approach, Ars deep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
5. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

Reference Books

1. Sawhney.A.K, Puneeth sawhney, "A Course in Electrical and Electronic Measurements and Instrumentation", Dhanpat Rai Publications, 2012.
2. Ernest O. Doeblin, "Measurement System, Application and Design", Tata McGraw Hill Publishing Company Ltd., 5th Edition, 2008
3. Ronald K. Jurgen, Sensors and Transducers (Progress in Technology), 2nd Ed., SAE International, 2003.
4. 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)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Identify** the appropriate sensor, including powering of the sensor and signal conditioning (electrical and Calculation conversions).	**PO1, PO2, PO3, PSO1**
CO2	**Learn** the operation of strain gauge and different types of sensors.	**PO1, PO2, PO3, PO6, PSO1**
CO3	**Identify** different actuators to monitor and control the behaviour of a process or product.	**PO1, PO2, PO4, PSO2**
CO4	**Explore and learn about** Internet of Things with the help of preparing projects designed for Raspberry Pi.	**PO1, PO2, PO3, PO5, PSO1**

CO5	**Understand** IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, and sensing modules.	**PO1, PO2, PO3, PO5, PO10, PSO2**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient computer-based systems of varying complexity.	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success, real world problems and meet the challenges of the future	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context, design, model, develop, test and manage complex software and information management systems.
Course Code	Course Title	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2	
ECE11 047	Sensors, Devices and Actuators for IoT	3	3	3	1	1	1				1			3	2	

1=weakly mapped

2= moderately mapped

3=strongly mapped

Course Objectives

		L	T	P	C
MEE11071	Robotics & Automation	L	T	P	C
Version 1.0		3	0	0	3
Pre-requisites/Exposure	Engineering Physics, Mechanics, Basic Electronics				
Co-requisites					

- Have successful professional and technical career
- Have strong foundation in basic sciences, mathematics and computational platforms
- Have knowledge on the theory and practices in the field and service of robotics Engineering and allied areas
- Engross in life-long learning to keep themselves abreast of new developments
- Practice and inspire high ethical values and technical standards

Course Outcomes

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

- Apply knowledge of mathematics, sciences and engineering
- Identify the electrical, electronic and mechanical components and use of them.
- Design automatic manufacturing cells with robotic control.
- Understand the electronic control system in metal machining and other manufacturing process. Understand the features and operation of automation products.
- Understand ethical and professional responsibilities
- Communicate effectively and work in interdisciplinary groups
- Review, comprehend and report technological development.

Catalog Description

This interdisciplinary course helps you design, implement and commercialise innovative systems and technologies. You will gain in-depth insight into top technologies of the digital industry, such as Digital Twin, automation or additive manufacturing. Students will become proficient in current topics such as robotics, extended reality or circular economy and get to strengthen your soft and hard skills thanks to our project and skills-based concept.

Course Content

Module 1: Robot Kinematics and Dynamics

Types and components of a robot, Classification of robots, Kinematics systems; Definition of mechanisms and manipulators, Degrees of Freedom, Kinematic Modelling: Translation and Rotation Representation, Coordinate transformation, DH parameters, Forward and inverse kinematics, Jacobian, Singularity, and Statics, Dynamic Modelling: Forward and inverse dynamics, Equations of motion using Euler-Lagrange formulation, Newton Euler formulation

Module 2: Sensors

Contact and Proximity, Position, Velocity, Force, Tactile etc. Introduction to Cameras, Camera calibration, Geometry of Image formation, Vision applications in robotics, Motion Sensors – Potentiometers, Resolver, Encoders – Optical, Magnetic, Inductive, Capacitive, LVDT – RVDT – Synchro – Microsyn, Accelerometer – GPS, Bluetooth, Range Sensors – RF beacons, Ultrasonic Ranging, Reflective beacons, Laser Range Sensor (LIDAR). Strain Gage, Load Cell, and Magnetic Sensors –types, principle, requirement and advantages: Magneto resistive – Hall Effect – Current sensor Heading Sensors – Compass, Gyroscope, Inclinometers.

Module 3: Robot Actuation Systems

Actuators: Electric, Hydraulic and Pneumatic, Transmission: Gears, Timing Belts and Bearings, Parameters for selection of actuators. Basics of control: open loop- closed loop, Transfer functions, and Control laws: P, PD, PID, Linear and Non-linear controls.

Module 4: Robotics in Industry 4.0

- Industry 4.0 and Technologies 1
- Industry 4.0: Design Principles
- Industry 4.0 and Technologies 2
- Building Blocks of Industry 4.0: Cyber Physical Systems 2
- Building Blocks of Industry 4.0: Cyber Physical Systems 1
- Aligning Industry 4.0 and Strategies. Advanced Manufacturing Process Analysis
- Data storage and data security
- Industry 4.0 and the national high technology strategies

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

Components	MT	ET	Assessment
The weightage (%)	20	50	30

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

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Apply knowledge of mathematics, sciences and engineering	**PO01, PO02, PO12**
CO2	Identify the electrical, electronic and mechanical components and use of them.	**PO01, PO02, PO04**
CO3	Design automatic manufacturing cells with robotic control.	**PO01, PO02, PO05, PO07**
CO4	Understand the electronic control system in metal machining and other manufacturing process. Understand the features and operation of automation products.	**PO10, PO12**
CO5	Review, comprehend and report technological development.	**PO03, PO04, PO05, PO12**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning			
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
MEE11071	Robotics & Automation	3	3	1	1	1		1			1		3	3	1	1

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

		L	T	P	C
MEE11060	Computer-Aided Simulation & Analysis	L	T	P	C
Version 1.0		3	0	0	3
Pre-requisites/Exposure	Engineering Physics, Mechanics, Basic Design				
Co-requisites	ANSYS Workbench, MATLAB				

Course Objectives

- To give exposure to software tools needed to analyse engineering problems.
- To expose the students to different applications of simulation and analysis tools.

Course Outcomes

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

- Create solid model in 3-D solid modeling CAD system from 2-D drawing generated in other CAD system
- Generate finite element analysis model for structure and thermal analyses, and boundary zones of finite volume method for CFD
- Solve linear and non-linear structural, thermal, and flow problems using commercial software packages
- Determine and solve engineering design problem that involves interaction between heat, stress, fluid and electric (multi-physics)
- Analyze and display the results obtained from computer analysis and draw a conclusion

Catalog Description

This course covers various topics in Computer-Aided Design (CAD) and Computer-Aided Engineering (CAE). The course provides an in-depth understanding and skill of constructing 2-D drawings using well-known commercial CAD package, and integrating 3-D solid modeling techniques into simulation, and analysis animation of new designs using commercial CAD/CAE software. The students will have hands-on experience to analyze Structure, Heat Transfer, and Computational Fluid Dynamics problems by using several different software packages. The course also focuses on CAD Product Data Exchange using both Direct Database conversion and International Standards based conversion methods between major CAD/CAE systems. Typical industrial applications will be illustrated

Course Content

Module 1: Introduction

Introduction: Simulation: a tool, advantages and disadvantages of simulation, areas of application, systems and system environment, components of a system, discrete and continuous systems, discrete event system simulation.

Module 4: Basic Finite Element Analysis

Linear interpolation polynomials in terms of local coordinate’s for1D, 2Delements. Higher order interpolation functions for 1D quadratic and cubic elements in natural coordinates, Constant strain triangle, Four-Nodded Tetrahedral Element (TET 4), Eight-Nodded Hexahedral Element (HEXA8), 2D iso-parametric element, Lagrange interpolation functions, Numerical integration: Gaussian quadrature one point, two point formulae, 2D integrals. Fore terms: Body force, traction force and point loads.

Module 3: Geometric Modelling & Meshing

Introduction to Engineering Workspace, Creating and Adding Materials, Assigning Material to the Beam, Assigning Material to the Clamp, Assigning Material to the Assembly, Meshing of Plate with Holes, Generating the mesh, optimize the model and generating the local mesh (illustration through three examples) Assembly Meshing

Module 4: Computer Aided Analysis

Introduction to Static Structural Analysis Pre-processing, Solution, Post-processing Static Structural Analysis of: Cantilever Beam Plate with a central circular holes and square slot Pressure vessel, Bracket, Clevis assembly, Introduction Important terms used in thermal analysis Types of thermal analysis Steady state thermal analysis of Car Disk Brake Rotor Heat sink Transient thermal analysis of Piston

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

Components	MT	ET	Assessment
The weightage (%)	**20**	**50**	**30**

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

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Progran Outcomes**
CO1	Create solid model in 3-D solid modeling CAD system from 2-D drawing generated in other CAD system	**PO01, PO02, PO12**
CO2	Generate finite element analysis model for structure and thermal analyses, and boundary zones of finite volume method for CFD	**PO01, PO02, PO04**
CO3	Solve linear and non-linear structural, thermal, and flow problems using commercial software packages.	**PO01, PO02, PO05, PO07**
CO4	Determine and solve engineering design problem that involves interaction between heat, stress, fluid and electric (multi-physics)	**PO10, PO12**
CO5	Analyze and display the results obtained from computer analysis and draw a conclusion	**PO03, PO04, PO05, PO12**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning			
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
MEE11060	Computer-Aided Simulation & Analysis	3	3	1	1	1		1			1		3	3	1	1

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

ECE11049	**Microcontroller and Interfacing**	L	T	P	C
Version 1.0		3	0	0	3
Pre-requisites/Exposure	Digital Electronics, Computer Architecture				
Co-requisites	--				

Course Objectives

1. Outline the history of computing devices.
2. Develop programs for microprocessor and microcontrollers.
3. Understand 8051 microcontroller concepts, architecture and programming.

Course Outcomes

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

CO1. Explain the difference between Microprocessors & Microcontrollers, Architecture of 8051 Microcontroller, Interfacing of 8051 to external memory and Instruction set of 8051.
CO2. Write 8051 Assembly level programs using 8051 instruction set.
CO3. Explain stack and Input Output Interfacing.
CO4. Write 8051 Assembly language program to generate timings and waveforms using 8051 timers, to send & receive serial data using 8051 serial port and to generate an external interrupt using a switch.
CO5. Explain the Interrupt system, operation of Timers/Counters and Serial port of 8051and interface simple switches, simple LEDs, ADC 0804, LCD and Stepper Motor to 8051 using 8051 I/O ports.

Catalog Description

To make the students understand that Microcontroller is a required course for under-graduate students in the ECE program. The purpose of this course is to teach students the fundamentals of microcontroller systems. The student will be able to incorporate these concepts into their electronic designs for other courses where control can be achieved via a microprocessor/controller implementation.

Course Content

Unit I: **9 lecture hours**

Introduction of 8051 Microcontroller:

Microprocessor Vs Microcontroller, Embedded Systems, Embedded Microcontrollers, 8051 Architecture- Registers, Pin diagram, I/O ports functions, Internal Memory organization. External Memory (ROM & RAM) interfacing.

Unit II: **9 lecture hours**

8051 Instruction Set:

Addressing Modes, Data Transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Bit manipulation instructions. Simple Assembly language program examples (without loops) to use these instructions.

Unit III: **10 lecture hours**

8051 Stack, I/O Port Interfacing and Programming:

8051 Stack, Stack and Subroutine instructions. Assembly language program examples on subroutine and involving loops.Interfacing simple switch and LED to I/O ports to switch on/off LED with respect to switch status.

Unit IV: 8 lecture hours

8051 Timers and Serial Port:
8051 Timers and Counters – Operation and Assembly language programming to generate a pulse using Mode-1 and a square wave using Mode- 2 on a port pin. 8051 Serial Communication- Basics of Serial Data Communication, RS-232 standard, 9 pin RS232 signals, Simple Serial Port programming in Assembly and C to transmit a message and to receive data serially.

Unit V: 9 lecture hours

8051 Interrupts and Interfacing Applications:
8051 Interrupts. 8051 Assembly language programming to generate an external interrupt using a switch, 8051 C programming to generate a square waveform on a port pin using a Timer interrupt. Interfacing 8051 to ADC-0804, DAC, LCD and Stepper motor and their 8051 Assembly language interfacing programming.

Text Books

1. "The 8051 Microcontroller and Embedded Systems – using assembly and C", Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; PHI, 2006 / Pearson, 2006.
2. "The 8051 Microcontroller", Kenneth J. Ayala, 3rd Edition, Thomson/Cengage Learning.

Reference Books

1. "The 8051 Microcontroller Based Embedded Systems", Manish K Patel, McGraw Hill, 2014, ISBN: 978-93-329-0125-4.
2. "Microcontrollers: Architecture, Programming, Interfacing and System Design", Raj Kamal, Pearson Education, 2005.

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

Components	MTE I	MTE II	Presentation/Assignment/ etc	ETE
Weightage (%)	10	30	20	40

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

Mapping between COs and POs		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	Explain the difference between Microprocessors & Microcontrollers, Architecture of 8051 Microcontroller, Interfacing of 8051 to external memory and Instruction set of 8051.	PO1
CO2	Write 8051 Assembly level programs using 8051 instruction set.	PO1,PO5
CO3	Explain stack and Input Output Interfacing.	PO1
CO4	Write 8051 Assembly language program to generate timings and waveforms using8051 timers, to send & receive serial data using 8051 serial port and to generate an external interrupt using a switch.	PO1,PO2,PO5,PO11
CO5	Explain the Interrupt system, operation of Timers/Counters and Serial port of 8051and interface simple switches, simple LEDs, ADC 0804, LCD and Stepper Motor to 8051 using 8051 I/O ports.	PO1,PO2,PO3,PO5,PSO1

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient computer-based systems of varying complexity	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software project development using open-ended	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context, design, model, develop, test and manage complex
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ECE11049	**Microcontroller and Interfacing**	3	2	1		3						1		1		

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

BIT11074	**Bioinformatics**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours - 60**	3	1	0	4
Pre-requisites/Exposure	PLUS TWO LEVEL SCIENCE				
Co-requisites	--				

Course Objectives

1. To provide those students with apt the knowledge to bioinformatics
2. It will also provide in depth knowledge of the general database, and biological databases.
3. Elaborating the alignment techniques
4. Explore the knowledge of the applications of bioinformatics

Course Outcomes

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

CO1. e**xplain** 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 – 12)**
Introduction & NCBI:
Internet basics; Connecting to internet; Email; FTP; www; NCBI; BIOSEQ's, BIOSEQ sets, SEQ-ANNOT, SEQ-DESCR.

Unit II **(Contact Hours – 12)**
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 – 12)**
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 – 12)**

Protein analysis:

Protein identity based on composition, Motifs & patterns; secondary structure prediction; specialized secondary structures; tertiary structures.

Unit V **(Contact Hours – 12)**

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:

1. Andreas D Baxevanis and B F Francis," Bioinformatics- A practical guide to analysis of Genes & Proteins", John Wiley, 2002.
2. 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:

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

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Students will be able to **explain** basic of bioinformatics and its techniques and tools.	**PO1, PO2**
CO2	Students will be able to **demonstrate** the biological database and their role in bioinformatics.	**PO1, PO2,PO3**
CO3	Students will be able to **interpret** the knowledge of sequence alignments techniques	**PO1, PO2, PO3**
CO4	Students will be able to **explain** protein structure and functional analysis	**PO2, PO5, PO6**
CO5	Students will be able to **demonstrate** the applications of bioinformatics and current research activities in the field of bioinformatics	**PO1, PO2, PO3, PO5, PO8**

Components	**Mid Term**	**Attendance**	**Class Assessment**	**End Term**
Weightage (%)	**20**	**10**	**30**	**40**

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and	The ability to understand the evolutionary changes in computing, apply standard	Ability to analyse the impact of Computer Science and Engineering solutions in the
Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12			
BIT110 74	**Bioinform atics** (THEOR Y)	3	3													

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

CSE12156	Operating System Lab	L	T	P	C
Version 1.0	**Contact Hours – 45 Hours**	**0**	**0**	**3**	**2**
Pre-requisite/Exposure	Data structures, Programming Languages, and Computer Architecture.				
Co-requisite	**NIL**				

Course Objectives:

1. To introduce basic Unix commands, system call interface for process management, interprocess communication and I/O in Unix.
2. To understand the students to study the basic principles and functionality of operating systems.
3. To provide the students to identify the concepts of CPU scheduling, concurrent processes, deadlock
4. To allow the students to identify the significance of memory management and virtual memory.
5. 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

CO1: **Understand** and implement basic services and functionalities of the operating system using system calls and shell script.

CO2: **Analyze** and simulate CPU Scheduling Algorithms like FCFS, Round Robin, SJF, and Priority.

CO3: **Assessing** various solutions for critical Section problem. Applying deadlock avoidance principles and Check for the occurrence of deadlock.

CO4: **Implement** memory management schemes and page replacement schemes.

CO5: **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:

1. To study about the basics of Linux commands.
2. Implementation of shell scripting using conditional/branching statement.
3. Implementation of shell scripting using Loop statement.
4. Implementation of shell scripting using Array.
5. Implementation of shell scripting using String.
6. Implementation of shell scripting using Function and recursion.

Unit-II	09 Lecture Hours

Process Scheduling Algorithm:

1. Simulate the following non-preemptive CPU scheduling algorithms to find turnaround time and waiting time.
   a) FCFS b) SJF c) Priority
2. Simulate the following non-preemptive CPU scheduling algorithms to find turnaround time and waiting time.
   a) Shortest Remaining Time First b) Round Robin c) Priority
3. 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:

1. Simulate producer-consumer problem using semaphores.
2. Simulate the concept of Dining-Philosophers problem.
3. Simulate Bankers algorithm for the purpose of deadlock avoidance.

Unit-IV	09 Lecture Hours

Memory Management Techniques:

1. Simulate page replacement algorithms
   a) FIFO b) LRU c) Optimal
2. Simulate disk scheduling algorithms
   a) FCFS b) SCAN c) C-SCAN
3. Simulate selection partition algorithm
   a). Best Fit b). First Fit c). Worst Fit

Unit-V	09 Lecture Hours

File Organization Techniques:

1. simulate the following file organization techniques
   a) Single level directory b) Two level directory c) Hierarchical

Text Books:

7. Operating System Concepts- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 9th Edition, John Wiley publishers, 2012

8. Operating Systems' – Internal and Design Principles, Stallings, Sixth Edition, Pearson education, 2005.

Reference Books:

4. Operating System a Design Approach-Crowley, 3 rd Edition, Tata Mcgraw Hill, 2009.
5. Operating systems- A Concept based Approach-D.M.Dhamdhere, 2nd Edition, Tata Mcgraw Hill, 2012
6. 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)

Mapping between COs and POs		
Course Outcomes (COs)		**Mapped Program Outcomes**
CO1	**Understand** and implement basic services and functionalities of the operating system using system calls and shell script.	PO1,PO3, PO12
CO2	**Analyze** and simulate CPU Scheduling Algorithms like FCFS, Round Robin, SJF, and Priority.	PO1, PO2,PO3
CO3	**Assessing** various solutions for critical Section problem. Applying deadlock avoidance principles and check for the occurrence of deadlock.	PO1, PO2 ,PO3
CO4	**Implement** memory management schemes and page replacement schemes.	PO2, PO3, PO5 ,PSO3
CO5	**Simulate** file allocation and organization techniques.	PO1, PO3, PO5,PSO3

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design	The ability to understand the evolutionary changes in computing, apply standard practices and	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE 12156	Operating System	3	3	3	-	2	-	-	-	-	-	-	3	-	-	2

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

CSE12157	Advanced Web Technologies Lab	L	T	P	C
Version 1.0	**Contact Hours – 45 Hours**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure					
Co-requisite					

Course Objectives:

1. To provide the concepts of full stack web development
2. 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)

Mapping between COs and POs		
Course Outcomes (COs)		**Mapped Program Outcomes**
CO1	Define basic concepts of HTML and CSS	PO2, PO3,PO4,PO5,PO11,PSO3
CO2	Explain concepts of bootstrap, javascript and jquery	PO2, PO3,PO4,PO5,PO11,PSO3
CO3	Apply concepts of Node.js to develop backends	PO2, PO3,PO4,PO5,PO11,PSO3
CO4	Design databases for web applications	PO2, PO3,PO4,PO5,PO11,PSO3
CO5	Build attractive front-end for web applications	PO2, PO3,PO4,PO5,PO11,PSO3

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context,
Course Code	**Course Title**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE12157	Advanced Web Technologies Lab		3	3	3	3						3				3

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

CSE12158	Applied Machine Intelligence Lab	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:

1. To help the student to acquire knowledge of basics of artificial intelligent computing.
2. To enable students to gain basic knowledge of machine learning.
3. To incorporate the evolutionary computational knowledge.
4. To enable students to acquire various problem solving, learning, and planning ability.
5. 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

CO1: **Understand** applications of Machine Learning in industry scenarios.

CO2: **Analyse** different parameters that control implementation of Machine Learning in a practical scenario.

CO3: **Explain** different data modelling techniques

CO4: **Compare** among different practical implementations and their effects on business

CO5: **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:

1. Implement PCA using python
2. Implement KNN Classification using python
3. Implement KMeans Clustering using python
4. Build a MLP using Pytorch
5. Build a CNN using Pytorch
6. Build an LSTM using Pytorch
7. Edge Detection
8. Shape Feature extraction,
9. LBP and GLCM Features
10. Implement a segmentation network using pytorch
11. Import and deploy the YOLO-V3 in tensorflow
12. Compute tf-idf from a set of documents
13. Measure similarity between two sentence using word2vec embedding
14. Use LSTMs to train a chatbot.
15. 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)

Mapping between COs and POs		
Course Outcomes (COs)		**Mapped Program Outcomes**
CO1	**Understand** applications of Machine Learning in industry scenarios.	PO1, PO2, PSO1
CO2	**Analyse** different parameters that control implementation of Machine Learning in a practical scenario.	PO2, PO3, PO4, PSO1
CO3	**Explain** different data modelling techniques	PO1, PO2, PO4, PSO2
CO4	**Compare** among different practical implementations and their effects on business	PO2, PO3, PO4, PO5, PO6, PSO3
CO5	**Develop** AI models using state of the art tool.	PO3, PO5, PSO3

Course Code	Course Title	PO 1 Engineering knowledge	PO 2 Problem analysis	PO 3 Design/development of solutions	PO 4 Conduct investigations of complex problems	PO 5 Modern tool usage	PO 6 The engineer and society	PO 7 Environment and sustainability	PO 8 Ethics	PO 9 Individual and team work	PO 10 Communication	PO 11 Project management and finance	PO 12 Life-long learning	PSO 1 Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient computer-based systems of varying	PSO 2 The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software project development using open-	PSO 3 Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context, design, model, develop, test and manage
CSE12158	Applied Machine Intelligence Lab	2	3	2	3	2	1	-	-	-	-	-	-	2	1	1

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

CSE12159	Data Analysis Lab	**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:

1. To introduce fundamental concepts of data analysis
2. To develop statistical models to represent data
3. To provide intelligent solutions for data mining processes

Course Outcomes:

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

CO1: **Define** different types of data analysis techniques

CO2: **Compare** various statistical tests

CO3: **Explain** data using different types of data distributions

CO4: **Build** algorithms for data processing

CO5: **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

1. Introduction to Data Analytics:
2. Calculate mean, median and mode from a dataset
3. Calculate variance and s.d. from a dataset
4. Calculate the correlation between two sequences
5. Perform Z-Test, T-Test, F-Test
6. Perform Chi-square Test
7. Implement Linear Regression
8. Scatter Plots,
9. Time-series plots,
10. error bars
11. line plots
12. bar graphs
13. frequency histograms
14. Compute similarity between two images based on colour distribution
15. 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)

Mapping between COs and POs		
Course Outcomes (COs)		**Mapped Program Outcomes**
CO1	**Define** different types of data analysis techniques	PO1, PO2, PSO1
CO2	**Compare** various statistical tests	PO2, PO3, PO4, PSO1
CO3	**Explain** data using different types of data distributions	PO1, PO2, PO4, PSO2
CO4	**Build** algorithms for data processing	PO2, PO3, PO4, PO5, PO6, PSO3
CO5	**Interpret** different types of data visualization.	PO3, PO5, PSO3

Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient computer-based systems of varying	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software project development using open-	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context, design, model, develop, test and manage
CSE12159	Data Analysis Lab	2	3	2	3	2	1	-	-	-	-	-	-	2	1	1

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

Course Code	**Cloud Architecture and Deployment Lab**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45 Hours**	**0**	**0**	**3**	**2**
Pre-requisite/Exposure	**Concept in Linux Operationg Syatem**				
Co-requisite	**NIL**				

Course Objectives:

1. Understand cloud architecture
2. Explore the caveats of deploying cloud infrastructure

Course Outcomes:

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

CO1: **Understanding** the Basics of Virtualization
CO2: **Demonstrate** instances over different Operating Systems and Databases.
CO3: **Explain** Applications ove rCloud
CO4: **Analyze** Vitrtualization techniques on Linux nodes
CO5: **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:

Unit-I: Basics of Virtualization	5 Lecture Hours
1. Desktop Virtualization using Chrome Remote Desktop 2. Create Nested Virtual Machine(VM under another VM) 3. Secure IOT integration with Cloud	
Unit-II: Creating Instances on Different Operating Systems and Databases	**9 Lecture Hours**
1. Create EC2 Linux instance on Amazon AWS and create SSH client configuration through PUTTY. 2. Create WINDOWS Server instance in AWS and Microsoft Azure. 3. 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**
1. Setup Wordpress web application through Amazon AMI 2. Create a PHP based web application using Elastic Beansta	
Unit-IV: Creating nodes in Linux using VMWare	**9 Lecture Hours**
1. Install KVM emulator(Virtual Machine Manager) in Linux and Create Nested Virtual Machine(VM under another VM) **2.** Configure and run integrated software packeges from virtual appliances(VMWARE marketplace	
Unit-V: Developing Applications over Cloud	**15 Lecture Hours**
1. Message queue service using AWS SNS and SQS 2. Creation of ChatBot using Amazon Lex 3. Create virtual IT infrastructure cost of company and make component wise comparison usin AWS TCO calculator 4. Create Software Application developement environment in AWS:Cloud9	
Text Books: **1.** Guo Ning Liu, Qiang Guo Tong, Harm Sluiman, Alex Amies, "Developing and Hosting Applications on the Cloud", IBM Press (2012) **2.** Chris Hay, Brian Prince, Azure in Action [ISBN: 978-1935182481],2018 **3.** 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:** **1.** 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	Class Assessment	End Term
Weightage (%)	50	50

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

Mapping between COs and POs		
Course Outcomes (COs)		Mapped Program Outcomes
CO1	**Understanding** the Basics of Virtualization	PO1
CO2	**Demonstrate** instances over different Operating Systems and Databases.	PO1
CO3	**Explain** Applications ove rCloud	PO2, PO3, PO4
CO4	**Analyze** Vitrtualization techniques on Linux nodes	PO1, PO3, PO5
CO5	**Develop** and design applications over cloud.	PO2, PO3, PO4, PSO2

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design	The ability to understand the evolutionary changes in computing, apply standard practices and	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and
Course Code	**Course Title**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE 12160	Cloud Architecture and Deployment Lab	3	2	3	2	1	-	-	-	-	-	-	-	-	1	-

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

CSE12161	**Application Security Lab**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 45 Hours**	**0**	**0**	**3**	**2**
Pre-requisite/Exposure	**Web Technology**				
Co-requisite	**NIL**				

Course Objectives:

3. To enable students to develop code for classical Encryption Techniques to solve the problems.
4. To provide the fundamentals of building code for authentication algorithms.
5. To enhance the skill of students to develop a signature scheme using the Digital signature standards.
6. 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

CO6: **Develop** code for classical Encryption Techniques to solve the problems.

CO7: **Build** cryptosystems by applying symmetric and public-key encryption algorithms.

CO8: **Develop** a signature scheme using the Digital signature standard.

CO9: **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)

Mapping between COs and POs		
Course Outcomes (COs)		Mapped Program Outcomes
CO1	**Develop** code for classical Encryption Techniques to solve the problems.	PO1,PSO1,PSO2
CO2	**Build** cryptosystems by applying symmetric and public-key encryption algorithms.	PO1,PO2,PO3,PSO2
CO3	**Develop** a signature scheme using the Digital signature standard.	PO2,PO3,PO4,PSO3
CO4	**Demonstrate** the network security system using open-source tools	PO4,PSO1,PSO3

		Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient computer-based systems of varying	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software project development using open-	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context, design, model, develop, test and manage
Course Code	**Course Title**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE12161	Application Security Lab	2	2	2	2	-	-	-	-	-	-	-	-	2	2	2

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

CSE14162	Summer Internship #	L	T	P	C
Version 1.0	Contact Hours -45	0	0	3	2
Pre-requisites/Exposure	Basic idea of the required subjects				
Co-requisites					

Course Objectives

1. To Give and overview of Internship.
2. To enable students building team.
3. To give the students a outline of technical internship.
4. 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 to harness the skill, knowledge, and theoretical practice they learnt in university. You can acquire endless amounts of education in your life, however, that knowledge doesn't always translate to the working life. The great thing 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 Examination
Examination Scheme:

Components	Continuous Assessment	ETE
Weightage (%)	50	50

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

Mapping between COs and POs		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	**Interpret** importance of Internship.	PO1, PO2, PO10, PO11,PO3, PO4, PO5,PSO1,PSO3
CO2	**Construct** the real-life scenario with internship.	PO1, PO2, PO10, PO3, PO4,PO5,PO7,PO8,PO9,PSO2
CO3	**Analyse** and practical implementation with emerging application.	PO1, PO3, PO4, PO5PO12, PO10, PO9, PSO1,PSO2
CO4	**Classify** understanding in technology up gradation.	PO3, PO4, PO5, PO6, PO2,PO12, PO9,PSO2

Course Code	Course Title	PO1 Engineering Knowledge	PO2 Problem analysis	PO3 Design/development of solutions	PO4 Conduct investigations of complex problems	PO5 Modern tool usage	PO6 The engineer and society	PO7 Environment and sustainability	PO8 Ethics	PO9 Individual and team work	PO10 Communication	PO11 Project management and finance	PO12 Life-long Learning	PSO1 Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient computer-based systems of varying complexity.	PSO2 The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software project development using open-ended	PSO3 Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context, design, model, develop, test and manage complex
CSE14162	Summer Internship #	3	3	3	3	3								2	3	3

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

CSE14163	Minor Project	L	T	P	C
Version 1.0	Contact Hours -45	0	0	3	2
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)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Investigate** a real world problem	**PO2,PO3,PSO1**
CO2	**Utilize** the modern tools to solve the problems	**PO2,PO3,PSO1**
CO3	**Discuss** in a group to promote team spirit and leadership quality among the students	**PO1, PO9**
CO4	**Plan** a projects involving both technological aspects and finance	**PO3,PO11**
CO5	**Identify** newer areas of in depth study and research and lifelong learning	**PO12,PSO2**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context,
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE14163	Minor Project	3	2	3	-	-	-	-	-	3	-	3	3	2	3	-

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

		L	T	P	C
CSE14164	**Major Project**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours -135**	**0**	**0**	**9**	**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)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Investigate** a real world problem	**PO1,PO2, PSO1**
CO2	**Utilize** the modern tools to solve the problems	**PO1,PO2,PO4,PSO1**
CO3	**Take part in** a group to promote team spirit and leadership quality among the students	**PO9,PO10, PSO2**
CO4	**Organize** projects involving both technological aspects and finance	**PO1,PO11, PO12**
CO5	**Identify** newer areas of in depth study and research and lifelong learning	**PO4,PO12,PSO3**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient computer-based systems of varying complexity.	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software project development using	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context, design, model, develop, test and manage complex
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE14164	Major Project	3	2	-	3	-	-	-	-	3	3	3		2	3	3

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

CSE15165	Comprehensive Viva Voce	3	3	3		3	3
Version 1.0		**0**	**0**	**3**	**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.

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)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Interpret** the vital feature behind comprehensive viva.	**PO3,PO5,PO6,PO9,PSO1,PSO2**
CO2	**Analyse** the real-life scenario, based on viva question.	**PO10, PO2, PO3,PO5,PO6, PO9,PSO1,PSO2**
CO3	**Classify** effective team building for good software project analysis.	**PO1, PO12, PO2, PO3,PO5,PO6,PO11, PO9,PSO1,PSO2,PSO3**
CO4	**Apply** logic of comprehensive viva in skill up gradation.	**PO2, PO3,PO5,PO6, PO9,PSO1,PSO2**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient	The ability to understand the evolutionary changes in computing, apply standard practices and strategies in	Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context,
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE15165	Comprehensive Viva Voce	3	3	3		3	3			3				3	3	3

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

CONSOLIDATED CO-PO MAPPING TABLE																
Code	**Course Title**	**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**
MTH 1150 1	Engineering Mathematics- I	-	3	3	3	-	-	-	-	-	-	-	3	-	-	-
PHY 1120 1	Applied Science	3	2	-	3	2	2	-	-	-	-	-	1	-	-	-
CSE1 1001	Introduction to Programming	3	-	1	2	2	-	-	-	1	-	1	-	-	-	-
ENG 1105 3	English Communication- I	-	-	-	-	-	2	2	3	2	3	-	2	-	-	-
BIT1 1003	Life Science	2	2	1	-	3	2	-	1	1	-	-	2	3	3	-
DGS 1100 1	Design Thinking	3	2	-	1	2	-	-	-	-	-	2	-	-	-	-
PHY 1 2202	Applied Science Lab	3	2	2	-	2	-	-	-	2	-	-	-	-	-	-
CSE1 2002	Programming Lab	3	1	1	2	2	-	1	-	-	-	1	-	1	-	-
MEE 1200 1	Engineering Workshop	3	1	-	-	-	-	-	-	3	-	-	-	3	-	-
CEE1 2001	Engineering Drawing & CAD	-	3	3	-	-	-	-	-	3	-	-	3	-	3	-
ENG 1104 3	Communication & Collaboration Skill -I	-	1	-	-	-	-	-	-	3	3	-	-	-	-	-
MTH 1150 2	Engineering Mathematics II	3	1	3	3	2	-	1	-	-	-	-	1	-	-	-
GEE1 1001	Electrical and Electronics Technology	3	2	3	3	2	2	2	1	1	1	1	2	-	-	-
MEE 1100 2	Engineering Mechanics	3	3	-	-	-	-	-	-	-	-	-	-	-	--	-
EVS1 1107	Environmental science	1	3	3	-	3	3	2	-	-	1	-	-	-	--	-
GEE1 1011	Basic Civil & Mechanical Engineering	3	-	-	-	2	-	-	-	-	-	-	-	3	-	-
EIC1 1001	Venture Ideation	-	-	-	-	-	3	-	3	-	-	3	-	-	-	-
GEE1 2002	Electrical and Electronics Technology Lab	3	-	3	-	-	-	-	-	-	-	-	-	-	-	-
MEE 1200 1	Engineering Workshop	3	1	-	-	-	-	-	-	3	-	-	-	3	-	-
CEE1 2001	Engineering Drawing & CAD	-	3	3	-	-	-	-	-	3	-	-	3	-	3	-
ENG 1104 4	Communication and Collaboration	-	1	-	-	-	-	-	2	3	3	-	-	3	3	-

	Skill-II															
SDS1 1510	Engineering Mathematics III-C	3	3	3	3	-	-	-	-	-	-	-	-	3	3	-
MTH 1153 4	Discrete Structures and Logic	3	3	3	3	-	-	-	-	-	-	-	-	3	3	-
CSE 1110 3	Principles of programming language	3	3	3	-	-	-	-	-	-	-	-	3	3	-	3
CSE 1110 4	Data Structures and Algorithms	3	3	3	3	-	-	-	-	-	-	-	-	3	3	3
CSE 1110 5	Switching Circuit & Logic Design	3	2	3	3	3	3	3	3	-	-	2	3	3	2	2
CSE 1210 6	Principles of programming language lab	3	3	3	-	3	-	-	-	-	-	-	-	3	-	3
MTH 1253 1	Numerical Techniques Lab	3	3	3	2	-	-	-	-	-	-	-	-	3	3	3
CSE1 1108	Database Management Systems	2	3	2	3	2	1	-	-	-	-	-	-	2	1	1
CSE 1110 9	Object oriented programming	3	3	2	-	-	-	-	-	-	-	-	3	3	1	1
CSE 1111 0	Design and Analysis of Algorithms	3	3	3	3	-	-	-	-	-	-	-	-	3	3	-
CSE1 1111	Formal Language and Automata Theory	3	3	3	3	-	-	-	-	-	-	-	-	3	3	-
CSE 1111 2	Introduction to Artificial Intelligence	2	3	2	3	2	1	-	-	-	-	-	-	2	1	1
PSG1 1021	Human Values and Professional Ethics	-	2	-	-	-	-	3	2	-	-	2	3	2	2	2
CSE1 2113	Database Management Systems Lab	2	3	2	3	-	-	-	-	-	-	-	3	2	2	3
CSE1 2114	Object oriented programming lab	3	3	3	-	3	-	-	-	-	-	-	-	3	-	3
CSE1 1115	Computer Networks	3	3	-	3	-	-	-	2	-	-	-	-	3	-	3
CSE1 1116	Computer Organization & Architecture	3	3	3	3	-	-	-	-	-	-	-	-	3	3	-
CSE1 1117	Software Engineering	3	2	-	-	2	2	-	-	-	-	-	3	2	3	2
CSE1 1118	Introduction to Python	3	3	3	3	-	-	-	-	-	-	-	-	3	3	3
CSE1 1119	Optimization and Game Theory	3	3	3	3	-	-	-	-	-	-	-	-	3	3	3
CSE1 1120	Introduction to Data Science	3	3	3	3	-	-	-	-	-	-	-	-	3	3	3

CSE11121	Distributed Systems and Cloud Computing	3	-	2	-	-	-	-	-	-	-	2	2	-	3	-
CSE11122	Introduction to cyber security	3	3	3	-	3	-	-	-	-	-	-	3	2	2	-
CSE11123	Full Stack Software Development	-	3	3	3	3	3	-	-	-	-	3	-	-	3	3
CSE11124	Pattern Recognition and Soft Computing	-	3	3	3	3	3	-	-	-	-	-	-	-	3	3
CSE11125	Data Mining and Warehousing	3	-	2	2	-	-	-	-	-	-	-	3	2	2	-
CSE11126	Cloud Security	2	3	2	2	2	-	-	-	-	-	-	-	2	2	2
CSE11127	Cyber Law and Governance	3	2	-	-	-	-	2	-	-	-	-	2	-	-	-
CSE11128	Computer Network lab	3	3	3	-	-	-	2	-	-	3	3	-	3	2	1
CSE12129	Computer Organization & Architecture Lab	3	3	3	3	-	-	-	-	-	-	-	-	3	3	-
CSE12130	Applied computing lab	3	3	3	-	3	-	-	-	-	-	-	3	3	-	1
CSE11131	Web Technology	3	3	-	3	-	-	-	2	-	-	-	-	3	-	3
CSE11132	Compiler Design	2	3	3	-	2	-	-	-	-	-	-	-	3	-	2
CSE11133	Mobile Computing and Android	-	3	3	3	3	-	-	-	-	-	-	-	-	3	3
CSE11134	Machine Learning	-	3	3	3	3	-	-	-	-	-	3	-	-	3	3
CSE11135	Real-time Analytics	3	3	3	3	3	1	-	-	-	-	-	-	3	3	3
CSE11136	Virtualization and Applied Cloud Computing	3	3	1	1	3	-	-	-	-	-	-	-	-	1	-
CSE11137	Network Security	3	-	-	2	2	-	-	-	-	-	-	2	3	2	-
CSE11138	Application Development with Python	-	3	3	3	3	-	-	-	-	-	3	-	3	3	3
CSE11139	Neural Networks and Deep Learning	2	3	2	3	2	1	-	-	-	-	-	-	2	1	1
CSE11140	Statistical Modelling for Data Analytics	3	3	2	3	3	1	-	-	-	-	-	-	2	2	2
CSE11141	Cloud Management	-	3	3	3	3	-	-	-	-	-	3	-	-	3	3
CSE11142	Malware Analysis	2	3	2	2	3	-	-	-	-	-	-	-	2	2	2
CEE1	Disaster	3	3	3	3	-	-	-	-	-	-	-	-	-	-	-

1029	Management															
ECE1 1009	Digital Signal Processing	3	3	3	-	-	-	-	-	-	-	-	-	3	-	-
ECE1 1015	VLSI Systems Design	3	3	3	3	2	2	-	-	-	-	-	1	3	2	-
ECO 1150 5	Economics for Engineers	-	2	3	2	-	2	-	-	-	-	2	3	2	-	2
CSE1 2143	Web Technology Lab	-	-	-	3	-	3	-	2	2	3	3	-	-	3	3
CSE1 5144	Technical Seminar	3	2	2	3	3	2	-	--	-	-	-	-	-	3	-
CSE1 2145	Android Application Development Lab	-	3	3	3	3	-	-	-	-	-	3	-	-	3	3
CSE1 2146	Machine Learning Lab	-	3	3	3	3	-	-	-	-	-	3	-	-	3	3
CSE1 2147	Statistical Modelling for data analytics lab	3	3	2	3	3	1	-	-	-	-	-	-	2	2	2
CSE1 2148	Virtualization and Applied Cloud Computing Lab	2	3	1	1	3	-	-	-	-	-	-	-	-	-	-
CSE1 2149	Network Security Lab	2	3	1	1	3	-	-	-	-	-	-	-	-	-	-
MGT 1140 2	Industrial Management	2	3	3	-	-	2	-	3	2	2	3	3	-	-	-
CSE1 1150	Operating System	3	3	3	-	2	-	-	-	-	-	-	3	-	-	2
CSE1 1151	Advanced Web Technologies	-	3	3	3	3	3	-	-	-	3	3	-	3	3	3
CSE1 1152	Applied Machine Intelligence	2	3	2	3	2	1	-	-	-	-	-	-	2	1	1
CSE1 1153	Data Analysis	2	3	2	3	2	1	-	-	-	-	-	-	2	1	1
CSE1 1154	Cloud Architecture and Deployment	3	3	2	1	-	-	-	-	-	-	-	-	1	1	-
CSE1 1155	Application Security	2	3	2	2	2	-	-	-	-	-	-	-	2	2	2
PHY 1120 3	-	3	2	2	1	3	1	-	3	1	-	-	1	3	2	2
ECE1 1047	Sensors, Devices and Actuators for IoT	3	3	3	1	1	1	-	-	-	1	-	-	3	2	-
MEE 1107 1	Robotics & Automation	3	3	1	1	1	-	1	-	-	1		3	3	1	1
MEE 1106 0	Computer-Aided Simulation & Analysis	3	3	1	1	1	-	1	-	-	1		3	3	1	1
ECE1 1049	Microcontroller and Interfacing	3	2	1	-	3	-	-	-	-	-	1	-	1	-	-
BIT1 1074	Bioinformatics	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-

CSE1 2156	Operating System	3	3	3	-	2	-	-	-	-	-	-	3	-	-	2
CSE1 2157	Advanced Web Technologies Lab	-	3	3	3	3	-	-	-	-	-	3	-	-	-	3
CSE1 2158	Applied Machine Intelligence Lab	2	3	2	3	2	1	-	-	-	-	-	-	2	1	1
CSE1 2159	Data Analysis Lab	2	3	2	3	2	1	-	-	-	-	-	-	2	1	1
CSE1 2160	Cloud Architecture and Deployment Lab	3	2	3	2	1	-	-	-	-	-	-	-	-	1	-
CSE1 2161	Application Security Lab	2	2	2	2	-	-	-	-	-	-	-	-	2	2	2
CSE1 4162	Summer Internship #	3	3	3	3	3	-	-	-	-	-	-	-	2	3	3
CSE1 4163	Minor Project	3	2	3	-	-	-	-	-	3	-	3	3	2	3	-
CSE1 4164	Major Project	3	2	-	3	-	-	-	-	3	3	3	-	2	3	3
CSE1 5165	Comprehensive Viva Voce	3	3	3	-	3	3	-	-	3	-	-	-	3	3	3
	AVERAGE	2.7	2.6	2.5	2.5	2.4	1.8	1.8	2.2	2.2	2.1	2.4	2.5	2.5	2.3	2.2