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 2025-26

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 design, deploy and manage cloud infrastructures using various modern platforms to aid in different types of intensive computational problems.

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	4	0	0	4	4
2	EVS11112	Environmental Science	3	0	0	3	3
3	PHY13201	Applied Science	2	0	2	4	
4	CSE11001	Introduction to Programming	2	0	0	2	2
5	GEE11001	Electrical and Electronics Technology	2	0	0	2	
6	CSE12002	Programming Lab	0	0	4	4	2
7	GEE12002	Electrical and Electronics Technology Lab	0	0	4	4	
8	ENG11053	English Communication	2	0	0	2	2
9	CSE11082	Principles and Applications of AI	2	0	0	2	
10	BIT11003	Life Sciences	2	0	0	2	2
11	DGS11002	Design Thinking & Prototyping	3	0	0	3	3
12	MEE11002	Engineering Mechanics	3	0	0	3	
13	CEE12001	Engineering Drawing and CAD	0	0	4	4	2
14	MEE12001	Engineering Workshop	0	0	4	4	
		Total	**15/16**	**0**	**8/10**	**24/25**	**20**

SEMESTER II							
S.No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**H**	**C**
1	MTH11502	Engineering Mathematics II	4	0	0	4	4
2	EVS11112	Environmental Science	3	0	0	3	3
3	PHY13201	Applied Science	2	0	2	3	
4	CSE11001	Introduction to Programming	2	0	0	2	2
5	GEE11001	Electrical and Electronics Technology	2	0	0	2	
6	CSE12002	Programming Lab	0	0	4	2	

7	GEE12002	Electrical and Electronics Technology Lab	0	0	4	2	2
8	ENG11053	English Communication	2	0	0	2	2
9	CSE11082	Principle and Applications of AI	2	0	0	2	
10	EIC11001	Venture Ideation	2	0	0	2	2
11	CLL11101	Soft Skills and Aptitude I	0	0	2	2	1
12	DGS11002	Design Thinking & Prototyping	3	0	0	3	3
13	MEE11002	Engineering Mechanics	3	0	0	3	
14	CEE12001	Engineering Drawing and CAD	0	0	4	2	2
15	MEE12001	Engineering Workshop	0	0	4	2	
Total			**15/16**	**0**	**10/12**	**27/26**	**21**

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

1st Year Credits = 41

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	CSE11108	**Database Management System**	3	0	0	3	3
3	CSE11103	**Professional Core – I** Principles of Programming Language	3	0	0	3	3
4	CSE11104	**Professional Core – II** Data Structures and Algorithms	3	0	0	3	3
5	CSE11105	**Professional Core – III** Switching Circuits and Logic Design	3	0	0	3	3
-6	CSE12106	**Professional Core Lab - I** Principles of Programming Language Lab	0	0	2	2	1
7	CSE12107	**Professional Core Lab - II** Data Structures and Algorithms Lab	0	0	2	2	2
8	CSE12113	Database Management System Lab	0	0	2	2	2
9	IDP14001	Interdisciplinary Project	0	0	5	5	3
10	SOC14100	Community Service #	0	0	0	0	1
11	CLL11102	Soft Skills and Aptitude II	0	0	2	2	1
Total			**15**	**1**	**13**	**29**	**26**

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

SEMESTER IV							
S.No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**H**	**C**
1	MTH11534	**Professional Core** Discrete Structures and Logic	3	0	0	3	3
2	CSE11109	Object Oriented Programming	3	0	0	3	3
3	CSE11110	Design and Analysis of Algorithms	3	0	0	3	3
4	CSE11111	Formal Language and Automata	3	0	0	3	3
5	CSE11112	Introduction to Artificial Intelligence	3	0	0	3	3
6	PSG11021	Human Values and Professional Ethics	2	0	0	2	2
7	MTH12531	Numerical Techniques Lab	0	0	2	2	1
8	CSE12114	Object Oriented Programming Lab	0	0	2	2	1
9	CSE12166	Design and Analysis of Algorithms Lab	0	0	2	2	1
10	CSE14170	**Mini Project-I**	0	0	3	3	2
11	CLL11103	Soft Skills and Aptitude III	0	0	2	2	1
Total			**17**	**0**	**11**	**28**	**23**

2nd Year Credits : 49

THIRD YEAR

SEMESTER V							
S.No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**H**	**C**
1	CSE11115	Computer Networks	3	0	0	3	3
2	CSE11116	Computer Organization and Architecture	3	0	0	3	3
3	CSE11117	Software Engineering	3	0	0	3	3
4	CSE11167	Competitive Programming-I	3	0	0	3	3
5		**Professional Elective - I**	3	0	0	3	3
	CSE11118	Introduction to Python					
	CSE11119	Optimization and Game Theory					
	CSE11120	Introduction to Data Science					
	CSE11121	Distributed Systems and Cloud					
	CSE11122	Introduction to Cyber Security					
6		**Professional Elective - II**	3	0	0	3	3
	CSE11123	Full Stack Software Development					
	CSE11124	Pattern Recognition and Soft Computing					
	CSE11125	Data Mining and Warehousing					
	CSE11126	Cloud Security					
	CSE11127	Cyber Law and Governance					
7	CSE12128	Computer Networks Lab	0	0	2	2	1
8	CSE12129	Computer Organization and Architecture Lab	0	0	2	2	1
9	CSE12168	Software Engineering Lab	0	0	2	2	1
10	CSE12169	Competitive Programming Lab	0	0	2	2	1
11	CSE14171	Mini Project-II	0	0	2	2	1
12	CLL11104	Soft Skills and Aptitude III	0	0	2	2	1
Total			**18**	**0**	**12**	30	**24**

SEMESTER VI							
S.No.	Course Code	Course Title	L	T	P	H	C
1	CSE11150	**Professional Core – XIV** Operating Systems	3	0	0	3	3
2	CSE11206	**Professional Core – XII** Introduction to Machine Learning	3	0	0	3	3
3		**Professional Elective - II**	3	0	0	3	3
		High Performance Computer Architecture					
	CSE11202	Unstructured Database					
	CSE11027	Computational Geometry					
4		**Open Elective - I**	2	0	0	2	2
	ECE11028	Internet of Things					
	ECE11030	Low Power VLSI					
	EEE11104	Renewable Energy Engineering					
	CEE11029	Disaster Management					
	MEE11037	Robotics					
	MEE11046	Automobile Engineering					
	EEE11101	Introduction to Electric Vehicle					
5	CSE12156	**Professional Core Lab – X** Operating System Lab	0	0	3	3	2
6	CSE12207	**Professional Core Lab – XII** Introduction to Machine Learning Lab	0	0	3	3	2
7	CSE14144	**Mini Project III**	0	0	5	5	3
8	CLL11105	Soft Skills and Aptitude V	0	0	2	2	1
9		**Professional Elective Lab - II**	0	0	3	3	2
	CSE12031	High Performance Computer Architecture Lab					
	CSE12203	Unstructured Database Lab					
	CSE12033	Computational Geometry Lab					
Total			**11**	**0**	16	27	21

3rd Year Credits : 45

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	XXXXXXXX	**Open Elective-III**	3	0	0	3	3
3		**Professional Elective - III**	3	0	0	3	3
	CSE11035	Image Processing					
	CSE11036	Cloud Computing					
	CSE11038	Computer Graphics					
	CSE11037	Information Retrieval					
4		**Professional Elective - IV**	3	0	0	3	3
	CSE11081	Fundamentals of Quantum Computing					
	CSE11040	Cryptography & Cyber Security					
	CSE11042	5G Wireless Communication Network					
5		**Open Elective - II**	3	0	0	3	3
	MEE11060	Computer-Aided Simulation & Analysis					
	ECE11049	Microcontrollers and Interfacing					
	BIT11074	Bioinformatics					
6		**Professional Elective Lab - III**	0	0	2	2	1
	CSE12044	Image Processing Lab					
	CSE12045	Cloud Computing Lab					
	CSE12047	Computer Graphics Lab					
	CSE12046	Information Retrieval Lab					
7	CSE14049	Summer Internship #	0	0	0	0	3
8	CSE14050	Minor Project	0	0	7	7	4
9	CLL11106	Soft Skills and Aptitude VI	0	0	2	2	1
Semester VII Total			**15**	**0**	**12**	**27**	**24**

#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	CSE14051	Industry Work experience/SIRE*/Major Project	0	0	12	12	6
2	CSE15061	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: 32

CREDIT DISTRIBUTION (SEMESTER-WISE)

SEM I	SEM II	SEM III	SEM IV	SEM V	SEM VI	SEM VII	SEM VIII	TOTAL
20	21	26	23	24	21	24	8	167

CREDIT DISTRIBUTION(YEAR-WISE)

YEAR I	YEAR II	YEAR III	YEAR IV	TOTAL
41	49	45	32	167

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

Course Objectives:

- To help the student to understand basic concept of abstract and vector algebra with its uses in engineering science.
- To give emphasis about concepts of differential calculus and enable students to apply these topics in real life problems.
- To give the students a perspective to learn integral calculus and its importance in advanced study in engineering science.
- To enable students acquire fundamental concept of ordinary differential equation and it'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 analysis with real world applications.

CO2 Explain the fundamental concepts of differential calculus and apply these topics in real life problems CO3 Illustrate the fundamental concepts of Integral Calculus and apply these topics in real life problems.

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

Course 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:

Units	**Lecture Hours**
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: Erwyn Kreyszig : Advanced Engineering Mathematics,	

Units	Lecture Hours
John Wiley and Sons B.V. Ramana, Higher Engineering Mathematics Tata McGraw-Hill. B.S.Grewal : Higher Engineering Mathematics, Khanna Publications C B Gupta, S R Singh, Mukesh Kumar: Engineering Mathematics, McGraw Hill Publication. R.K.Jain and S.R.K.Iyengar : Advanced Engineering Mathematics, Narosa Publishing House, 2002	

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

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
MTH11 501	Engineeri ng Mathema tics-I	CO115 01.1	1	2	3	3	1	3	1	-	3	-	-	2	3	2	3
MTH11 501	Engineeri ng Mathema tics-I	CO115 01.2	2	3	3	3	2	2	2	-	2	-	-	3	1	3	1
MTH11 501	Engineeri ng Mathema tics-I	CO115 01.3	1	3	3	2	3	3	1	-	1	-	-	2	3	2	2
MTH11 501	Engineeri ng Mathema tics-I	CO115 01.4	3	3	3	2	3	2	3	-	1	-	-	2	1	2	2
MTH11 501	Engineeri ng Mathema tics-I	CO115 01	1. 75	2. 75	3. 0	2. 5	2. 25	2. 5	1. 75	-	1. 75	-	-	2.2 5	2.0	2.2 5	2.0

CSE11001	**Introduction to Programming**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours - 45**	**3**	**0**	**0**	**3**

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

Pre-requisites/Exposure	**10+2 Level Mathematics, Knowledge of Basics of Computer**
Co-requisites	**Knowledge of Logical Reasoning and Analysis**

Course Objectives:

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

Course Outcomes:

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

CO1. Define basics concepts of programming structure and implement the basics concepts 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.

Course 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:

Units	**Lecture Hours**
Unit-I: 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	**4**
Unit-II: 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	**10**
Unit-III: 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	**10**
Unit-IV: 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:	**17**

Units	Lecture Hours
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: 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.	**4**

Text Books:

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

Reference Books:

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

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

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE11	Introduct	CO110	3	1	2	3	1	1	3	-	1	-	-	1	2	2	2
001	ion to	01.1															
	Program ming	CO110 01.2	2	1	3	3	2	1	2	-	1	-	-	2	3	1	2
		CO110	2	1	3	2	1	1	1	-	2	-	-	1	2	2	2
		01.3															

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
		CO110	2	3	3	2	2	2	1	-	3	-	-	1	1	1	3
		01.4															
		CO110	3	3	3	3	2	3	1	-	1	-	2	3	3	2	1
		01.5															
		CO110	2.	1.	2.	2.	1.	1.	1.	-	1.	-	2.0	1.6	2.2	1.6	2.0
		01	4	8	8	6	6	6	6		6						

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

Course Objectives:

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

Course Outcomes:

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

CO1. Apply knowledge about different passive components used in electronic industry for common application. CO2. Illustrate with the working of different active components to demonstrate basic electronic circuits.

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

CO4. Describe the basic construction of measuring instruments used in electronic measurements. CO5. Apply the Network theorems to calculate the voltage, current and power for a given circuit.

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

CO7. Understand the three-phase power measurement.

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

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

Course 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:

Units	**Lecture Hours**
Module-1: 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.	**7**

Units	Lecture Hours
Module-2: 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.	**6**
Module-3: 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.	**6**
Module-4: Basics of Semi-Conductors and PN Junction: Introduction; Carrier Concentrations- the Fermi Level; Electron and Hole Concentrational Equilibrium; Temperature Dependence of Carrier Concentration; Drift an d diffusion current; The Hall Effect; Optical Absorption, Luminescence; PN Junction Diode in Equilibrium Conditions; PN Junction Diode in Forward Biased and Reverse Biased Condition; Breakdown in PN Junction Diodes.	**7**
Module-5: 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.	**6**
Module-6: Field Effect Transistors: Introduction, JFET and MOSFET, Realization of digital logic circuit using MOSFET (AND, OR, NOT etc.), Realization of switching circuit using MOSFET.	**6**
Module-7: Electronics Instruments & Digital Electronics Fundamental: Signal generator, Multimeter, operation of CRO and its application. Number systems, Conversions and codes, Logic gates and truth tables.	**7**

Text Books:

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

Reference Books:

- Electronic Circuits, Discrete and Integrated- Charles Belove and Donald L.Schilling
- Principles of Electrical Engineering and Electronics -VKMehta, RohitMehta, SChand and Company, New Delhi
- Solid State Electronic Devices- Ben G. Streetman and Sanjay Kumar Banerjee,PHI.
- Fundamental of Digital Circuits by Anand Kumar 2nd Edition,PHI Learning Pal, Rajendra and Korlahalli,
- Theodore Wildi, Electric Machines, Drives and Power Systems, Pearson,2005.
- Vincent Del Toro, Electrical Engineering Fundamentals, 2nd Ed., Prentice Hall India Learning Pvt. Ltd.,1989.
- J. Millman, C. Halkias and C. D. Parikh, Millman's Integrated Electronics: Analog and Digital Circuits and Systems, 2nd Ed., McGraw Hill Education,2017.
- D.P.Leach,A.P.MalvinoandG.Saha,DigitalPrinciplesandApplications,8thEd.,McGraw Hill Education,2014.

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

1=weakly mapped

2= moderately mapped 3=strongly mapped

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	P O 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
GEE11	Electric	CO1100	2	2	2	3	3	3	1	2	3	-	-	2	1	3	2
001	al and	1.1															
	Electron	CO1100	3	2	3	1	3	2	2	-	2	2	3	2	2	1	2
	ics	1.2															
	Technol ogy	CO1100 1.3	2	3	2	3	2	3	3	-	3	-	-	2	1	3	2

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	P O 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
		CO1100	3	2	2	3	2	3	2	-	3	-	-	2	3	1	1
		1.4															
		CO1100	2	1	3	1	3	2	3	-	3	-	-	3	3	1	1
		1.5															
		CO1100	2	3	3	1	3	2	2	-	1	-	-	2	2	3	1
		1.6															
		CO1100	3	1	3	3	2	2	3	-	2	-	-	3	1	1	3
		1.7															
		CO1100	2	1	3	3	2	2	1	-	2	-	-	2	1	2	2
		1.8															
		CO1100	3	1	1	2	2	3	2	-	2	-	-	3	3	1	1
		1.9															
		CO1100	2.	1.	2.	2.	2.	2.	2.	2.	2.	2.0	3.0	2.3	1.8	1.7	1.6
		1	44	78	44	22	44	44	11	0	33			3	9	8	7

CSE12002	**Programming Lab**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours - 30**	**0**	**0**	**3**	**2**
Pre-requisites/Exposure	**10+2 Level Mathematics, Knowledge of Basics of Computer**				
Co-requisites	**Knowledge of Logical Reasoning and Analysis**				

Course Objectives:

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

Course Outcomes:

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

CO1. List and memorize various Unix commands. Also, students be able to construct various basic programs 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 library functions.

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.

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

Course 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 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. In all these modules related programming problems are practiced to understand the syntactical and semantical correctness of a program. Gradually students become more comprehensive through the progress of the course.

Course Content Experiments:

Familiarization with LINUX commands and vi editor.

Programs to demonstrate Decision Making, Branching and Looping, Use of break and continue statement etc.

Implementation involving the use of Arrays with subscript, String operations and pointers.

Implementation involving the use Functions and Recursion.

Implementation involving the use Structures and Files.

Implementation based on Stack Queues and Linked List for example Insertion and Deletion.

Text Books:

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

Reference Books:

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

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

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE12 002	Program ming Lab	CO1200 2.1	1	2	3	3	2	2	1	-	2	-	-	2	1	1	1
CSE12 002	Program ming Lab	CO1200 2.2	2	3	2	3	2	3	3	-	3	-	-	3	1	3	1

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE12 002	Program ming Lab	CO1200 2.3	2	3	2	3	1	1	3	-	3	-	-	1	1	3	1
CSE12 002	Program ming Lab	CO1200 2.4	2	3	1	1	2	3	3	-	2	-	-	1	3	3	1
CSE12 002	Program ming Lab	CO1200 2.5	3	1	3	3	2	1	2	-	3	-	3	3	3	3	3
CSE12 002	Program ming Lab	CO1200 2	2. 0	2. 4	2. 2	2. 6	1. 8	2. 0	2. 4	-	2. 6	-	3.0	2.0	1.8	2.6	1.4

GEE12002	**Electrical and Electronics Technology Lab**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours -30**	**0**	**0**	**3**	**2**
Pre-requisites/Exposure	**Class 12th Level physics**				
Co-requisites					

Course Objectives:

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

Course Outcomes:

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

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

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

CO3. Demonstrate various application circuits using diodes CO4. Experiment with the R-L-C circuits

CO5. Illustrate the three phase circuits

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

Identify the principle and significance of engineering drawing along with all the possible geometrical shapes.

Infer the principle and concept of projection of Points, Lines and Planes over Auxiliary Planes.

Demonstrate the principle and concept of Projection of Regular Solids.

Illustrate Sections and Sectional Views of Right Angular Solids and Regular Solids.

Interpret Isometric projection.

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

Identify the principle and significance of engineering drawing along with all the possible geometrical shapes.

Infer the principle and concept of projection of Points, Lines and Planes over Auxiliary Planes.

Demonstrate the principle and concept of Projection of Regular Solids.

Illustrate Sections and Sectional Views of Right Angular Solids and Regular Solids.

Interpret Isometric projection.

Course 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.

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.

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:

Units	**Lecture Hours**
List of experiments (Electrical Part): Verification of Thevenin's theorem and Norton's theorem. Verification of Superposition theorem. Verification of Maximum power transfer theorem. Study of R-L-C series circuit. Study of R-L-C parallel circuit. Performance study of fluorescent, LED, tungsten and carbon lamps. Measurement of power in a three-phase circuit using two-watt meter method. List of experiments (Electronics Part): Familiarization of bread board and electronics elements such as R, L, C, diode, and BJT etc. Familiarization of Function generator and measuring instruments such as CRO and multimeter. Study the V-I characteristic of PN junction diode and find knee voltage. Study the input and output characteristic of bipolar junction transistor (BJT): Common emitter (CE) configuration Study the transfer and drain characteristic of junction field-effect transistor (JFET), hence determine the drain resistance, transconductance factor, amplification factor. Study the transfer and drain	

Units	Lecture Hours
characteristic of MOSFET, hence determine the drain resistance, transconductance factor, amplification factor. Realization of digital logic circuit using MOSFET (AND, OR, NOT etc.).	
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	
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.	

Units	Lecture Hours
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:

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

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

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

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
GEE12 002	Electrical and Electronics Technology Lab	CO1200 2.1	3	3	2	1	1	2	1	-	3	-	-	2	1	1	3
GEE12 002	Electrical and Electronics Technology Lab	CO1200 2.2	3	1	3	1	3	3	3	-	2	-	-	1	2	3	2
GEE12 002	Electrical and Electronics Technology Lab	CO1200 2.3	2	2	2	3	2	3	1	-	3	-	-	3	1	2	1
GEE12 002	Electrical and Electronics Technology Lab	CO1200 2.4	2	1	3	3	3	1	3	-	1	-	-	1	3	3	1
GEE12 002	Electrical and Electronics Technology Lab	CO1200 2.5	2	3	1	3	2	1	2	-	3	-	-	2	1	3	1
GEE12 002	Electrical and Electronics Technology Lab	CO1200 2	2. 4	2. 0	2. 2	2. 2	2. 2	2. 0	2. 0	-	2. 4	-	-	1.8	1.6	2.4	1.6
Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
GEE12 002	Electrical and Electronics Technology Lab	CO120 02.1	3	2	1	3	1	1	2	-	3	-	-	1	1	3	2
GEE12 002	Electrical and Electronics Technology Lab	CO120 02.2	3	1	1	2	3	1	2	-	2	-	-	2	1	1	2
GEE12 002	Electrical and Electronics Technology Lab	CO120 02.3	2	2	1	3	1	1	3	-	3	-	-	3	1	3	3
GEE12 002	Electrical and Electronics Technology Lab	CO120 02.4	2	2	2	2	2	2	3	-	3	-	-	2	1	1	3
GEE12 002	Electrical and Electronics Technology Lab	CO120 02.5	2	3	3	3	3	1	2	-	2	-	-	1	2	1	3
GEE12 002	Electrical and Electronics Technology Lab	CO120 02.6	2	2	1	1	2	1	2	-	3	-	-	1	1	1	3
GEE12 002	Electrical and Electronics	CO120 02	2. 33	2. 0	1. 5	2. 33	2. 0	1. 17	2. 33	-	2. 67	-	-	1.6 7	1.1 7	1.6 7	2.6 7

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
	Technol ogy Lab																

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CEE12	Engineer	CO1200	1	2	2	1	2	3	3	-	1	-	-	2	3	2	1
001	ing	1.1															
	Drawing & CAD	CO1200 1.2	1	3	2	1	3	1	2	-	3	-	-	3	2	3	1
		CO1200	2	2	2	1	2	3	1	-	3	-	-	3	3	1	2
		1.3															
		CO1200	2	2	2	3	2	1	1	-	2	-	-	2	1	2	3
		1.4															
		CO1200	3	2	2	2	1	1	3	-	2	-	-	2	2	1	1
		1.5															
		CO1200	1.	2.	2.	1.	2.	1.	2.	-	2.	-	-	2.4	2.2	1.8	1.6
		1	8	2	0	6	0	8	0		2						

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

Course Objectives:

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

Course Outcomes:

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

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

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

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

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

Course Description:

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

Course Content:

Units	Lecture Hours
Module-I: Communication Level 1: Basics of Communication, Means of Communication, Barriers of Communication	**6**
Module-II: 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.	**6**
Module-III: 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.	**6**
Module-IV: 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.	**6**
Module-V: 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	**6**

Text Books:

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

Reference Books:

- Lewis, Norman. Word Power Made Easy. Anchor: 2014.

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

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

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

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
ENG11 053	English Communication	CO110 53.1	3	2	1	3	2	2	3	-	3	3	-	2	1	1	1
ENG11 053	English Communication	CO110 53.2	1	3	2	1	3	2	3	-	1	2	-	2	1	2	2
		CO110 53.3	2	1	1	2	3	3	2	3	2	-	-	3	1	1	1
		CO110 53.4	2	2	1	1	1	1	3	2	2	-	-	3	1	2	3
		CO110 53	2. 0	2. 0	1. 25	1. 75	2. 25	2. 0	2. 75	2. 5	2. 0	2.5	-	2.5	1.0	1.5	1.7 5

CSE11082	**Principles and Applications of AI**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours - 30**		**0**	**0**	**2**
Pre-requisites/Exposure	**10+2 Level Mathematics, Knowledge of Basics of Computer**				
Co-requisites	**Knowledge of Logical Reasoning and Analysis**				

Course Objectives:

- To introduce the fundamental concepts, principles, and real-world applications of Artificial Intelligence.
- To provide an in-depth understanding of data collection, preprocessing, and feature engineering techniques used in AI systems.
- To develop the ability to build and evaluate predictive models using statistical and machine learning approaches.
- To explore computer vision and prompt engineering techniques for solving intelligent computing problems.
- To enable students to design, implement, and apply AI-based solutions for practical and industry-oriented applications.

Course Outcomes:

CO1: Demonstrate understanding of AI concepts, lifecycle, and applications in STEM domains.

CO2: Import, clean, and preprocess structured datasets using Python tools.

CO3: Build and evaluate basic predictive models using statistical and machine learning techniques.

CO4: Apply foundational techniques in computer vision and prompt engineering to solve simple AI problems.

Course Content:

Units	Lecture Hours
Module-1: Introduction to AI and AI Lifecycle What is Artificial Intelligence, Machine Learning, and Deep Learning Use cases in STEM domains AI Lifecycle: Data → Model → Deployment → Feedback	**2**
Module-2: Data Import, Cleaning & Preprocessing Loading data from CSV, Excel, and APIs Handling missing values, outliers, normalization Data encoding and feature selection basics	**4**
Module-3: AI for Statistical Data & Predictive Modelling Overview of statistical AI applications Linear Regression and Logistic Regression Introduction to Decision Trees and Random Forests Performance metrics: accuracy, precision, recall, confusion matrix	**5**

Units	Lecture Hours
Module-4: Introduction to Computer Vision Traditional Computer Vision techniques: Grayscale conversion Gaussian Blur Edge detection (Sobel, Canny) Contour extraction Basics of Convolutional Neural Networks (concept only)	**5**
Module-5: Prompt Engineering Basics Introduction to Prompt Engineering and LLMs Prompt structures: Instructional, Few-shot, Chain-of-Thought (conceptual) Applications in writing, summarization, Q&A	**3**
Module-6: Hands-On Mini Project Choose one domain: Tabular, Visual, or Text data Problem definition and data import Preprocessing and basic model application Visualization and result interpretation	**6**
Module-7: Career Readiness & Future Trends Tools used in industry (Colab, Hugging Face, GitHub Copilot) AI roles and upskilling paths Industry case studies and project presentations Course Outcomes \ Program Outcomes PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 CO1 2 1 2 CO2 3 2 1 3 2 1 2 CO3 3 2 3 1 2 1 2 CO4 2 1 3 1 2 3 2 3	**5**

Reference Books:

- AI for Everyone
- Author: Saptarshi Goswami
- Publisher: Pearson Education
- Introduction to Artificial Intelligence
- Author: Dr. Dinesh Peter & Dr. Ajay Rana
- Publisher: Cengage Learning
- Artificial Intelligence: Made Simple
- Author: H. S. Behera
- Publisher: BPB Publications
- Artificial Intelligence Simplified
- Author: Amit Konar
- Publisher: New Age International
- 5. Python Machine Learning: Machine Learning and Deep Learning with Python, scikit-learn, and TensorFlow
- Author: Sebastian Raschka & Vahid Mirjalili
- Publisher: Packt Publishing
- Edition: 3rd Edition (or latest)

BIT11003	Life Sciences	L	T	P	C

Version 1.0	Contact Hours - 45	3	0	0	3
Pre-requisites/Exposure	Class 12 Biology				
Co-requisites	-				

Course Outcomes:

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 and can 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.

Course 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:

Units	Lecture Hours
Unit-I: Cell biology & Communication: [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.	**7**

Units	Lecture Hours
Unit-II: Genetics & Systems Biology [lecture] Genetic switches and oscillators, cell-to-cell interactions, cellular and genetic networks, and evolutionary dynamics.	**4**
Unit-III: Transport & Flow in Biological Systems [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.	**7**
Unit-IV: Human Physiology & Diseases [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 and gene therapy.	**10**
Unit-V: Neurophysiology [lecture] Neuron structure and function; Regeneration of nerve; flow and transport of signals from one neuron to other; Nervous system; Aging and its effect on brain; Behavioral functions of the brain - emotion, memory, learning and consciousness; Disorders of the nervous system and treatment.	**10**
Unit-VI: Medical Biotechnology [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.	**7**

Text Books:

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

Reference Books:

- Applied Cell and Molecular Biology for Engineers by Gabi Nindl Waite and Lee R. Waite. McGraw-Hill Education, 1 edition, 2007.
- Samson Wright's Applied Physiology.
- Modes of Examination: Assignment/Quiz/Project/Presentation/Written

Examination Scheme:

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

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

Course Code	Course Name	C Os	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
BIT11003	Life Sciences	CO 1	-	-	-	-	-	-	-	-	3	-	-	2	1	2	-
		CO 2	-	2	-	-	3	2	-	-	-	-	-	-	3	3	-
		CO 3	-	2	1	-	3	-	-	1	-	-	-	-	2	3	-
		CO 4	1	2	3	-	3	2	-	-	-	-	-	2	3	3	-
		CO 5	1	2	3	-	3	2	-	-	-	-	-	2	3	3	-
		CO 6	2	2	1	-	3	2	-	1	-	-	-	2	3	3	-

DGS11002	Design Thinking & Prototyping	L	T	P	C
Version 1.0	Contact Hours - 45	3	0	0	3
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	Knowledge of Logical Reasoning and Analysis				

Course Objectives:

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

Course Outcomes:

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

CO1. Examine design thinking concepts and principles

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

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

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

Course 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:

Units	Lecture Hours
Unit-I: 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.	**5**
Unit-II: 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.	**5**

Units	Lecture Hours
Unit-III: 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.	**6**
Unit-IV: 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.	**6**
Unit-V: 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 they can be considered and discussed.	**8**
Unit-VI: 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 as a prototype.	**7**
Unit-VII: 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.	**4**
Unit-VIII: 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 a process,	**4**

Units	Lecture Hours
allowing us to look at each step – or phase – along the journey to the development of a final design.	

Reference Books:

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

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

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
DGS11001	Design Thinking	CO11001.1	3	1	3	2	2	1	2	-	2	-	3	2	2	1	2
DGS11001	Design Thinking	CO11001.2	2	3	1	1	2	2	1	-	2	-	-	2	3	1	2
DGS11001	Design Thinking	CO11001.3	3	2	2	3	1	2	1	-	2	-	-	1	2	3	2
DGS11001	Design Thinking	CO11001.4	2	1	1	1	3	3	2	-	1	-	-	1	1	3	3
DGS11001	Design Thinking	CO11001	2.5	1.75	1.75	1.75	2.0	2.0	1.5	-	1.75	-	3.0	1.5	2.0	2.0	2.25

MEE11002	Engineering Mechanics	L	T	P	C
Version 1.0	Contact Hours - 45	3	0	0	3

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

Pre-requisites/Exposure	**12th level Physics, Mathematics**
Co-requisites	**--**

Course Objectives:

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

Course Outcomes:

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

CO1. Apply conditions of equilibrium of bodies subjected to forces

CO2. Determine the centroid, centre of gravity and moment of inertia of various one dimensional and two- dimensional objects

CO3. Analyze motion under the effect of dry friction

CO4. Apply the concept of virtual work for bodies in equilibrium

CO5. Apply the D'Alembert's Principle for reducing the problem of kinetics to equivalent staticsproblem.

Course 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:

Units	Lecture Hours
Module-1: 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.	**11**
Module-2: 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.	**11**
Module-3: 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.	**6**
Module-4: Virtual Work Virtual displacement, principle of virtual work.	**4**
Module-5: Introduction to Dynamics Laws of motion, Projectile motion, D'Alembert's Principle, Work andenergy, impulse and momentum, impact of bodies.	**8**

Text Books:

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

Reference Books:

- Engineering Mechanics: Statics & Dynamics by I.H.Shames, 4th ed. – PHI

- Engineering Mechanics by Timoshenko, Young and Rao, Revised 4th ed. – TMH

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

1=weakly mapped

2= moderately mapped 3=strongly mapped

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
MEE11	Enginee	CO1100	2	3	1	2	3	2	1	-	3	-	-	3	3	3	1
002	ring	2.1															
	Mechani cs	CO1100 2.2	3	2	2	1	3	2	1	-	3	-	-	2	3	2	1
		CO1100	2	2	2	2	1	1	3	-	3	-	-	2	3	1	3
		2.3															
		CO1100	3	3	3	3	1	2	1	-	3	-	-	3	2	3	3
		2.4															
		CO1100	3	2	2	3	2	3	3	-	1	-	-	2	2	3	3
		2.5															
		CO1100	2.	2.	2.	2.	2.	2.	1.	-	2.	-	-	2.4	2.6	2.4	2.2
		2	6	4	0	2	0	0	8		6						

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

Course Objectives:

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

Course Outcomes:

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

CO1 Demonstrate the basic operations in pattern and mould making. CO2 Experiment with different metal fitting works

CO3 Show basic forging and welding works CO4 Understand the operations of machine tools

CO5 Select the appropriate tools required for specific operation

CO6 Understand the safety measures required to be taken while using the tools

Course 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:

Units	**Lecture Hours**
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	

Units	Lecture Hours
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, and knurling) on a given mild steel rod followed by the given dimensions.	

Reference Books:

- Workshop Technology by S.K. Garg, 3rd Edition, LP
-
- CO-PO-PSO Mapping Table for the Engineering Workshop (MEE12001) Course
- 1 = Weakly Mapped
- 2 = Moderately Mapped
- 3 = Strongly Mapped
- SEMESTER II

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

Course Objectives:

- To help the student to understand the basic concepts of matrix theory with its uses inengineering science.
- To give emphasis about concepts of Eigen value and Eigen vector, vector space and linear transformation and enable students to apply these topics for analysing the engineering problems.
- To help the student to understand the use of vector calculus in engineering.

- To give the students a perspective to learn about functions of complex variables, pole, and residues and their importance in advanced study of engineering science.
- To enable students to acquire the knowledge of different transformation techniques and their applications in engineering science.

Course Outcomes:

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

CO1 Apply the knowledge of matrix theory for finding solution of a related engineering problem CO2 Illustrate the Eigen value(s) and Eigen vector(s) of a matrix

CO3 Explain the concept of vector space and linear transformation between the vector spaces

CO4 Build the knowledge of vector calculus and apply it for solving related problems CO5 Develop the concept of complex variable and its application

CO6 Outline the Fourier series representation of a function

CO7 Make use of appropriate transformation technique for solving differential equation o difference equation

Course Description:

For any engineering program, Mathematics is the backbone. With a sound knowledge in fundamental mathematics, an engineering student can become a very skilful engineer. In this course, the focus will be on learning Mathematics in depth, which will motivate students to grow their thinking ability in different fields of engineering. Students will be able to applythis 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:

Units	Lecture Hours
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	

Units	Lecture Hours
Unit-II: Complex Variables [15H] Limit, continuity, differentiability and analyticity of complex functions, Cauchy-Riemann equations, derivatives of analytic functions, line integrals in complex plane, Cauchy's integral theorem, independence of path, existence of indefinite integral, Cauchy's integral formula, Taylor's series, Laurent's series, zeros and singularities, Residue theorem	
Unit-III: Ordinary Differential Equations [20H] Formation of ODE, order and degree, First order ODE, Method of separation of variables, Exact and non-exact equations, linear and Bernoulli's form, second order differential equations with constant coefficients, Complementary functions and Particular Integral, D-operator, method of variation of parameters, general linear differential equations with constant coefficients, Cauchy-Euler's equations, Simultaneous differential equations	
Unit-IV: Vector Calculus [10H] Ordinary Integrals of Vectors, Line, surface and volume integrals of Vector fields, Gauss' divergence theorem, Green's and Stokes Theorems and their applications References: Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley and Sons B.V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill David C. Lay, Linear algebra and its application, (Latest edition), Pearson publication, New Delhi B. S. Grewal, Higher Engineering Mathematics, Khanna Publications C B Gupta, S R Singh, and Mukesh Kumar, Engineering Mathematics, Mc Graw Hill Publication R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, Narosa Publishing House	

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

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
MTH11	Engineeri	CO115	1	3	3	3	3	3	1	-	1	-	-	3	2	3	3
502	ng	02.1															

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
	Mathematics- II	CO115 02.2	2	1	3	2	1	2	3	-	2	-	-	1	3	1	1
		CO115	2	1	1	3	3	2	3	-	1	-	-	2	3	2	1
		02.3															
		CO115	2	1	2	2	3	1	2	-	2	-	-	2	3	1	2
		02.4															
		CO115	1	3	2	1	3	3	3	-	2	-	-	2	1	2	1
		02.5															
		CO115	3	1	3	2	3	2	2	-	2	-	-	2	3	3	3
		02.6															
		CO115	3	3	2	2	2	3	1	-	1	-	-	2	3	2	1
		02.7															
		CO115	2.	1.	2.	2.	2.	2.	2.	-	1.	-	-	2.0	2.5	2.0	1.7
		02	0	86	29	14	57	29	14		57				7		1

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

Course Objectives:

- To help the students understand the way to be an Entrepreneur

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

Course Outcomes:

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

CO1. Assess personal capacity in the context of the entrepreneurial process

CO2. Assess characteristics of successful entrepreneurs and entrepreneurial formsand processes

CO3. Apply resources, research and tools for Entrepreneurial ventures CO4. Analyze and apply opportunity identification techniques, feasibility, terminology, processes and models

CO5. Develop Ideation and planning documents for entrepreneurial venture

Course 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:

Units	**Lecture Hours**
Unit-1: . Introduction 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-	**6**

Units	Lecture Hours
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 Customer types, Customer archetypes, Customer segments and business models, Customer segments, value propositions, product features, value mapping, interviewingcustomer, insights of your customers.	**6**
Unit-3: Product Understanding and Marketing. Customer value, The DNA of customer-centricity, Crossing the chasm, Qualitative and quantitative marketing research, importance and methods of market segmentation, Focusing on the target market, Beyond the chasm, Strategic implications of beyond thechasm, E-commerce: The internet as a selling platform.	**6**
Unit-4: . Prototyping and Testing. 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.	**6**

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

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

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
EIC110	Ventu	CO1100	1	1	2	3	1	2	1	-	1	-	2	2	1	3	2
01	re	1.1															
	Ideation	CO1100 1.2	1	3	1	2	2	3	3	-	2	-	2	1	1	2	1

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
		CO1100	2	1	3	2	1	3	2	2	3	-	3	1	2	3	2
		1.3															
		CO1100	1	1	1	1	1	2	3	2	2	-	3	1	3	2	3
		1.4															
		CO1100	2	3	1	3	1	3	1	2	3	-	2	2	3	2	3
		1.5															
		CO1100	1.	1.	1.	2.	1.	2.	2.	2.	2.	-	2.4	1.4	2.0	2.4	2.2
		1	4	8	6	2	2	6	0	0	2						

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

Course Objectives:

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

- To help students to understand future Engineering positions with scope of understanding dynamics of working between inter departments of a typical OEM.

Course Outcomes:

On completion of this course, the students will be able to CO1. Examine design thinking concepts and principles

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

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

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

Course 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:

Units	**Lecture Hours**
Unit-I: 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.	**2**
Unit-II: 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.	**4**
Unit-III: 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.	**4**

Units	Lecture Hours
Unit-IV: 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.	**4**
Unit-V: 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 they can be considered and discussed.	**4**
Unit-VI: 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 as a prototype.	**4**
Unit-VII: 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.	**4**
Unit-VIII: 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 a process, allowing us to look at each step – or phase – along the journey to the development of a final design.	**4**

Reference Books:

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

- van der Lelie, Corrie. "The Value of Storyboards in the Product Design Process." Journal of Personal and Ubiquitous Computing 10.203 (2006): 159–162. Web. 9 July 2015. [PDF].
- Millenson, Alisson. "Design Research 101: Prototyping Your Service with a Storyboard." Peer Insight. Peer Insight, 31 May 2013. Web. 9 July 2015.

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

Course Code	Course Name	COs	P O1	P O2	P O3	P O4	PO 5	PO 6	PO 7	P O8	P O9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
DGS11 001	Design Thinking	CO1100 1.1	3	3	2	2	1	2	2	-	2	-	3	3	3	1	3
DGS11 001	Design Thinking	CO1100 1.2	3	3	1	3	3	3	1	-	1	-	-	2	2	2	3
DGS11 001	Design Thinking	CO1100 1.3	3	2	1	2	2	1	1	-	2	-	-	1	2	3	2
DGS11 001	Design Thinking	CO1100 1.4	3	2	2	1	3	1	1	-	1	-	-	1	2	3	3
DGS11 001	Design Thinking	CO1100 1	3. 0	2. 5	1. 5	2. 0	2. 25	1. 75	1. 25	-	1. 5	-	3.0	1.7 5	2.2 5	2.2 5	2.7 5

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

Unit 1: AI/ML lecture:10

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

Unit 2: Data Analytics With Tools: lecture:6

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

Unit 3:IOT lecture:10

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

Unit 4: Cyber Security lecture:9

Introduction To Cybersecurity, Definition And Scope Of Cybersecurity, Historical Perspective And Evolution Of Cybersecurity, Cyber Threats And The Need For Protection, Overview Of Common Cyber Threats (Malware, Phishing, Ransomware, Etc.), Social Engineering Attacks, Confidentiality, Integrity, And Availability (Cia) Triad, Risk

Assessment And Management, Security Policies And Procedures, Cybersecurity Best Practices, Security Technologies And Tools, Introduction To Antivirus Software, Firewalls And Intrusion

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

Unit 5: Robotic Process Automation lecture:6

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

Unit 6: Additive Manufacturing (Am) And Rapid Prototyping (Rp) lecture:6

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

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

Legend for Mapping

1 = Weakly Mapped

2 = Moderately Mapped

3 = Strongly Mapped

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1: Understand key concepts and applications	3	3	2	2	3	1	1	-	-	2	1	2	3	2	3

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
of disruptive technologies in AI/ML, IoT, and Cybersecurity.															
CO2: Apply knowledge of data analytics tools and methods for effective decision-mak ing.	3	3	3	2	3	1	1	-	2	-	2	2	3	2	2
CO3: Develop prototypes and IoT	3	2	3	3	3	-	2	-	2	1	3	2	3	3	3
solutions using hands-on exercises with Arduino and Raspberry Pi.															
CO4: Understand cybersecurity threats and apply protection mechanisms in real-world scenarios.	3	3	3	3	3	3	2	2	1	1	2	3	3	3	3
CO5: Analyze and implement automation solutions using Robotic	3	3	3	2	3	1	-	-	-	-	3	2	3	2	2

solutions using hands-on exercises with Arduino and Raspberry Pi.															
Process Automation.															
CO6: Understand the principles and applications of Additive Manufacturing (AM) and Rapid Prototyping (RP).	3	3	3	3	3	1	1	-	2	-	3	3	3	2	2

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

Course Objectives:

- To develop the capability of the students for understanding fundamental aspects of physics.
- To give students theoretical background, the key prerequisite for performing laboratory experiments.
- To build up the foundations for further studies in physics and engineering.
- Learn to analyze and evaluate various thermodynamic cycles used for energy production - work and heat, within the natural limits of conversion
- To impart the knowledge of measurement of the rate of a chemical reaction and to gain knowledge 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 harmonic motions. 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, calculate the cell potential for a nonstandard cell.

Course 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:

Units	Lecture Hours
Module-1: Mechanics 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).	**10**
Module-2: Optics Principle of Superposition and Interference from parallel thin films, Single slit and Double slit diffraction, Diffraction grating, dispersive power of Grating, resolving power of prism and grating. Production of plane polarized light by different methods, Brewster and Malus Laws. Double refraction, Nicol prism, specific rotation.	**5**
Module-3: Electromagnetic Theory 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).	**10**
Module-4: Thermodynamics 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 Cp and Cv using ideal gas; Thermodynamics of Chemical Processes, Concept of entropy, 2nd law of thermodynamics, Idea of Chemical potential, Equilibrium conditions for closed systems.	**10**
Module-5: Reaction Kinetics, Catalysis & Electrochemistry Rate laws, 1stOrder reaction & 2ndorder reaction, Arrhenius equation, Mechanism and Theories of reaction rates, kinetic and thermodynamic control of reaction; idea of rate	**10**

Units	Lecture Hours
determining step; steady- state approximation; Characteristics and types of Catalyst, Theories of Catalysis, Electrode potential, Redox reaction & Nernst Equation.	

Text Books:

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

Reference Books:

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

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

1=weakly mapped

2= moderately mapped 3=strongly mapped

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
PHY112	Appli	CO1120	3	3	3	3	2	3	2	-	2	-	-	3	2	2	2
01	ed	1.1															
	Science	CO1120 1.2	3	3	2	3	2	1	2	-	3	-	-	3	2	3	3

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
		CO1120	2	1	1	1	3	2	2	-	1	-	-	2	2	2	1
		1.3															
		CO1120	3	3	3	2	3	2	2	-	3	-	-	2	2	3	3
		1.4															
		CO1120	2	3	3	3	3	3	2	-	2	-	-	2	3	3	2
		1.5															
		CO1120	2.	2.	2.	2.	2.	2.	2.	-	2.	-	-	2.4	2.2	2.6	2.2
		1	6	6	4	4	6	2	0		2						

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

Course Objectives:

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

Course Description:

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

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

Course Content Experiments: Physics

Determination of Young's Modulus of a Beam by traveling microscope by FLEXURE method.

Carry Foster's Method to Determine Resistance of a Given Coil.

Determination of the Coefficient of viscosity of water by Poiseulle's Capillary Flow method.

To determine the wavelength of sodium light by forming Newton's Ring.

Determination of Rigidity Modulus by dynamical method.

Determine the Plank's constant using photocell.

To verify Stefan's law by electrical method.

To study the temperature dependence of reverse saturation current in a junction diode and hence to determine the Band gap.

Determination of specific charge (e/m) of electron by J.J. Thomson’s method.

Determination of the Rydberg constant by studying hydrogen or helium spectrum.

Determination of dielectric constant of a given dielectric material.

Determination of Hall coefficient of Semiconductor.

Study current – voltage characteristic load response of photovoltaic solar cells.

Experiments: Chemistry (Any Four)

Determination of total hardness of water by complexometric titration method

Determination of carbonate and bicarbonate in water

Estimation of iron (ferrous ion in Mohr salt) by permanganometry.

Determination of strength of an unknown HCl solution with standardized NaOH solution by conductometric titration.

Dissolved oxygen by Winkler's method

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

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
PHY12	Appli	CO12202	3	1	1	2	1	2	1	-	2	-	-	2	3	1	1
202	ed	.1															
	Scien	CO12202	3	3	3	1	3	3	3	-	1	-	-	2	1	1	2
	ce	.2															
	Lab	CO12202	2	1	1	2	3	2	2	-	2	-	-	3	1	3	1
		.3															
		CO12202	2	1	1	2	1	1	1	-	3	-	-	3	1	1	1
		.4															
		CO12202	2	3	1	2	3	3	2	-	3	-	-	3	1	3	2
		.5															

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
		CO12202	2	2	1	2	1	1	3	-	2	-	-	2	1	3	2
		.6															

		CO12202.7	**2**	**2**	**2**	**2**	**3**	**2**	**1**	**-**	**1**	**-**	**-**	**2**	**3**	**2**	**3**
		CO12202.8	3	2	2	3	3	2	2	-	3	-	-	1	1	2	3
		CO12202.9	1	3	2	2	1	1	2	-	2	-	-	2	3	1	3
		CO12202.10	1	3	2	2	2	2	1	-	1	-	-	1	1	2	2
		CO12202	2. 1	2. 1	1. 6	2. 0	2. 1	1. 9	1. 8	-	2. 0	-	-	2.1	1.6	1.9	2.0

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

Course Objectives:

- To introduce the concepts of descriptive statistics
- To reinforce the concepts of probability
- To demonstrate the applications of sampling and statistical inference
- To establish the importance of hypothesis testing in experiments

Course Outcomes:

After completion of the course the students will be able to

CO1: Formulate descriptive statistics for real world problemsCO2 : 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

Random variables, Distribution of a random variable, expectation, variance and standard deviation of probability

distribution, standard discrete distributions Bernoulli, binomial, geometric, Poisson, Poisson approximation ofbinomial 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:

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

Reference Books:

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

Modes of Evaluation:

Quiz/Assignment/Presentation/Extempore/ Written

ExaminationExamination Scheme:

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:

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

Course Outcomes:

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

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. Studentswill 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 toclasses for programmer-defined data types.

Course Content:

Units	**Lecture Hours**
Unit-I: C Refresher: Procedural programming, variables, data types, operators, conditions, loops, functions, arrays, pointers, strings and structures	**09**
Unit-II: Introduction to OOP: Need for OOP Paradigm, Procedural programming vs object oriented programming, objectoriented 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	**09**
Unit-III: Functions: Main function, function prototyping, inline functions, reference variables, call by reference ,Defaultsarguments, 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,	**09**

Units	Lecture Hours
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: 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, managingoutput with manipulators. Exceptions: Run time errors, exception handling using try, catch and throw, Working with files: Classes for filestream operations, opening and closing files, File opening modes, file Pointers, Error handling during file operations, command line arguments, templates	**09**
Unit-V: Problem solving with C++: Case study for problem solving on various real life systems like Bank, Library, Hospital, Hotel, Employee management system etc.	**09**

Examination Scheme:

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

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

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

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE11	Principle	CO111	2	3	1	1	1	1	2	-	2	-	-	2	1	3	2

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
103	s of	03.1															
	Program	CO111	2	3	3	2	2	2	1	-	1	-	-	2	2	3	3
	ming	03.2															
	Language	CO111	3	3	2	3	3	3	1	-	2	-	-	2	3	3	2
		03.3															
		CO111	2	3	1	2	2	1	2	-	3	-	-	2	1	1	3
		03.4															
		CO111	2	2	2	3	3	1	1	-	3	-	-	3	1	1	2
		03.5															
		CO111	2.	2.	1.	2.	2.	1.	1.	-	2.	-	-	2.2	1.6	2.2	2.4
		03	2	8	8	2	2	6	4		2						

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

Course Objectives:

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

Course Outcomes:

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

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 andanalysis 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:

Units	**Lecture Hours**
Unit-I: 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 DifferentData 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.	**5**
Unit-II: 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 Representationwith 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,	**10**

Units	Lecture Hours
Representation ofpolynomials 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: 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	**15**
Unit-IV: 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.	**10**
Unit-V: 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 OrganisationHeap File Organisation, Hash File Organisation, Index Sequential File Organisation Primary Index, Secondary Index.	**5**

Examination Scheme:

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

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

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

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE11	Data	CO1100	3	3	3	3	2	1	2	-	3	-	-	2	2	2	3
004	Structu	4.1															
	res and	CO1100	2	3	3	3	2	1	1	-	3	-	-	2	2	3	3
	Algorit	4.2															
	hms	CO1100	2	2	3	2	1	2	1	-	3	-	-	1	2	3	2
		4.3															
		CO1100	3	2	2	2	3	3	2	-	3	-	-	1	2	3	1
		4.4															
		CO1100	3	2	2	2	3	3	1	-	2	-	-	1	3	2	1
		4.5															
		CO1100	2.	2.	2.	2.	2.	2.	1.	-	2.	-	-	1.4	2.2	2.6	2.0
		4	6	4	6	4	2	0	4		8						

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

Course Objectives:

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

Course Outcomes:

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

CO1: Understand and construct the basic design principles of logic gate. CO2: Understand the different fabrication techniques used in Bipolar, CMOS

and PLA.CO3: Formalize 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 toactual 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:

Units	**Lecture Hours**
Unit-I: Switching Circuits: Logic families: TTL, nMOS, CMOS, dynamic CMOS and pass transistor logic (PTL) circuits, inverters and otherlogic gates, area, power and delay characteristics, concepts of fan-in, fan-out and noise margin.	**7**
Unit-II: 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, multipleoutput minimization, representation and manipulation of functions using BDD's, two-level and multi-level logic circuit synthesis.	**10**

Units	Lecture Hours
Unit-III: 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	**7**
Unit-IV: 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 uential circuit synthesis.	**15**
Unit-V: ASM charts: Representation of sequential circuits using ASM charts, synthesis of output and next state functions, data pathcontrol path partition-based design.	**6**

Examination Scheme:

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

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

1 = Weakly Mapped

2 = Moderately Mapped3 = Strongly Mapped

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE11	Switch	CO1110	2	2	2	2	2	1	1	-	1	-	-	1	2	3	2
105	ing	5.1															
	Circuit	CO1110	2	3	3	3	3	3	2	-	3	-	-	3	1	3	3
	and	5.2															

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
	Logic Design	CO1110 5.3	3	2	3	3	1	3	2	-	1	-	-	3	3	3	2
		CO1110	2	2	2	3	2	2	3	-	3	-	-	3	1	2	3
		5.4															
		CO1110	3	3	1	1	3	2	3	3	3	-	-	2	2	2	3
		5.5															
		CO1110	2.	2.	2.	2.	2.	2.	2.	3.	2.	-	-	2.4	1.8	2.6	2.6
		5	4	4	2	4	2	2	2	0	2						

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

Course Objectives:

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

Course Outcomes:

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

CO1: Define classes, objects, members of a class and the relationships among them needed for afinding the solution to specific problem.

CO2: Apply fundamentals of object-oriented programming in C++, including defining classes, invokingmethods, 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. Studentswill 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 toclasses for programmer-defined data types..

Course Content:

Units	Lecture Hours
Unit-I: 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.	**09**
Unit-II: Write a C++ program that demonstrate the basic class program to get department, name and salary of anemployee. Write a C++ program that to calculate area of circle, square, rectangle and triangle using switch-casestatements Write a C++ program to that accepts number from user and displays all the factors of that number.	**09**
Unit-III: 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.	**09**
Unit-IV: 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.	**09**

Units	Lecture Hours
Unit-V: Write a C++ Program to read the name and roll numbers of students from keyboard and write them into afile and then display it. 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 sumand display sum using defined member functions 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 andsales of salesman.	**09**

Examination Scheme:

Components	Interna l	End Term
Weightage (%)	50	50

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

1 = Weakly Mapped

2 = Moderately Mapped3 = Strongly Mapped

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE12	Principles	CO1210	2	3	2	3	2	2	1	-	1	-	-	2	3	1	1
106	of	6.1															
	Program	CO1210	2	2	2	1	3	2	1	-	1	-	-	1	3	3	2
	ming	6.2															
	Language Lab	CO1210 6.3	2	2	1	3	2	2	1	-	2	-	-	2	1	3	2

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
		CO1210	2	2	1	1	3	2	2	-	2	-	-	1	3	1	1
		6.4															
		CO1210	2	3	3	3	3	2	1	-	2	-	-	2	2	3	1
		6.5															
		CO1210	2.	2.	1.	2.	2.	2.	1.	-	1.	-	-	1.6	2.4	2.2	1.4
		6	0	4	8	2	6	0	2		6						

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 elementarydata 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 ListsCO3. 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 scienceundergraduate 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:

Units	Lecture Hours
List of Programs: Write a menu based C program to insert a node at the beginning, after a specified position, at the end of asingly linked list. Write a menu based C program to delete a node from the beginning, from a specified position, from the end ofa singly linked list. Write a menu based C program to display the data part of the nodes in reverse order, reverse the list and sortthe elements of a singly linked list. Write a menu based C program to insert a node at the beginning, after a specified position, at the end of adoubly linked list. Write a menu based python program to delete a node from the beginning, from a specified position, from theend of a doubly linked list. Write a menu based C program to display the data part of the nodes in reverse order, reverse the list and sortthe elements of a doubly linked list. Write a menu based C program to insert, delete and display operation of a linear queue by using singly linkedlist. Write a menu based C program to insert, delete and display operation of a linear queue by using an array. Write a menu based C program to implement push, pop and display operation of a linear queue by usingsingly linked list. Write a menu based C program to implement push, pop and display operation of a linear queue by using anarray. Write a menu based C program to implement insert, delete and display operation of a circular queue by usingan array. Write a menu based C program to implement insert, delete and traverse operation of a binary search tree usingdoubly linked list. Write a menu based C program to implement linear search, binary search and interpolation search algorithm. Write a menu based C program to implement bubble sort, selection sort, and quick sort, merge sort, insertionsort, heap sort and radix sort algorithm. Implement Tree Traversals, BFS, Graph Traversal, Shortest path and some topics on Spanning Tree using C.	

Text Books:

- Cormen, Thomas H Cormen, Charles E Leiserson, Ronald L Rivest,
- Clifford Stein.

Reference Books:

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

Modes of Evaluation:

Quiz/Assignment/Presentation/Extempore/ Written Examination

Examination Scheme:

Components	Interna l	End Term
Weightage (%)	50	50

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

1 = Weakly Mapped

2 = Moderately Mapped3 = Strongly Mapped

Course Code	Course Name	COs	P O1	P O2	P O3	P O4	P O5	P O6	P O7	P O8	P O9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE121 07	Data Structu res and Algorit hm Lab	CO1210 7.1	3	3	1	2	1	1	2	-	1	-	-	3	3	2	3
CSE121 07	Data Structu res and Algorit hm Lab	CO1210 7.2	2	2	2	2	1	2	2	-	1	-	-	3	2	2	2
CSE121 07	Data Structu	CO1210 7.3	2	3	2	2	2	2	3	-	2	-	-	2	3	2	2

Course Code	Course Name	COs	P O1	P O2	P O3	P O4	P O5	P O6	P O7	P O8	P O9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
	res and Algorit hm Lab																
CSE121 07	Data Structu res and Algorit hm Lab	CO1210 7.4	3	3	2	2	2	2	2	-	3	-	-	1	3	3	1
		CO1210 7.5	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**-**	**1**	**-**	**-**	**2**	**1**	**1**	**2**
		CO1210 7	2. 6	2. 8	1. 8	2. 0	1. 8	2. 0	2. 4	-	1. 6	-	-	2.2	2.4	2.0	2.0

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

Course Objectives:

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

Course Outcomes:

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

CO1. recognize the unique advantages of integrative research and learning

CO2. understand the fundamentals of research methods and practices of various academic disciplinesCO3. demonstrate an understanding of current issues and concerns

CO4. realize the importance of ethics in research process

CO5. understand the inter-disciplinary systems of research documentation Typical Progress Roadmap

After discussion with the Project Advisor(s), each student shall prepare an initial outline of their assigned project indicating the major sections of discussion, list the principal research sources for each section, and explain the overall objective of the project, including a justification of the interdisciplinary nature of the work.

Each student shall meet with the Project Advisor(s)regularly as per the weekly Time-Table. Other meetingsmay be scheduled at the discretion of the Project Advisor(s) at mutually agreed upon timings.

Typically, the progress will include a combination of industrial and academic mentoring , self study sessions,case studies, trend studies, presentation by students, interactive sessions, industrial visits etc.

Regular submission of progress reports shall be required of each student-group as notified through the ProjectAdvisor(s) from time to time.

Modes of Evaluation:

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

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

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
IDP14	Interdiscipli	CO140	2	2	3	3	2	3	2	-	1	-	-	3	1	1	1
001	nary	01.1															
	Projects	CO140	3	2	2	3	2	3	2	-	1	-	-	1	3	2	1
		01.2															
		CO140	1	2	3	3	1	2	3	-	2	-	-	2	2	1	3

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
		01.3															
		CO140	2	3	3	2	3	3	2	3	3	-	-	2	1	3	2
		01.4															
		CO140	1	1	1	1	3	2	3	-	2	3	3	3	1	1	1
		01.5															
		CO140	1.	2.	2.	2.	2.	2.	2.	3.	1.	3.0	3.0	2.2	1.6	1.6	1.6
		01	8	0	4	4	2	6	4	0	8						

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

Course Objectives:

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

Course Outcomes:

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

CO1. Identify the indispensable and relevant social issues of Indian as well as global context.CO2. Construct a questionnaire schedule, plan and execute field work.

CO3. Create a report after serving the social issue.

Course Description:

To prepare students for ethical decision making guided by empathy, care, values and principles course on

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

Course Content:

Units	Lecture Hours
Unit-I: Introduction to the course. A brief on social issues facing the society with both global and Indian examples. Unit II: Minimum 24 hours of field work on a social issue and helping the marginalized / affected community / cause withphotographs and testimonies.	
Unit-III: Submission of individual reflection on the social service rendered.The benefits that accrue to the students are Subjective Psychosomatic benefits : Volunteering increases overall life satisfaction and also helps to relive stress andacts as an anti-depressant. Intellectual benefits: Enhances knowledge through new experiences, and developscommunication skills. Career benefits: Enhances career prospects by acquisition of work-related skills, builds good references for employers and provides a forum to network with future potential employers. It also The experience allows gained helps students to take up leadership positions. Letters of recommendation can also be easily sought. Research shows that students who indulge in volunteer word perform better in studies as it invigorates their passion for learning Personal benefits: Real world skills like leadership, problem-solving, collaboration with others, time management and communication skills, learn patience and empathy. Connect learning to real world and enables deeper and lifelong learning.B.) Community Collective benefits: Strong interpersonal bonds are created, and leads to increased civic andsocial awareness and responsibility.	

Text Books:

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

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

Year II Semest er IV

SEMESTER IV

Course Code	Course Name	COs	PO 1	PO 2	P O 3	P O 4	PO 5	PO 6	P O 7	P O 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
SOC14 100	Commu nity Service	CO1410 0.1	1	3	1	2	2	2	2	-	1	-	-	3	2	1	1
SOC14 100	Commu nity Service	CO1410 0.2	2	2	2	1	2	1	3	2	3	2	-	1	1	3	2
SOC14 100	Commu nity Service	CO1410 0.3	2	2	3	3	3	2	1	-	3	-	-	3	3	2	1
SOC14 100	Commu nity Service	CO1410 0	1. 67	2. 33	2. 0	2. 0	2. 33	1. 67	2. 0	2. 0	2. 33	2.0	-	2.3 3	2.0	2.0	1.3 3

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

Course Objectives:

- To introduce the concepts of logic
- To reinforce the concepts of set theory
- To demonstrate the applications of permutations and combinations
- To establish the importance of graph theory in computer science

Course Outcomes:

After completion of the course the students will be able to

CO1: Formulate propositional and first order logic

CO2: Explain the concepts of set theory

CO3: Apply permutation and combinations in several problemsCO4 : 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 theoryconcepts

Course ContentUnit

I :

Propositional Logic: Encoding, reasoning and deductions. Truth tables, satisfiability and validity. Tautology,

Contradictions, Contingency, Propositional equivalences, Inverse, Converse, and Contra-positive, Conjunctive normalform, 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 andDestructive 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:

- Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw - Hill.
- V Somasundaram, Discrete Mathematics with Graph Theory and Combinatory, Tata McGraw- Hill.
- T. Veeraranjan, Discrete Mathematics with Graph Theory and Combinatorics, Tata McGraw- Hill. Reference Books
- Norman L. Biggs, Discrete Mathematics, 2nd Edition, Oxford University Press.
- Drysdale, Key College Publishing.

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

Course Code	Course Name	COs	P O 1	P O 2	P O 3	PO 4	PO 5	PO 6	P O 7	P O 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
MTH11 534	Discret e Structu res and Logic	CO1153 4.1	2	3	3	3	2	1	1	-	1	-	-	2	2	2	2
MTH11 534	Discret e Structu res	CO1153 4.2	2	2	3	3	2	1	3	-	1	-	-	2	2	3	2

Course Code	Course Name	COs	P O 1	P O 2	P O 3	PO 4	PO 5	PO 6	P O 7	P O 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
	and Logic																
MTH11 534	Discret e Structu res and Logic	CO1153 4.3	3	2	3	2	1	1	1	-	2	-	-	1	2	1	1
MTH11 534	Discret e Structu res and Logic	CO1153 4.4	3	3	3	3	2	2	1	-	3	-	-	2	3	3	2
MTH11 534	Discret e Structu res and Logic	CO1153 4	2. 5	2. 5	3. 0	2. 75	1. 75	1. 25	1. 5	-	1. 75	-	-	1.7 5	2.2 5	2.2 5	1.7 5

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 pointsCO4. 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. Thecourse 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:

Units	Lecture Hours
Write a C / MATLAB program to execute the following: The root of non-linear equation using Bisection method. The root of non-linear equation using false position method. The root of non-linear equation using Newton Raphson method.4. Solve a system of linear equation using gauss-elimination method.	

Text Books:

- Solve a system of linear equation using gauss-seidel method.
- Evaluate the integral using different numerical integration rules.
- Solve an ordinary differential equation using different numerical methods.

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

Reference Books:

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

Modes of Evaluation:

Quiz/Assignment/ presentation/ extempore/ Written

ExaminationExamination Scheme:

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

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
MTH12	Numeri	CO1253	2	3	2	3	2	3	1	-	1	-	-	2	3	2	1
531	cal	1.1															
	Techniq ues Lab	CO1253 1.2	3	2	3	1	2	3	2	-	3	-	-	3	1	3	1
		CO1253	3	2	3	1	3	3	2	-	3	-	-	2	2	3	2
		1.3															
		CO1253	3	3	3	2	3	1	2	-	2	-	-	2	1	3	2
		1.4															
		CO1253	2	3	2	2	1	3	2	-	3	-	-	1	1	1	1
		1.5															

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
		CO1253	2.	2.	2.	1.	2.	2.	1.	-	2.	-	-	2.0	1.6	2.4	1.4
		1	6	6	6	8	2	6	8		4						

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:

Units	Lecture Hours
Unit-I: 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.	**09**
Unit-II: 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.	**09**
Unit-III: 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.	**09**
Unit-IV: 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	**09**

Units	Lecture Hours
Applets And Applications, Life Cycle, Passing Parameters To Applets, Applet Security Issues.	
Unit-V: Application Development: Design of real life GUI applications using Swing/AWT/JDBC for Employee management system, Hotel management system, Hospital management system etc.	**09**

Examination Scheme:

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

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

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

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

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11109	Object Oriented Programming	CO11109.5	2	2	3	2	3	3	3	-	2	-	-	2	1	2	2
CSE11109	Object Oriented Programming	CO11109	2.4	2.2	2.6	2.2	1.8	2.0	2.0	-	2.2	-	-	2.2	1.8	1.8	2.4

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

Course Objectives:

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

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 tosolve 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 havedifferent 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 algorithmdesign 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:

Units	**Lecture Hours**
Unit-I: Introduction: Characteristics of algorithm. Analysis of algorithm: Asymptotic analysis of complexity bounds best, average and worst-casebehaviour; Performance measurements of Algorithm, Time and space trade-offs, Analysis of recursive algorithms through Algorithm Design Paradigms.	**09**
Unit-II: 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 recurrences, The recursion-tree method for solving recurrences, The master method for solving recurrences.	**09**
Unit-III: Greedy algorithms: General Characteristics of greedy algorithms, Problem solving using Greedy Algorithm- 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.	**09**
Unit-IV: Graph Algorithms : Representations of graphs, Breadth- - Minimum Spanning Trees, Growing a minimum-spanning tree, The algorithms of Kruskal	**09**

Units	Lecture Hours
and Prim, Single-Source Shortest Paths, Bellman-Ford algorithm, Single-constraints and shortest paths, Proofs of shortest-paths properties, All-Pairs Shortest Paths, Shortest paths and matrix multiplication, The Floyd- -networks, The Ford-Fulkerson method, Branch & Bound & Backtracking	
Unit-V: String Matching The naive string-matching algorithm, The Rabin- -Morris- Pratt algorithm Approximation Algorithms: The vertex-cover problem, The traveling-salesman problem, The set-covering problem, Randomization and linear programming	**09**

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

1 = Weakly Mapped

2 = Moderately Mapped3 = Strongly Mapped

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE11	Design	CO1111	3	1	2	3	2	3	1	-	2	-	-	3	2	3	1
110	and	0.1															
	Analysi	CO1111	2	1	3	3	3	1	1	-	2	-	-	3	2	1	2
	s of	0.2															
	Algorit hms	CO1111 0.3	2	1	3	3	3	1	3	-	3	-	-	2	1	2	3
		CO1111	2	1	2	3	1	2	3	-	3	-	-	2	1	2	3
		0.4															
		CO1111	2	3	3	3	3	2	2	-	1	-	-	3	2	3	2
		0.5															

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
		CO1111	2.	1.	2.	3.	2.	1.	2.	-	2.	-	-	2.6	1.6	2.2	2.2
		0	2	4	6	0	4	8	0		2						

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

Course Objectives:

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

Course Outcomes:

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

CO1: Define the basic concepts in formal language theory, grammars, automata theory, computabilitytheory, 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 andcomputational models including (but not limited to) decidability and Intractability.

CO5: Solve fundamental problems related to Computational Model.

Course Description:

This course will

sometimes chaotic technology oriented world of computers has a very elegant mathematical basis to it. This basisis 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, regularexpressions 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 twopoints of view: a class of automata defining the language, and a class of grammars defining the language. Thisdual 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:

Units	**Lecture Hours**
Unit-I: 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 Rangeof 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, UndirectedGraph, Trees, Lemma, Theorem Proving, Proof by Induction Proof by Contradiction, Proof by Example.	**4**
Unit-II: Finite Automata: Finite-state Machine, Finite- 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- -closure), Eliminating e- -Transition to NFA, - -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	**16**

Units	Lecture Hours
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, NFAand 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: 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 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	**15**
Unit-IV: 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 hines as Enumerators,	**10**

Units	Lecture Hours
Universal Turing Machine, Counter Machine, Recursive andRecursively Enumerable Languages Unrestricted grammars and equivalence with Turing machines, Church-Turing thesis, universal Turing machine, Rice's theorem,undecidable problems about languages.	
Unit-V: 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, MappingReducibility , Computable functions, Formal definition of mapping reducibility Time Complexity: Measuring Complexity, Big-O and small-o notation, Analyzing algorithms, Complexity relationships among models, The ClassP, 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: -completeness	**10**

Examination Scheme:

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

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

1 = Weakly Mapped

2 = Moderately Mapped3 = Strongly Mapped

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

CSE11111	**Formal Language and Automata Theory**	**CO11111.1**														
CSE11111	Formal Language and Automata Theory	CO11111.2	2	3	3	3	2	3	3	-	1	-	-	1	2	2	1
CSE11111	Formal Language and Automata Theory	CO11111.3	3	3	3	2	1	2	2	-	1	-	-	3	1	2	2
CSE11111	Formal Language and Automata Theory	CO11111.4	2	1	3	3	3	1	2	-	1	-	-	1	3	1	3
CSE11111	Formal Language and Automata Theory	CO11111.5	2	2	3	3	1	3	3	-	1	-	-	3	2	3	2

CSE11111	**Formal Language and Automata Theory**	**CO11111.1**															
CSE11111	Formal Language and Automata Theory	CO11111	2. 4	2. 2	3. 0	2. 8	1. 6	2. 4	2. 6	-	1. 4	-	-	2.0	2.2	2.2	1.8

CSE11112	**Introduction to Artificial Intelligence**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Fundamentals of computer science, Operating system**				
Co-requisite	**NIL**				

Course Objectives:

- To provide the most fundamental knowledge of AI.
- To make a computer that can learn, plan, and solve problems autonomously.
- To give the students a perspective on the main research topics in AI i.e. problem solving, reasoning, planning,etc.
- To enable students to acquire knowledge on some basic search algorithms for problem solving; knowledgerepresentation 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 areuseful 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 fundamentalknowledge 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:

Units	**Lecture Hours**
Unit-I: Introduction: Introduction, Agents, Problem formulation, Forward and backward chaining, Unification, Resolution.	**10**
Unit-II: Search in State Space and Planning: Uninformed search strategies, Heuristics, Informed search strategies, Satisfying constraints. Planning with state-space search, Partial-order planning, planning graphs, Planning and acting in the real world, Forward and backward chaining, Unification, Resolution.	**8**
Unit-III: Knowledge Representation & Reasoning: Introduction & Overview, Logical agents, Propositional logic, Inference rules, First-order logic, Inferences in first order logic, Ontology Engineering, knowledge representation	**9**
Unit-IV: Uncertainty Quantifying Uncertainty, Probabilistic Reasoning, Probabilistic Reasoning over Time ,Probabilistic Programming,Making Simple Decisions, Making Complex Decisions ,Multiagent Decision Making	**9**

Units	Lecture Hours
Unit-V: Various wings of AI: Introduction to various wings of AI Neurophysiology, cognitive science, pattern recognition, machine learning,machine vision, linguistics, data science, robotics, bioinformatics, speech processing, generative systems.	**9**

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

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE11	Introduc	CO111	3	3	3	2	2	1	1	-	1	-	-	1	3	3	2
112	tion to	12.1															
	Artificial	CO111	1	3	3	3	2	3	1	-	2	-	-	1	3	1	2
	Intellige	12.2															
	nce	CO111	3	2	3	2	1	3	2	-	1	-	-	2	3	3	1
		12.3															
		CO111	3	3	3	3	3	3	2	-	3	-	-	1	3	1	2
		12.4															
		CO111	3	1	3	3	3	1	2	-	1	-	-	3	3	3	1
		12.5															
		CO111	2.	2.	3.	2.	2.	2.	1.	-	1.	-	-	1.6	3.0	2.2	1.6
		12	6	4	0	6	2	2	6		6						

		L	T	P	C
PSG11021	**Human Values and Professional Ethics**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours -45**	**3**	**0**	**0**	**3**

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

Pre-requisites/Exposure	**Basic human ethics**
Co-requisites	**--**

Course Objectives:

- To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life, profession and happiness, basedon a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basisof Value based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful andmutually satisfying human behaviour and mutually enriching interaction with Nature.
- To explain basic database concepts, applications, data models, schemas and instances.
- To demonstrate the use of constraints and relational algebra operations.
- To describe the basics of SQL and construct queries using SQL.
- To emphasize the importance of normalization in databases.
- To facilitate students in Database design
- To familiarize issues of concurrency control and transaction management.
- To understand how to design, implement, test, debug, and document programs that use basic data types andcomputation, simple I/O, conditional and control structures, string handling, functions and object oriented approaches.
- Cour se
- To develop a problem and design the solution for the problem.
- To design and implement efficient algorithms for a specified application.
- To provide the ability to identify and apply the suitable algorithm for the given real world problem

Course Outcomes:

On 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 -making processes.

CO5. Plan

practice.

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 creationinteraction.

CO3. Define a commercial relational database system (Oracle, MySQL) by writing SQLusing the system.

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 afinding the solution to specific problem.

CO2. Illustrate object-oriented modelling techniques like classes and Instances modelling techniquesCO3. 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 conceptCO5. Solve GUI program with proper event handling techniques.

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

CO1. Identify the problem given and design the algorithm using various algorithm design techniques.

CO2. Implement various algorithms in a high level language CO3. Analyze the performance of various algorithms.

CO4. Compare the performance of different algorithms for same problem.

Course 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 graphsand 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.

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 systemfor 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.

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.

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:

Units	**Lecture Hours**
Unit-I: theories and their applications.	**9**
Unit-II: 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.	**9**
Unit-III: Sustainable Engineering and Sustainable Development: Meaning of sustainable engineering, Principles of sustainable engineering, Safety and risk assessment, Sustainable development, Sustainable engineering v. engineeringnegligence.	**9**

Units	**Lecture Hours**
Unit-IV: Engineering Negligence: The elements of engineering negligence, The standard duty of care, Liability in negligencecases, Defenses Negligence Cases (Engineering, med ical and others).	**9**
Unit-V: Rights and obligations of Engineers under Various Indian Laws: The Indian adjuratory system, Constitutional lawsgoverning engineering professionals, Contractual obligations of engineers Environment protection laws, Arbitration and conciliation laws, Intellectual property laws, Information technology laws. 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.	**9**
Unit-I: 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 classesextends 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.	**09**
Unit-II: Write a Java program that creates a user interface to perform integer divisions. The user enters two numbers in thetext 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. IfNum2 were Zero, the program would throw an Arithmetic Exception. Display the exception in a message dialog box	**09**

Units	Lecture Hours
Unit-III: 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 lineper 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).	**09**
Unit-IV: Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow,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 todisplay the table using Labels in Grid Layout. velop an applet in Java that displays a simple message. Develop an applet in Java that receives an integer in one text field, and computes its factorial Value and returns	**09**
Unit-V: 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 thenumber of interchanges occurred for the given set of integers. Experiment 1: Implementation based on Divide and Conquer: Binary Search using Divide and Conquer approach, Quick sort and Merge Sort Experiment 2: Implementation based on Dynamic Programming : Implement all pair of Shortest path for a graph (Floyed-Warshall Algorithm), , Bellman Ford Algorithm and Implement Traveling Salesman Problem Experiment 3: Implementation based on Brunch and Bound :Implement 15 Puzzle Problem Experiment 4: Implementation based on Backtracking :Implement 8 Queen problem, Graph Coloring Problem, Hamiltonian Problem Experiment 5: Implementation based on Greedy method: Knapsack Problem and Job sequencing with deadlines, Minimum Cost Spanning Tree by Prim's Algorithm and Minimum Cost Spanning Tree by Kruskal's Algorithm Experiment 6: Implementation based on Graph Traversal Algorithm: Implement Breadth First Search (BFS) and Implement Depth First Search (DFS)	**09**

Text Books:

- AroraVibha, AroraKunwar, Laws for Engineers, Central Law Publications, 1st Edition, 2017.2.Fledderman Charles B., Engineering Ethics, Pearson Education Inc., 4th Edition, 2012
- Govindarajan M., Natarajan S., Senthilkumar V. S., Engineering Ethics Includes Human Values, PHI LearningPrivate Limited, 1st Edition, 2010
- Database System Concepts, 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill
- Principles of Database and KnowledgeBase Systems, Vol 1 by J. D. Ullman, Computer Science Press.
- Java Fundamentals - A Comprehensive Introduction, Illustrated Edition ByDaleskrien, Herbert Schildt, Mcgraw-Hill Education.
- Introduction to Algorithms, 4TH Edition, Thomas H Cormen, Charles E Lieserson, Ronald L RivestAnd Clifford Stein, MIT Press/Mcgraw-Hill.
- 2 Fundamentals of Algorithms E. Horowitz Et Al.

Reference Books:

- Govindarajan M., Natarajan S., Senthilkumar V. S., Professional Ethics and Human Values, PHI LearningPrivate Limited, 1st Edition, 2017.
- Harris Charles E., Jr., Pritchard Michael S., Rabins Michael J., Engineering Ethics, Wadsworth CengageLearning, 4th Edition, 2009
- 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.
- For Programmers, 2nd Edition By Paul Deitel And Harvey Deitel, Pearson Education. nking In Java, Low Price Edition By Bruce Eckel, Pearson Education
- Algorithm Design, 1ST Edition, Jon Kleinberg and EƵ vatardos, Pearson.
- Algorithm Design: Foundations, Analysis, And Internet Examples, Second Edition, Michael T Goodrich And Roberto Tamassia, Wiley.
- Algorithms -- A Creative Approach, 3RD Edition, Udimanber, Addison-Wesley, Reading, MA.

Examination Scheme:

Components	Interna l	End Term
Weightage (%)	50	50

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

1 = Weakly Mapped

2 = Moderately Mapped3 = Strongly Mapped

Year III Semeste r V

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
PSG11	Human	CO1102	2	3	3	1	1	2	3	2	2	-	-	3	1	1	1
021	Values	1.1															
	and	CO1102	1	3	2	3	3	2	2	3	3	-	-	1	2	3	1
	Professi	1.2															
	onal Ethics	CO1102 1.3	3	3	1	2	2	1	3	-	2	-	-	3	2	3	3
		CO1102	1	1	1	2	1	3	3	-	2	-	2	2	3	1	2
		1.4															
		CO1102	1	1	2	1	1	1	2	-	3	-	-	2	1	3	3
		1.5															
		CO1102	1.	2.	1.	1.	1.	1.	2.	2.	2.	-	2.0	2.2	1.8	2.2	2.0
		1	6	2	8	8	6	8	6	5	4						

Course Code	Course Name	COs	PO 1	PO 2	P O 3	P O 4	P O 5	P O 6	PO 7	P O 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
PSG11 021	Human Values and Professi onal Ethics	CO1102 1.1	2	1	2	1	2	3	2	-	3	-	-	2	3	2	3
PSG11 021	Human Values	CO1102 1.2	3	1	2	2	3	3	2	-	1	-	-	2	2	1	2

Course Code	Course Name	COs	PO 1	PO 2	P O 3	P O 4	P O 5	P O 6	PO 7	P O 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
	and Professi onal Ethics																
PSG11 021	Human Values and Professi onal Ethics	CO1102 1.3	2	3	2	3	1	3	3	-	3	-	-	1	1	2	2
PSG11 021	Human Values and Professi onal Ethics	CO1102 1	2. 33	1. 67	2. 0	2. 0	2. 0	3. 0	2. 33	-	2. 33	-	-	1.6 7	2.0	1.6 7	2.3 3

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
PSG11	Human	CO1102	3	2	3	3	1	1	3	-	1	-	-	2	1	2	1
021	Values	1.1															
	and	CO1102	3	2	2	3	3	3	3	-	3	-	-	1	1	1	2
	Professi	1.2															
	onal Ethics	CO1102 1.3	3	3	3	2	3	2	1	-	2	-	-	3	1	2	3
		CO1102	2	3	3	1	1	3	1	-	2	-	-	3	1	1	3
		1.4															
		CO1102	2	2	3	2	2	3	2	-	2	-	-	1	2	3	1
		1.5															

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
		CO1102	2.	2.	2.	2.	2.	2.	2.	-	2.	-	-	2.0	1.2	1.8	2.0
		1	6	4	8	2	0	4	0		0						

Course Code	Course Name	COs	PO 1	PO 2	P O 3	P O 4	PO 5	PO 6	PO 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
PSG11 021	Human Values and Professi onal Ethics	CO1102 1.1	2	2	2	3	1	1	1	-	3	-	-	1	2	2	2
PSG11 021	Human Values and Professi onal Ethics	CO1102 1.2	2	3	3	3	2	2	2	-	2	-	-	1	1	2	2
PSG11 021	Human Values and Professi onal Ethics	CO1102 1.3	2	3	2	3	1	1	2	-	3	-	-	3	3	2	3
PSG11 021	Human Values and Professi onal Ethics	CO1102 1.4	1	3	3	3	3	1	2	-	2	-	-	1	2	1	3
PSG11 021	Human Values and Professi onal Ethics	CO1102 1	1. 75	2. 75	2. 5	3. 0	1. 75	1. 25	1. 75	-	2. 5	-	-	1.5	2.0	1.7 5	2.5

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

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:

Units	Lecture Hours
Unit-I: 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.	**09**
Unit-II: 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	**09**
Unit-III: 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).	**09**
Unit-IV: 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. Develop an applet in Java that displays a simple message. 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.	**09**

Units	Lecture Hours
Unit-V: 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.	**09**

Text Books:

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

Reference Books:

- Java For Programmers, 2nd Edition By Paul Deitel And Harvey Deitel, Pearson Education. Thinking In Java, Low Price Edition By Bruce Eckel, Pearson Education

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

1 = Weakly Mapped

2 = Moderately Mapped

3 = Strongly Mapped

SEMESTER V

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE12	Object	CO1211	2	2	3	2	3	1	3	-	3	-	-	3	3	1	1
114	Oriented	4.1															
	Programming Lab	CO1211 4.2	3	2	3	1	1	3	1	-	1	-	-	3	2	3	3
		CO1211	2	2	2	2	2	3	2	-	2	-	-	1	1	3	3
		4.3															

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
		CO1211	2	2	2	1	2	2	2	-	2	-	-	1	1	1	3
		4.4															
		CO1211	2	2	2	3	1	3	2	-	3	-	-	3	2	3	2
		4.5															
		CO1211	2.	2.	2.	1.	1.	2.	2.	-	2.	-	-	2.2	1.8	2.2	2.4
		4	2	0	4	8	8	4	0		2						

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

Course Objectives:

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

Course Outcomes:

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

Describe the characteristics of database and the architecture of Database system.

Model the elements used in Entity- Relationship diagram.

Summarize relational model concept and illustrate the relational constraints.

Build Structured Query Language (SQL) and apply to query a database and Define normalization forrelational databases.

Develop some Standalone (Example)/ Mobile/ Web Application DB on real world case studies.

Course Description:

Databases form the backbone of all applications today tightly or loosely coupled, intranet or internet based, financial,social, administrative, and so on. Database Management Systems (DBMS) based on relational and other models have long formed the basis for such databases. Consequently, Oracle, Microsoft SQL Server,

Sybase etc. have emerged as

in the details, they share a common set of models, design paradigms and a Structured Query Language (SQL).

In this

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 variousassignments. Design of simple multi-tier client / server architectures based and Webbased database applications is alsointroduced.

Course Content:

Units	**Lecture Hours**
Unit-I: 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 ShipSet, Cardinality Properties, Type of Entities, Type of Keys, Aggregation, Specialization and Generalization.	**9**
Unit-II: 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,	**9**

Units	Lecture Hours
DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE,DB2, SQL server.	
Unit-III: 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, ExtendedArmstrong's axioms, Assertions and Demons. Data Base Decomposition: Domain and data dependency, Normalforms: 1NF, 2 NF, 3 NF, BCNF, Dependency preservation, Lossless design.	**9**
Unit-IV: 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.	**9**
Unit-V: 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, DatabaseSecurity: Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection. Advanced topics: Distributed databases, Data warehousing and data mining.	**9**

Modes of Evaluation:

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

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:

- To explain basic database concepts, applications, data models, schemas and instances.
- To demonstrate the use of constraints and relational algebra operations.
- To describe the basics of SQL and construct queries using SQL.
- To emphasize the importance of normalization in databases.
- To facilitate students in Database design
- 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.

Course 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:

Units	Lecture Hours
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:

- Database System Concepts, 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill
- Principles of Database and Knowledge – Base Systems, Vol 1 by J. D. Ullman, Computer Science Press.

Reference Books:

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

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

1=weakly mapped

2= moderately mapped 3=strongly mapped

Course Code	Course Name	COs	P O 1	PO 2	P O 3	P O 4	PO 5	P O 6	P O 7	P O 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE12 113	Database Manage ment Systems Lab	CO1211 3.1	3	1	3	2	3	1	1	-	3	-	-	2	3	3	2
CSE12 113	Database Manage ment Systems Lab	CO1211 3.2	2	1	3	2	2	3	1	-	2	-	-	2	2	3	2
CSE12 113	Database Manage ment Systems Lab	CO1211 3.3	1	2	3	2	3	2	1	-	2	-	-	1	2	3	2
CSE12 113	Database Manage ment Systems Lab	CO1211 3	2. 0	1. 33	3. 0	2. 0	2. 67	2. 0	1. 0	-	2. 33	-	-	1.6 7	2.3 3	3.0	2.0

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:

- To give a brief overview of fundamentals of computer network
- To conceptualize understanding in transmission media and data communication.
- To propagate a functional overview of addressing techniques and protocols
- To analyse file transfer protocols, and concepts of secured data communication technique

Course Outcomes:

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

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 meettheir diverse requirements.

CO4: Distinguish between control and d ata planes in computer networks, and their corresponding architectures inreal-world networks (including the Internet).

CO5: Illustrate reliable transport protocols and networked system architectures via implementation using SocketAPIs, 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, switchingand 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:

Units	**Lecture Hours**
Unit-I: 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 andHTTP, Electronic mail in Internet, DNS ry Service, Peer-to-Peer Applications. LAN Topology, Encoding Technique, Transmission Mode, layers of networking	**9**
Unit-II: 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,	**9**

Units	Lecture Hours
Ethernet, Data Link Layer switching, Wireless LAN, Broadband Wireless, Bluetooth	
Unit-III: Unit Heading: Network and Transport layer Network layer design issues, routing algorithms, Congestion control algorithms, Internetworking, the networklayer 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	**9**
Unit-IV: 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 getservbyportfunctions	**9**
Unit-V: 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 andrealtime application case study.	**9**

Examination Scheme:

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

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

1 = Weakly Mapped

2 = Moderately Mapped3 = Strongly Mapped

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE11	Compu	CO1111	2	2	1	1	3	1	2	-	3	-	-	1	1	3	1
115	ter	5.1															
	Netwo rks	CO1111 5.2	3	2	2	3	2	1	2	-	2	3	2	3	2	1	1
		CO1111	3	2	2	2	3	2	3	-	1	-	-	3	2	2	2
		5.3															
		CO1111	1	1	2	1	2	2	1	-	3	2	2	2	2	1	2
		5.4															
		CO1111	1	3	1	1	2	2	2	-	3	2	3	2	1	3	2
		5.5															
		CO1111	2.	2.	1.	1.	2.	1.	2.	-	2.	2.3	2.3	2.2	1.6	2.0	1.6
		5	0	0	6	6	4	6	0		4	3	3				

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 willinclude 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.
- To

- help the
- student to acquire knowledge of software evolution process.
- To enable students modelling software project with appropriate metric and precision at workplace.
- 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.
- To enable students, acquire testing and quality assessment of model required for their profession.

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, performanceimprovement 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

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.

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 ofchange that has always characterized computer technology continues with no letup. These changes cover all aspects ofcomputer technology, from the underlying integrated circuit technology used to construct computer components, to theincreasing 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 intentof 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 theperformance and utilization of all elements.

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:

Units	**Lecture Hours**
Unit-I: 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 addressingmodes.	**8**
Unit-II: Computer Arithmetic : Look ahead carries adders. Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division andlogic 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 completeinstruction. Program Control, Reduced Instruction Set Computer, Pipelining. Hardwire and micro programmed control: microprogramme sequencing, concept of horizontal and vertical	**10**

Units	Lecture Hours
microprogramming. RISC Scalar Procesors, CISC Scalar Process, Super Scalar and Vector Procesor and its Instruction Set Architecture.	
Unit-III: 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.	**12**
Unit-IV: Pipeline and Superscalar: Linear Pipeline, Non- Linear Pipeline, Instruction Pipeline Design, Arithmetic Pipeline Design, Super Scalar & SuperpipelineDesign Paralle Computing Models: PRAM & VLSI models, Shared & Distributed memory multi Computers, Vector Super Computers & SIMD Super Computers	**10**
Unit-V: Motivation: why parallel computing, Fundamentals of parallel computing, PCA components & systems, PCA architectures:ARM Architectures, x86 Architectures, Other Sample Architectures.	**5**
Unit-I: 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.	**9**
Unit-II: 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	**10**

Units	Lecture Hours
Measurement, Reconciling of Different, Metrics Approaches, Software quality metrics, Validation management, Software project planning: Observations on estimation, Objectives of Project planning.	
Unit-III: 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	**8**
Unit-IV: 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.)	**9**
Unit-V: Software configuration management: Object identification in software configuration, Configuring audit-SCM standards, Analysis concepts and principles: Requirement analysis, Software prototyping, Specification Review Analysis modeling, Data modeling, Functional modeling, Behavioral modeling, Software design, Software testing techniques: White box and black box testing, Software testing strategies - Unit testing, Integrating testing, System testing.	**9**

Text Books:

- Computer Organization 1.and Design: The Hardware/Software Interface, 5th Edition by David A. Patterson and John
- L. Hennessy, Elsevier.
- Computer Organization and Embedded Systems, 6th Edition by Carl Hamacher, McGraw Hill Higher Education.
- Software Engineering: A practitioner's approach, 8th Edition, Roger S. Pressman, McGraw Hill
- An integrated approach to Software Engineering, Springer/Narosa Edition, Pankaj Jalote.

Reference Books:

- mputer Architecture and Organization, 3rd Edition by John P. Hayes, WCB/McGraw-Hill
- Computer Organization and Architecture: Designing for Performance, 10th Edition by William Stallings, PearsonEducation.
- mputer System Design and Architecture, 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education
- Fundamentals of Software Engineering, 4th Edition, Rajib Mall, Prentice Hall, India.

Examination Scheme:

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

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

1 = Weakly Mapped

2 = Moderately Mapped3 = Strongly Mapped

1=weakly mapped

2= moderately mapped 3=strongly mapped

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE11	Compute	CO111	2	3	3	3	2	2	1	-	2	-	-	2	3	2	3
116	r	16.1															
	Organiza	CO111	2	2	3	3	3	1	2	-	1	-	-	2	3	3	1
	tion and	16.2															
	Architect ure	CO111 16.3	2	3	3	2	2	2	2	-	1	-	-	3	3	1	3
		CO111	2	3	2	2	3	2	2	-	1	-	-	3	2	1	3
		16.4															
		CO111	3	3	3	2	2	3	3	-	3	-	-	3	3	2	3

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
		16.5															
		CO111	2.	2.	2.	2.	2.	2.	2.	-	1.	-	-	2.6	2.8	1.8	2.6
		16	2	8	8	4	4	0	0		6						

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE11	Softwar	CO111	3	1	2	1	3	2	3	-	3	3	2	2	3	1	2
117	e	17.1															
	Enginee ring	CO111 17.2	2	2	1	2	3	1	3	-	3	-	-	1	1	1	1
		CO111	3	1	2	1	2	2	1	-	1	-	-	3	2	1	1
		17.3															
		CO111	3	3	3	3	3	2	1	3	3	-	-	3	2	2	2
		17.4															
		CO111	2	1	3	3	2	3	2	3	3	-	-	3	2	3	2
		17.5															
		CO111	2.	1.	2.	2.	2.	2.	2.	3.	2.	3.0	2.0	2.4	2.0	1.6	1.6
		17	6	6	2	0	6	0	0	0	6						

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**				

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

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.

Course 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:

Units	Lecture Hours
Unit-I: 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.	**9**
Unit-II: 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.	**10**
Unit-III: 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	**8**
Unit-IV: 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.)	**9**
Unit-V: Software configuration management: Object identification in software configuration, Configuring audit-SCM standards, Analysis concepts and principles: Requirement analysis, Software prototyping, Specification Review Analysis modeling, Data modeling, Functional modeling, Behavioral modeling, Software design, Software testing techniques: White box and black box testing, Software testing strategies - Unit testing, Integrating testing, System testing.	**9**

Text Books:

- 1. Software Engineering: A practitioner's approach, 8th Edition, Roger S. Pressman, McGraw Hill

- 2. An integrated approach to Software Engineering, Springer/Narosa Edition, Pankaj Jalote.

Reference Books:

- Fundamentals of Software Engineering, 4th Edition, Rajib Mall, Prentice Hall, India.

Examination Scheme:

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

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

1=weakly mapped

2= moderately mapped

3=strongly mapped

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11117	Software Engineering	CO11117.1	3	2	1	3	2	2	1	-	1	2	2	3	2	1	2
CSE11117	Software Engineering	CO11117.2	3	2	2	1	2	2	2	-	3	-	-	2	2	1	1
CSE11117	Software Engineering	CO11117.3	3	2	1	1	3	3	1	-	2	-	-	3	2	1	3
CSE11117	Software Engineering	CO11117.4	2	3	3	1	3	2	3	2	2	-	-	2	1	2	1
CSE11117	Software Engineering	CO11117.5	2	3	2	3	3	3	2	3	2	-	-	3	1	3	3
CSE11117	Software Engineering	CO11117	2.6	2.4	1.8	1.8	2.6	2.4	1.8	2.5	2.0	2.0	2.0	2.6	1.6	1.6	2.0

CSE11167	Competitive Programming	L	T	P	C
Version 1.0	Contact Hours -45	3	0	0	3

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

Prerequisites/Exposure	**Basics of data structure, algorithm**
Co-requisites	**Programming Concepts**

Course Objectives:

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

Course Outcomes:

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

Implement the basics about arrays and learn how to analyse and design greedy methods.

Identify different data structure techniques methods to solve computing problems

Choose divide and conquer, dynamic programming methods to solve real life problems

Understand the approach for solving problems using graphs.

Implement different number theory and combinatorics related problems.

Course Description:

The focus of the course is the development and implementation of advanced algorithms, as well as the skills required for programming competitions. The students will learn to select appropriate algorithms for a given problem, integrate multiple algorithms for solving a complex problem, design new algorithms, and implement them. They will also learn skills required for participation in programming contests, which include evaluation of problem difficulty, solving problems in teams, and work under time pressure.

Course Content:

Units	Lecture Hours
Module-I: [] Basics Of Array, String, Greedy and Bit Manipulation: Single and Multidimensional Arrays, Representation of Arrays - Row Major Order, and Column Major Order, Application of arrays – searching and sorting, Declaration of a String, Initialization of a String, Various String Handling Functions with example, greedy algorithms, Bit operators	**8**
Module-II: [] Basic Data Structures and Algorithms: Linked Lists: Implementation and basic operations. Stacks and Queues: Concepts and applications. Trees. Hashing and Hash tables: Introduction and applications. Bubble Sort, Selection Sort, Insertion Sort. Merge Sort, Quick Sort, Counting Sort. Binary Search, Ternary Search.	**11**
Module-III: [] Dynamic Programming and Divide and Conquer: Introduction to Dynamic Programming (DP). Memoization and tabulation techniques. Problems involving DP (e.g., Fibonacci sequence, knapsack problem). Introduction to Divide and Conquer. Problems involving the Divide and Conquer approach.	**11**
Module-IV: [] Graph Algorithms: Graph Representation (Adjacency Matrix, Adjacency List). Depth-First Search (DFS) and Breadth-First Search (BFS). Shortest Path Algorithms (Dijkstra's, Bellman-Ford, Floyd-Warshall). Minimum Spanning Tree (Prim's and Kruskal's algorithms).	**9**
Module-V: [] Number Theory and Combinatorics: Prime numbers and primality testing. Sieve of Eratosthenes. Modular arithmetic and its applications. Permutations and Combinations. Heaps and Priority Queues. Disjoint Set Union (Union-Find) Data Structure. Segment Trees and Fenwick Trees (Binary Indexed Trees).	**6**

Text Books:

- Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, Introduction to Algorithms, first or second edition, McGraw Hill.
- "Programming Challenges" by Steven S. Skiena and Miguel A. Revilla:

Reference Books:

- "Competitive Programming" by Steven Halim and Felix Halim

Examination Scheme:

Components	Internal Assessment	Mid Semester Examination	End Semester Examination
Weightage (%)	30	20	50

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

1=weakly mapped

2= moderately mapped

3=strongly mapped

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE11167	Competitive Programming	CO11167.1	3	2	2	2	2	3	2	-	1	-	-	2	2	3	1
CSE11167	Competitive Programming	CO11167.2	3	3	3	3	3	2	2	-	3	-	-	1	3	3	3
CSE11167	Competitive Programming	CO11167.3	3	2	3	2	2	2	3	-	2	-	-	1	3	3	1
CSE11167	Competitive Programming	CO11167.4	2	2	3	3	2	1	2	-	3	-	-	1	3	2	1
CSE11167	Competitive Programming	CO11167.5	2	2	2	3	3	2	3	-	3	-	-	1	3	2	2
CSE11167	Competitive Programming	CO11167	2.6	2.2	2.6	2.6	2.4	2.0	2.4	-	2.4	-	-	1.2	2.8	2.6	1.6

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 pythonTo apply numerical computations using numpy
- To apply scientific computations using scipyTo 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 pythonCO5 : 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, studyingproteinstructures 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 logicbehind the data analysis. So we need a programming language which can cater to all these diverse needs of datascience. Python shines bright as one such language as it has numerous libraries and built in features which makesit easy to tackle the needs of Data science. In this course we will cover these the various techniques used in datascience using the Python programming language.

Course Content:

Units	Lecture Hours
Unit-I: Introduction to Python :Datatypes, expressions, statements, conditions, loops, classes, objects, functions, datastructures, I/O, packages.	**9**

Units	Lecture Hours
Unit-II: Data Handling with Pandas: DataFrames, Series, loading and saving, alignment, missing data, reshaping, pivoting,slicing, indexing, subsetting, insertion/deletion, merge and join, time series.	**9**
Unit-III: Numerical computation: ndarrays, datatypes, mathematical and logical operations, linear algebra, fourier transforms,random, searching, sorting, import and export data.	**9**
Unit-IV: 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	**9**
Unit-V: Data visualization: Chart properties, styling, box plots, heatmaps, scatterplots, bubble charts, 3d charts, time series,geographical data, graph data.	**9**

Text Books:

- Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython - Wes McKinney
- Machine Learning with Python Cookbook: Practical Solutions from Preprocessing to Deep Learning
- Chris Albon-

Reference Books:

- Introduction to Machine Learning with Python: A Guide for Data Scientists by Andreas C.
- Müller, Sarah Guido-
- Learning Python: Powerful Object-Oriented Programming, Mark Lutz-

Modes of Evaluation:

Quiz/Assignment/Presentation/Extempore/ Written

ExaminationExamination Scheme:

1 = Weakly Mapped

2 = Moderately Mapped3 = Strongly Mapped

CSE11119	Optimization and Game Theory	L	T	P	C
Version 1.0	Contact Hours 45	3	0	0	3
Pre-requisite/Exposure	---				
Co-requisite	NIL				

Course Objectives:

- Formulate an equilibrium-finding problem of certain games as a CP/VI or an MPEC
- Rigorously analyze the existence and uniqueness of solutions to CPs, VIs and MPECs, and hence able toprove the existence and uniqueness of Nash equilibrium to certain games
- Understand and utilize various algorithms to solve CPs, VIs and MPECs
- Understand the basic formulation and theories of optimization under uncertainty
- Understand the basic concepts of games with uncertainty

Course Outcomes:

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

Course Description:

This course will serve as an advanced graduate-level course to provide students both solid theoretical foundations ofoptimization 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:

Units	Lecture Hours
Unit-I: 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 theoremsConvex 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	**10**
Unit-II: 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 -	**10**
Unit-III: Nonlinear complementarity problems and variational inequalities - Problem definitions and application areasSolution analysis Algorithms for CPsAlgorithms for VIs	**15**
Unit-IV: Mathematical problems with equilibrium constraints xtensive-form games and Stackelberg games PECs : Formulation, Solution existence, constraint qualifications, and optimality conditions, Algorithms for MPECs	**10**
Unit-V: Decision-making under uncertainty and competition ecision theory under uncertainty ptimization under uncertainty - Formulation, solution concepts and analysis , Sample average approximation ame theory under uncertainty - Information and equilibrium concepts, Algorithms	**5**

Examination Scheme:

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

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

1 = Weakly Mapped

2 = Moderately Mapped3 = Strongly Mapped

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE11	Optimiza	CO111	3	2	2	2	1	3	1	-	1	-	-	3	2	1	3
119	tion and	19.1															
	Game Theory	CO111 19.2	2	3	3	3	2	2	2	-	3	-	-	1	3	3	2
		CO111	2	2	2	2	1	2	1	-	3	-	-	2	2	1	2
		19.3															
		CO111	2	3	3	2	2	3	1	-	1	-	-	3	2	2	3
		19.4															
		CO111	3	3	3	3	1	3	3	-	2	-	-	2	2	2	1
		19.5															
		CO111	2.	2.	2.	2.	1.	2.	1.	-	2.	-	-	2.2	2.2	1.8	2.2
		19	4	6	6	4	4	6	6		0						

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 provenanceCO2: Understand data organization, management, preservation, and reuse

Knowledge of what statistical analysis techniques to choose, given particular demands of inference andavailable 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:

Units	**Lecture Hours**
Unit-I: Definition of Data Science, Essential Concepts of Data, Data Problems and Solutions	**5**
Unit-II: Data Modelling and Relationship, Data Structure and Variables.	

Units	Lecture Hours
Unit-III: Descriptive Statistics, Sampling Distributions, Big Data and Statistics	
Unit-IV: Linear Regression, Cluster Analysis, Similarity Metrics, Dimensionality Reduction	
Unit-V: Text Analysis(Unstructured Data), Relevant Issues in Data Science	

Text Books:

- Jeffrey M. Stanton (2013). Introduction to Data Science.
- 10 Lecture Hours
- 10 Lecture Hours
- 10 Lecture Hours
- 10 Lecture Hours

Examination Scheme:

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

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

1 = Weakly Mapped

2 = Moderately Mapped3 = Strongly Mapped

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE11	Introduc	CO111	3	3	2	3	2	2	2	-	3	-	-	2	2	1	1
120	tion to	20.1															
	Data Science	CO111 20.2	3	2	2	2	2	2	2	-	3	-	-	1	3	3	3
		CO111	2	3	2	3	2	1	3	-	3	-	-	1	3	3	3

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
		20.3															
		CO111	2	2	3	3	2	2	1	-	3	-	-	2	2	2	2
		20.4															
		CO111	3	3	2	3	2	2	1	-	3	-	-	1	1	2	3
		20.5															
		CO111	2.	2.	2.	2.	2.	1.	1.	-	3.	-	-	1.4	2.2	2.2	2.4
		20	6	6	2	8	0	8	8		0						

CSE11121	**Distributed Systems and Cloud**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Knowledge of programming, computer systems architectures, networks and operation systems**				
Co-requisite	**NIL**				

Course Objectives:

- To explain the evolving computer model called cloud computing.
- To introduce the various levels of services that can be achieved by cloud.
- To describe the security aspects in cloud.
- Apply distributed computational model and understand the need for cloud computing.

Course Outcomes:

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

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 andstorage levels.

CO3: Explain distributed computation model on large datasets using parallel and distributed programmingapproaches 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 differen t directions in whichit is useful and applicable. The outcome of the course implicitly and explicitly affects the abilities of students to have agood 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:

Units	Lecture Hours
Unit-I: 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.	**09**
Unit-II: Virtual Machines and Virtualization of Cluster and Data Centres: Levels of Virtualization, Virtualizationstructures/Tools and Mechanism, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resources Management, Virtualization Data-Centre Automation.	**09**
Unit-III: Service Oriented Architecture for Distributed Computing: Services & SOA, Message Oriented Middleware,Workflow in SOA. Cloud Programming & Software Environments: Features of Cloud & Grid, Parallel & Distributed	**09**

Units	Lecture Hours
programmingparadigms, Programming support of Google Cloud, Amazon AWS & Azure. Case Studies: OpenStack & Aneka.	
Unit-IV: Cloud Security, Data Security in the Cloud: An Introduction to the Idea of Data Security, The Current State ofData Security in the Cloud CryptDb: Onion Encryption layers- DET, RND, OPE, JOIN, SEARCH, HOM, and Homomorphism Encryption, FPE.	**09**
Unit-V: 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.	**09**

Examination Scheme:

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

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

1 = Weakly Mapped

2 = Moderately Mapped3 = Strongly Mapped

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE11	Distribu	CO1112	2	3	3	3	2	1	1	-	1	-	-	3	2	3	3
121	ted	1.1															
	Systems	CO1112	3	2	2	3	2	1	1	-	1	-	-	2	3	2	2
	and	1.2															

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
	Cloud	CO1112	3	1	3	1	2	1	2	-	3	-	3	1	2	3	1
		1.3															
		CO1112	1	2	1	3	3	3	1	-	3	-	-	2	2	1	2
		1.4															
		CO1112	3	2	2	3	3	3	2	-	2	-	2	3	2	1	1
		1.5															
		CO1112	2.	2.	2.	2.	2.	1.	1.	-	2.	-	2.5	2.2	2.2	2.0	1.8
		1	4	0	2	6	4	8	4		0						

CSE11122	Introduction to Cyber Security	L	T	P	C
Version 1.0	Contact Hours 45	3	0	0	3
Pre-requisite/Exposure	Computer Network				
Co-requisite	NIL				

Course Objectives:

- To understand basics of Cyber Security.
- To be able to secure a message over insecure channel by various means.
- To learn about how to maintain the Confidentiality, Integrity and Availability of a data.
- To understand various protocols for cyber security to protect against the threats in the cyber space.

Course Outcomes:

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

Course Description:

Effective network communication is an integral part of technical life. Cyber Security and Cryptography is a process ofsecuring 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 differenttypes 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 securitywe will cover more advanced security tasks such as zero- day vulnerability, privacy mechanisms, and other forms of defence against hackers.

Course Content:

Units	**Lecture Hours**
Unit-I: 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	**09**
Unit-II	**09**
Unit-09: 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	**09**
Unit-III: Prevention tips: Design a strong password, Two-step verification, Question validity of web-sites, related case studies Mobile protection: related case studies	**09**
Unit-IV: Social network security: Security measures like not revealing location, keeping birth-date hidden, having private profile, not linkingaccounts, related	**09**

Units	Lecture Hours
case study Prevention software: Firewalls, Virtual private network, Anti-virus & anti-spyware, Routine updates, related case study	
Unit-V: 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	**09**

Examination Scheme:

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

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

1 = Weakly Mapped

2 = Moderately Mapped3 = Strongly Mapped

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE11	Introduc	CO111	2	2	2	2	3	1	2	-	2	-	-	3	3	1	1
122	tion to	22.1															
	Cyber Security	CO111 22.2	1	3	3	1	3	3	3	-	3	-	-	1	3	1	1
		CO111	3	3	3	3	3	3	2	-	3	-	-	2	3	1	1
		22.3															
		CO111	3	3	2	2	1	3	3	-	1	-	-	3	2	1	1
		22.4															

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
		CO111	2	1	1	2	3	3	1	-	3	-	-	2	1	1	3
		22.5															
		CO111	2.	2.	2.	2.	2.	2.	2.	-	2.	-	-	2.2	2.4	1.0	1.4
		22	2	4	2	0	6	6	2		4						

CSE11123	**Full Stack Software Development**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure					
Co-requisite					

Course Objectives:

- To enhance software development capability of students
- To familiarize students with modern software development technologies
- To introduce all components of software development cycles

Course Outcomes:

CO1: Understand the concepts of full stack development CO2 : Explain the uses of front end libraries and frameworksCO3 : Understand principles of backend development CO4 : Explore database management solutions

CO5: Compare several popular stacks

Course Content:

Units	**Lecture Hours**
Unit-I: Component of full stack development Software Requirement specification, Interface Design, Database Design, Logic Design AGILE software development	**9**
Unit-II: Fron t -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	**9**
Unit-III: Backend Development : Overview of backend development frameworks : PHP, C++, Java, Python, JavaScript, Node.js, Django, Rails, Laravel Efficient data handling, API requests, Data security	**9**
Unit-IV: Databas Management : e Overview of database management frameworks: Oracle, MongoDB, MariaDB, SQL Overview of distributed database management: Hadoop Database connectivity protocols.	**9**
Unit-V: Popula Stacks: r MEAN Stack: MongoDB, Express, AngularJS and Node.js. MERN Stack: MongoDB, Express, ReactJS and Node.js Django Stack: Django, python and MySQL as Database. Rails or Ruby on Rails: Uses Ruby, PHP and MySQL. LAMP Stack: Linux, Apache, MySQL and PHP. Python Stack: Pandas, Numpy, Matplotlib, Tkinter.	**9**

Examination Scheme:

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

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

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

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE11 123	Full Stack Software Develop ment	CO111 23.1	3	3	3	2	3	2	2	-	3	-	3	2	2	1	1
CSE11 123	Full Stack Software Develop ment	CO111 23.2	1	3	2	2	3	3	3	-	2	-	2	1	2	1	2
CSE11 123	Full Stack Software Develop ment	CO111 23.3	1	3	3	2	3	3	2	-	1	-	2	1	1	2	3

		CO111 23.4	**1**	**2**	**2**	**3**	**2**	**2**	**2**	**-**	**2**	**-**	**3**	**1**	**3**	**2**	**2**
		CO111 23.5	2	3	3	2	2	2	1	-	3	-	2	2	1	2	3
		CO111 23	1. 6	2. 8	2. 6	2. 2	2. 6	2. 4	2. 0	-	2. 2	-	2.4	1.4	1.8	1.6	2.2

CSE11124	**Pattern Recognition and Soft Computing**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**---**				
Co-requisite	**---**				

Course Objectives:

- To familiarize concepts of pattern recognition systems
- To introduction fuzzy logic and soft computing princples

Course Outcomes:

CO1: Discuss components of a pattern recognition system

CO2: Explore dimensionality reduction and classification techniquesCO3 : Validate clustering techniques

CO4: Explain concepts of representation learning

CO5: Compare Hard and Soft computing methodologies

Course Description:

Pattern recognition is the automated recognition of patterns and regularities in data. It has applications in statisticaldata analysis, signal processing, image analysis, information retrieval, bioinformatics, data compression, computergraphics and machine learning. Pattern recognition has its origins in statistics and engineering; some modern approaches to pattern recognition include the use of machine learning, due to the increased availability of big data and a new abundance of processing power. Soft computing is a set of algorithms,[1] including neural networks, fuzzy logic, and genetic algorithms.[2] These algorithms are tolerant of imprecision, uncertainty, partial truth and approximation. It is contrasted with hard computing: algorithms which find provably correct and optimal solutionsto problems.

Course Content:

Units	Lecture Hours
Unit-I: Introduction Components of a pattern recognition system, feature selection vs feature extraction, types of learning techniques, descriptive statistics,	**9**
Unit-II: Dimensionalit y reduction PCA, SVD, LDA, Classification Techniques K-NN, Decision Trees, Naïve Bayes.	**9**
Unit-III: Clustering: Similarity and Dissimilarity Measures, Clustering Techniques: K-Means, Hierarchical Clustering, Cluster ValidityIndices: Dunn and DB Index	**9**
Unit-IV: Representation Learning with Networks : Perceptron, MLP, Backpropagation, Autoencoders, Variational Neural Autoencoders	**9**

Units	Lecture Hours
Unit-V: Soft Computing Principles : Hard Logic vs Logic, Membership Functions, Fuzzy Clustering: FCN, EM Fuzzy Algorithms	**9**

Examination Scheme:

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

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

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

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE11	Pattern	CO1112	2	3	3	2	2	2	3	-	3	-	-	2	2	1	3
124	Recogni	4.1															
	tion and	CO1112	1	3	2	3	3	2	3	-	3	-	-	2	3	1	3
	Soft	4.2															
	Computi ng	CO1112 4.3	1	2	3	2	3	2	3	-	1	-	-	2	1	1	3
		CO1112	3	2	2	2	3	2	3	-	2	-	-	1	1	1	2
		4.4															
		CO1112	2	2	2	3	3	2	3	-	1	-	-	1	3	3	1
		4.5															
		CO1112	1.	2.	2.	2.	2.	2.	3.	-	2.	-	-	1.6	2.0	1.4	2.4

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
		4	8	4	4	4	8	0	0		0						

CSE11125	**Data Mining and Warehousing**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**DBMS**				
Co-requisite	**NIL**				

Course Objectives:

- Introduce data mining principles and techniques.
- Introduce data mining as a cutting edge business intelligence tool.
- Develop and apply critical thinking, problem solving and decision making skills.
- Introduce the concepts of Data Warehousing, difference between database and data warehousing
- Describe and demonstrate basic data mining algorithms, methods, tools.
- Describe ETL Model and the Star Schema to design a Data Warehouse.

Course Outcomes:

On the completion of this course the student will be able to CO1: Design a data mart or data warehouse for any

organizationCO2: Develop skills to write queries using DMQL

CO3: Extract knowledge using data mining techniquesCO4: 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 benefitfrom 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 courseintroduces 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:

Units	Lecture Hours
Unit-I: 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, Integrationof 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 DataDiscretization, Data Cleaning and Data Integration.	**09**
Unit-II: 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.	**09**
Unit-III: 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.	**09**
Unit-IV: 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 NeuralNetworks, Support Vector Machines, Pattern-Based	**12**

Units	Lecture Hours
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: Term Paper on Data Mining: Pictorial Data Mining, Text Mining, Social Media Mining, Web Mining, And Audio And Video Mining	**06**

Examination Scheme:

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

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

1 = Weakly Mapped

2 = Moderately Mapped3 = Strongly Mapped

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE11	Data	CO111	2	3	2	2	2	2	3	-	2	-	-	1	1	1	1
125	Mining	25.1															

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
	and	CO111	3	3	1	3	1	3	1	-	3	-	-	3	1	2	2
	Warehou	25.2															
	sing	CO111	3	2	2	1	2	3	2	-	2	-	-	3	3	2	3
		25.3															
		CO111	2	2	2	3	1	1	1	-	3	-	-	2	1	2	3
		25.4															
		CO111	3	2	3	2	2	1	1	-	3	-	-	3	1	3	1
		25.5															
		CO111	2.	2.	2.	2.	1.	2.	1.	-	2.	-	-	2.4	1.4	2.0	2.0
		25	6	4	0	2	6	0	6		6						

CSE11126	**Cloud Security**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Fundamentals of Cloud Computing and Cryptography**				
Co-requisite	**NIL**				

Course Objectives:

- To understand core cloud computing concepts and fundamental principles, including standard delivery modelsand service designs
- To understand the foundational security practices that are required to secure modern cloud computinginfrastructures.
- To enable the students to analyse the differences between traditional data security practices and cloud-baseddata security methodologies.
- To allow students to identity and access management practices of both cloud providers and consumers

- To allow the student how to protect data-at-rest, data-in-transit, and data-in-use within a cloud environment.

Course Outcomes:

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

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:

Units	**Lecture Hours**
Unit-I: Cloud Computing Fundamentals: Introduction to Cloud Computing, The Evolution of Cloud Computing, Essential Characteristics of Cloud, Benefitsand 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.	**09**
Unit-II: Cloud Computing deployment and Service Security Needs: Cloud Information Securities Objectives: Confidentiality, Integrity, and Availability;	**09**

Units	Lecture Hours
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: 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.	**09**
Unit-IV: 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 ProviderIAM Practice and Responsibilities, Customers IAM Responsibilities.	**09**
Unit-V	**09**

Examination Scheme:

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

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

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CSE111	Cloud	CO1112	2	2	3	1	3	2	2	-	2	-	-	2	2	2	1
26	Secur	6.1															
	ity	CO1112	1	2	2	3	3	3	3	-	2	-	-	2	3	3	2
		6.2															
		CO1112	3	3	2	2	1	3	2	-	2	-	-	2	3	3	3
		6.3															
		CO1112	3	1	2	2	2	3	1	-	1	-	-	1	1	2	3
		6.4															
		CO1112	1	3	2	1	2	3	3	-	2	-	-	2	3	3	1
		6.5															
		CO1112	2.	2.	2.	1.	2.	2.	2.	-	1.	-	-	1.8	2.4	2.6	2.0
		6	0	2	2	8	2	8	2		8						

CSE11127	Cyber Law and Governance	L	T	P	C
Version 1.0	Contact Hours 45	3	0	0	3
Pre-requisite/Exposure	Computer Network, Engineering Mathematics				
Co-requisite	NIL				

Course Objectives:

- To understand the different types of cybercrimes and cyber laws in India and abroad
- To impart sufficient knowledge on the fundamental legal issues in internet archiving.
- To provide the exposure to different forms of Cyber crimes and the Indian and International laws tocombat Cyber crimes and facilitate e-commerce.

Course Outcomes:

On the completion of this course the student will be able toCO1: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 usedin 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:

Units	**Lecture Hours**
Unit-I: 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.	**08**
Unit-II: 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	**10**

Units	Lecture Hours
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: 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 ofIndian Penal Code, Relevant Sections of Reserve Bank of India Act, Law Relating To Employees And Internet, Alternative Dispute Resolution , Online Dispute Resolution (ODR).	**08**
Unit-IV: 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.	**09**
Unit-V: 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.	**10**

Examination Scheme:

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

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

1 = Weakly Mapped

2 = Moderately Mapped3 = Strongly Mapped

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE11	Cyber	CO1112	2	2	3	2	3	2	3	-	1	-	-	1	1	3	3
127	Law and	7.1															
	Governa nce	CO1112 7.2	3	3	1	1	2	1	3	-	2	-	-	2	3	3	1
		CO1112	1	3	2	2	1	2	1	-	2	-	3	3	1	3	2
		7.3															
		CO1112	3	3	1	3	3	3	2	-	1	-	-	1	1	1	1
		7.4															
		CO1112	3	2	2	2	3	3	1	-	1	-	-	2	1	2	2
		7.5															
		CO1112	2.	2.	1.	2.	2.	2.	2.	-	1.	-	3.0	1.8	1.4	2.4	1.8
		7	4	6	8	0	4	2	0		4						

CSE12128	**Computer Networks lab**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours 30**	**0**	**0**	**2**	**1**
Pre-requisite/Exposure	**Fundamental of Computer and LAN**				
Co-requisite	**NIL**				

Course Objectives:

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

Course Outcomes:

On the completion of this course the student will be able to 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 portCO5: 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 applyappropriate 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:

Units	Lecture Hours
Suggested assignments to be framed based on the following Programming Language such as Network topology, PacketTracer, 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-definedports 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 andsends back (Case Server). Experiment 11: Program for Connection-Oriented Iterative service in which server calculates the Net-salary of an Employee based	

Units	**Lecture Hours**
onthe following details sent by the Experiment 12: Program for Remote Command Execution using sockets	

Examination Scheme:

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

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

1 = Weakly Mapped

2 = Moderately Mapped3 = Strongly Mapped

Course Code	**Course Name**	**COs**	**P O1**	**P O2**	**P O3**	**P O4**	**P O5**	**P O6**	**P O7**	**P O8**	**P O9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
28	**ter Netwo rks lab**	**CO1212 8.1**	**3**	**1**	**3**	**3**	**3**	**3**	**2**	**-**	**2**	**3**	**-**	**1**	**1**	**2**	**2**
28	ter Netwo rks lab	CO1212 8.2	2	2	1	3	1	2	2	-	3	3	-	3	3	3	1
28	ter Netwo rks lab	CO1212 8.3	1	1	1	3	2	2	1	-	2	2	-	3	1	2	2
28	ter Netwo rks lab	CO1212 8.4	2	2	3	3	2	3	1	3	3	-	-	2	2	1	3
28	ter Netwo rks lab	CO1212 8.5	1	1	3	2	3	3	1	2	3	-	-	3	3	2	2

28	**ter Netwo rks lab**	**CO1212 8.1**	**3**	**1**	**3**	**3**	**3**	**3**	**2**	**-**	**2**	**3**	**-**	**1**	**1**	**2**	**2**
28	ter Netwo rks lab	CO1212 8	1. 8	1. 4	2. 2	2. 8	2. 2	2. 6	1. 4	2. 5	2. 6	2.6 7	-	2.4	2.0	2.0	2.0

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 willinclude 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, performanceimprovement 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 nalyze the synchronization techniques

Course Description:

The architecture of computer systems and associated software. Topics include addressing modes, interrupt systems, input/output systems, external memory systems, assemblers, loaders, multiprogramming, performance evaluation, and data security.

This task is challenging for several reasons. First, there is a tremendous variety of products that can rightly claim the name of computer, from single-chip microprocessors costing a few dollars to supercomputers costing tens of millions of dollars. Variety is exhibited not only in cost, but also in size, performance, and application. Second, the rapid pace ofchange that has always characterized computer technology continues with no letup. These changes cover all aspects ofcomputer technology, from the underlying integrated circuit technology used to construct computer components, to theincreasing 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 intentof 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 theperformance and utilization of all elements.

Course Content:

Units	**Lecture Hours**
Write the working of 8085 simulator GNUsim8085 and basic architecture of 8085 along with small introduction. Study the complete instruction set of 8085 and write the instructions in the instruction set of 8085 along withexamples. Write an assembly language code in GNUsim8085 to implement data transfer instruction. Write an assembly language code in GNUsim8085 to store numbers in reverse order in memory location. Write an assembly language code in GNUsim8085 to implement arithmetic instruction. Write an assembly language code in GNUsim8085 to add two numbers using lxi instruction. Write an assembly language code in GNUsim8085 to add two 8 bit numbers stored in memory and also storing thecarry. Write an assembly language code in GNUsim8085 to find the factorial of a number. Write an assembly language code in GNUsim8085 to implement logical instructions. Write an assembly language code in GNUsim8085 to implement stack and branch instructions	

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

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE12	Compute	CO1212	3	2	3	3	2	1	2	-	3	-	-	1	2	3	2
129	r	9.1															
	Organiza	CO1212	2	2	2	2	1	3	1	-	2	-	-	3	1	3	1
	tion and	9.2															
	Architect ure Lab	CO1212 9.3	3	3	3	2	1	2	3	-	1	-	-	2	1	1	2
		CO1212	2	2	3	2	3	1	2	-	3	-	-	1	1	3	2
		9.4															
		CO1212	3	2	3	3	3	1	2	-	3	-	-	1	3	3	2
		9.5															
		CO1212	2.	2.	2.	2.	2.	1.	2.	-	2.	-	-	1.6	1.6	2.6	1.8
		9	6	2	8	4	0	6	0		4						

		L	T	P	C
CSE12168	**Software Enginering Lab**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours 30**	**0**	**0**	**2**	**1**
Co-requisite/Exposure	**A Course on “Software Engineering”**				
Co-requisite	**NIL**				

Course Objectives:

- To have hands on experience in developing a software project by using various software engineering principles and methods in each of the phases of software development.
- g.

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

Course Outcomes:

Ability to translate end-user requirements into system and software requirements

Ability to generate a high-level design of the system from the software requirements

Will have experience and/or awareness of testing problems and will be able to develop a simple testing report

After completing this course the student will be able to:

CO1: To understand the software engineering methodologies involved in the phases for project development.

CO2: To gain knowledge about open source tools used for implementing software engineering methods.

CO3: To exercise developing product-start-ups implementing software engineering methods.

CO4: Able to study the problem and identify the project scope, Objectives and Infrastructure.

CO5: Able to identify the modules of the project and differentiate the functional and nonfunctional requirements.

CO6: Able to create prototypes for the projects. List of Experiments

Do the following 8 exercises for any four projects given in the list of sample projects or any other projects:

Development of problem statement.

Preparation of Software Requirement Specification Document, Design Documents and Testing Phase related documents.

Preparation of Software Configuration Management and Risk Management related documents.

Study and usage of any Design phase CASE tool

Performing the Design by using any Design phase CASE tools.

Develop test cases for unit testing and integration testing

Develop test cases for various white box and black box testing techniques. Sample Projects:

Passport automation System

Book Bank
Online Exam Registration
Stock Maintenance System
Online course reservation system
E-ticketing
Software Personnel Management System
Credit Card Processing
E-book management System.
Recruitment system
On completion of this course, the students will be able to
Implement the basics about arrays and learn how to analyse and design greedy methods.
Identify different data structure techniques methods to solve computing problems
Choose divide and conquer, dynamic programming methods to solve real life problems
Understand the approach for solving problems using graphs.
Implement different number theory and combinatorics related problems.

Course Description:

The focus of the course is the development and implementation of advanced algorithms, as well as the skills required for programming competitions. The students will learn to select appropriate algorithms for a given problem, integrate multiple algorithms for solving a complex problem, design new algorithms, and implement them. They will also learn skills required for participation in programming contests, which include evaluation of problem difficulty, solving problems in teams, and work under time pressure.

Course Content:

Units	Lecture Hours
List of Programs: There is one meeting room in a firm. There are N meetings in the form of (start[i], end[i]) where start[i] is start time of meeting i and end[i] is finish time of meeting i. What is the maximum number of meetings that can be accommodated in the meeting room when only one meeting can be held in the meeting room at a particular time? Note: Start time of one chosen meeting can't be equal to the end time of the other chosen meeting. Given a number N, calculate the prime numbers up to N using Sieve of Eratosthenes. Given an	

Units	Lecture Hours
aarray A[] of N positive integers which can contain integers from 1 to P where elements can be repeated or can be absent from the array. Your task is to count the frequency of all elements from 1 to N. Note: The elements greater than N in the array can be ignored for counting and do modify the array in-place. Given an array arr of integers of size N and an integer K, the task is to find the length of the longest subarray with at most K even elements Input: The first line of the input contains a single integer T denoting the number of test cases. The description of T test cases follows. The first line of each test case contains two space-separated integers N and K. The second line contains N space-separated positive integers represents array arr. Output: For each test case, print the length of the longest subarray with at most K even elements. Constraints: 1. 1 <= T <= 10 2. 1 <= K <= N <= 100000 0 <= arr[i] <= 100000 Given a number N, find the least prime factors for all numbers from 1 to N. The least prime factor of an integer X is the smallest prime number that divides it. Note : Input: 1 needs to be printed for 1. You need to return an array/vector/list of size N+1 and need to use 1-based indexing to store the answer for each number. Given two numbers A and B. The task is to find out their LCM and GCD. Given two integers ‘a’ and ‘m’. The task is to find the smallest modular multiplicative inverse of ‘a’ under modulo ‘m’. There are N students in a class. Each student got arr[i] (1 <= i <= N) marks in mathematics exam. Geek loves mathematics, so, he wanted to solve the questions. But to his surprise, he got different marks every time he solved. There are Q queries, each query represents a number X. For each query, your task is to find the sum of the marks of students who got marks greater than X. The first line of the input contains a single integer T denoting the number of test cases. The description of T test cases follows. The first line of each test case contains a single integer represents N Next line contains N space-separated integers The next line contains a single integer represents Q. Next, Q lines contain a single integer X. Output: For each query, print the sum of the marks of students who got marks greater than X. Constraints: 1. 1 <= T <= 5 <= N, Q <= 100000 <= arr[i], X <= 10^9 Given a weighted, undirected and connected graph of V vertices and an adjacency list adj where adj[i] is a list of lists containing two integers where the first integer of each list j denotes there is edge between i and j , second integers corresponds to the weight of that edge . You are given the source vertex S and You to Find the shortest distance of all the vertex's from the source vertex S. You have to return a list of integers denoting shortest	

Units	Lecture Hours
distance between each node and Source vertex S. Note: The Graph doesn't contain any negative weight cycle. Given a weighted directed graph with n nodes and m edges. Nodes are labeled from 0 to n-1, the task is to check if it contains a negative weight cycle or not. Note: edges[i] is defined as u, v and weight. Given four integers A, B, C, D. A represents the initial position of the geek on the x-axis. In each step, geek can go to X+B or X-B if he is standing at X. The tasks is to check if it is possible for the geek to reach C exactly after D steps. If it is possible to reach C in exactly D steps, then print all distinct possible paths in lexicographical order. Otherwise, print -1 Input: The first line of the input contains a single integer T denoting the number of test cases. The description of T test cases follows. The first line of each test case contains four space-separated integers A, B, C, and D. Output: For each test case, print all distinct possible paths in lexicographical order if it is possible to reach C. Otherwise, print -1. Constraints: 1. 1 <= T <= 5 2. -10^9 <= A, C <= 10^9 <= B <= 10^9 <= D <= 12 Geek created a random series and given a name geek-onacci series. Given four integers A, B, C, N. A, B, C represents the first three numbers of geek-onacci series. Find the Nth number of the series. The nth number of geek-onacci series is a sum of the last three numbers (summation of N-1th, N-2th, and N-3th geek-onacci numbers) Note: The answer can be very large. So, output answer modulo 109 + 7. Input: The first line of the input contains a single integer T denoting the number of test cases. The description of T test cases follows. The first line of each test case contains four space-separated integers A, B, C, and N. Output: For each test case, print Nth geek-onacci number Constraints: <= T <= 102 <= A, B, C <= 105 4 <= N <= 104 Given a string of characters, find the length of the longest proper prefix which is also a proper suffix. NOTE: Prefix and suffix can be overlapping but they should not be equal to the entire string. Given an array arr[], its starting position l and its ending position r. Sort the array using merge sort algorithm.	

Text Books:

- 1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, Mc Graw Hill International Edition.
- Software Engineering- Sommerville, 7th edition, Pearson Education.
- The unified modeling language user guide Grady Booch, James Rambaugh, Ivar Jacobson, Pearson Education.

- Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, Introduction to Algorithms, first or second edition, McGraw Hill.
- "Programming Challenges" by Steven S. Skiena and Miguel A. Revilla:

Reference Books:

- "Competitive Programming" by Steven Halim and Felix Halim

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

1=weakly mapped

2= moderately mapped

3=strongly mapped

SEMESTER VI

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE12	Competiti	CO1216	2	3	2	1	2	3	1	-	2	-	-	2	3	3	2
169	ve	9.1															
	Program ming Lab	CO1216 9.2	2	2	3	2	3	2	1	-	3	-	-	2	3	2	3
		CO1216	2	1	3	3	3	2	3	-	2	-	-	1	1	1	3
		9.3															
		CO1216	3	1	1	2	2	3	2	-	3	-	-	2	2	2	1
		9.4															
		CO1216	3	2	1	2	2	3	2	-	2	-	-	1	3	1	1
		9.5															
		CO1216	2.	1.	2.	2.	2.	2.	1.	-	2.	-	-	1.6	2.4	1.8	2.0
		9	4	8	0	0	4	6	8		4						

CSE12169	Competitive Programming Lab	L	T	P	C

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

Version 1.0	**Contact Hours -45**	**0**	**0**	**3**	**2**
Prerequisites/Exposure	**Basics of data structure, algorithm**				
Co-requisites	**Programming Concepts**				

Course Objectives:

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

Course Outcomes:

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

Implement the basics about arrays and learn how to analyse and design greedy methods.

Identify different data structure techniques methods to solve computing problems

Choose divide and conquer, dynamic programming methods to solve real life problems

Understand the approach for solving problems using graphs.

Implement different number theory and combinatorics related problems.

Course Description:

The focus of the course is the development and implementation of advanced algorithms, as well as the skills required for programming competitions. The students will learn to select appropriate algorithms for a given problem, integrate multiple algorithms for solving a complex problem, design new algorithms, and implement them. They will also learn skills required for participation in programming contests, which include evaluation of problem difficulty, solving problems in teams, and work under time pressure.

Course Content:

Units	Lecture Hours
List of Programs: There is one meeting room in a firm. There are N meetings in the form of (start[i], end[i]) where start[i] is start time of meeting i and end[i] is finish time of meeting i. What is the maximum number of meetings that can be accommodated in the meeting room when only one meeting can be held in the meeting room at a particular time? Note: Start time of one chosen meeting can't be equal to the end time of the other chosen meeting. Given a number N, calculate the prime numbers up to N using Sieve of Eratosthenes. Given an aarray A[] of N positive integers which can contain integers from 1 to P where elements can be repeated or can be absent from the array. Your task is to count the frequency of all elements from 1 to N. Note: The elements greater than N in the array can be ignored for counting and do modify the array in-place. Given an array arr of integers of size N and an integer K, the task is to find the length of the longest subarray with at most K even elements Input: 1. The first line of the input contains a single integer T denoting the number of test cases. The description of T test cases follows. 2. The first line of each test case contains two space-separated integers N and K. 3. The second line contains N space-separated positive integers represents array arr. Output: For each test case, print the length of the longest subarray with at most K even elements. Constraints: 1. 1 <= T <= 10 2. 1 <= K <= N <= 100000 3. 0 <= arr[i] <= 100000 Given a number N, find the least prime factors for all numbers from 1 to N. The least prime factor of an integer X is the smallest prime number that divides it. Note : 1 needs to be printed for 1. You need to return an array/vector/list of size N+1 and need to use 1-based indexing to store the answer for each number. Given two numbers A and B. The task is to find out their LCM and GCD. Given two integers 'a' and 'm'. The task is to find the smallest modular multiplicative inverse of 'a' under modulo 'm'. There are N students in a class. Each student got arr[i] (1 <= i <= N) marks in mathematics exam. Geek loves mathematics, so, he wanted to solve the questions. But to his surprise, he got different marks every time he solved. There are Q queries, each query represents a number X. For each query, your task is to find the sum of the marks of students who got marks greater than X. Input: 1. The first line of the input contains a single integer T denoting the number of test cases. The description of T test cases follows. 2. The first line of each test case contains a single integer represents N 3. Next line contains N space-separated integers 4. The next line contains a single integer represents Q. 5. Next, Q lines contain a single integer X. Output: For each query,	

Units	Lecture Hours
print the sum of the marks of students who got marks greater than X. Constraints: 1. 1 <= T <= 5 2. 1 <= N, Q <= 100000 3. 1 <= arr[i], X <= 10^9 Given a weighted, undirected and connected graph of V vertices and an adjacency list adj where adj[i] is a list of lists containing two integers where the first integer of each list j denotes there is edge between i and j , second integers corresponds to the weight of that edge . You are given the source vertex S and You to Find the shortest distance of all the vertex's from the source vertex S. You have to return a list of integers denoting shortest distance between each node and Source vertex S. Note: The Graph doesn't contain any negative weight cycle. Given a weighted directed graph with n nodes and m edges. Nodes are labeled from 0 to n-1, the task is to check if it contains a negative weight cycle or not. Note: edges[i] is defined as u, v and weight. Given four integers A, B, C, D. A represents the initial position of the geek on the x-axis. In each step, geek can go to X+B or X-B if he is standing at X. The tasks is to check if it is possible for the geek to reach C exactly after D steps. If it is possible to reach C in exactly D steps, then print all distinct possible paths in lexicographical order. Otherwise, print -1 Input: 1. The first line of the input contains a single integer T denoting the number of test cases. The description of T test cases follows. 2. The first line of each test case contains four space-separated integers A, B, C, and D. Output: For each test case, print all distinct possible paths in lexicographical order if it is possible to reach C. Otherwise, print -1. Constraints: 1. 1 <= T <= 5 2. -10^9 <= A, C <= 10^9 3. 1 <= B <= 10^9 4. 1 <= D <= 12 Geek created a random series and given a name geek-onacci series. Given four integers A, B, C, N. A, B, C represents the first three numbers of geek-onacci series. Find the Nth number of the series. The nth number of geek-onacci series is a sum of the last three numbers (summation of N-1th, N-2th, and N-3th geek-onacci numbers) Note: The answer can be very large. So, output answer modulo 109 + 7. Input: 1. The first line of the input contains a single integer T denoting the number of test cases. The description of T test cases follows. 2. The first line of each test case contains four space-separated integers A, B, C, and N. Output: For each test case, print Nth geek-onacci number Constraints: 1. 1 <= T <= 102 2. 1 <= A, B, C <= 105 3. 4 <= N <= 104 Given a string of characters, find the length of the longest proper prefix which is also a proper suffix. NOTE: Prefix and suffix can be overlapping but they	

Units	Lecture Hours
should not be equal to the entire string. Given an array arr[], its starting position l and its ending position r. Sort the array using merge sort algorithm.	

Text Books:

- Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, Introduction to Algorithms, first or second edition, McGraw Hill.
- "Programming Challenges" by Steven S. Skiena and Miguel A. Revilla:

Reference Books:

- "Competitive Programming" by Steven Halim and Felix Halim

Examination Scheme:

Components	Internal Assessment	End Semester Examination
Weightage (%)	50	50

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

1=weakly mapped

2= moderately mapped

3=strongly mapped

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE12169	Competitive Programming Lab	CO12169.1	2	2	3	2	3	2	2	-	2	-	-	2	3	3	2
CSE12169	Competitive Programming Lab	CO12169.2	3	3	2	2	2	2	1	-	1	-	-	2	3	1	3
CSE12169	Competitive Programming Lab	CO12169.3	3	2	1	3	3	2	2	-	1	-	-	1	2	3	3

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE12169	Competitive Programming Lab	CO12169.4	3	3	3	2	2	1	3	-	1	-	-	2	3	2	2
CSE12169	Competitive Programming Lab	CO12169.5	3	1	3	3	3	1	1	-	1	-	-	1	2	3	1
CSE12169	Competitive Programming Lab	CO12169	2.8	2.2	2.4	2.4	2.6	1.6	1.8	-	1.2	-	-	1.6	2.6	2.4	2.2

CEE11029	**Disaster Management**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours - 45**	**3**	**0**	**0**	**3**
Pre-requisites/Exposure					
Co-requisites					

Course Objectives:

- To introduce students about disaster (natural or man-made both), their types, causes, effects onvarious sectorsand some of the practical examples to aware students about it.
- To enhance the student to make them able to understand the risk scale and develop the strategies for Vulnerability.
- To prepare students about preparedness to response immediately and execute the plan for search, rescueoperations, Logistic Management etc.
- To make students handling the post disaster situations, accordingly psychological and medical point of views.
- To get them brief idea that how the area will rehabilitated, the damage are reconstructed andrecover the societyand 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 psychologicaland 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.

Course Description:

Disaster Management is introduce to combat the disaster and tried to minimize the losses by developing suitable plansand 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 basicconcepts of the subject via exercise and discussions with the coordinator.

Course Content:

Units	Lecture Hours
Module-I: 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.	**10**
Unit-II: Risk and Vulnerability Analysis: Risk and Vulnerability Analysis, Risk: Its concept and analysis, Risk Reduction, Vulnerability: Its concept and analysis, Strategic Development for Vulnerability.	**10**
Unit-III: 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	**13**

Units	Lecture Hours
Management(Trauma, Stress, Rumour and Panic), Relief and Recovery, MedicalHealth Response to Different Disasters.	
Unit-IV: Rehabilitation, Reconstruction and Recovery: Reconstruction and Rehabilitation as a Means of Development, DamageAssessment, Post Disaster effects and Remedial Measures. Creation of Long- term Job Opportunities and Livelihood Options, Disaster Resistant House Construction, Sanitationand Hygiene, Education and Awareness, Dealing with Psychology, Long-term Counter Disaster Planning, Role of Educational Institute. Reference Books Dr. Mrinalini Pandey, Disaster Management, Wiley India Pvt. Ltd. Jagbir Singh, Disaster Management : Future Challenges and Opportunities, K W Publishers Pvt. Ltd. Shailesh Shukla, Shamna Hussain, Biodiversity, Environment and Disaster Management, Unique Publications. J. P. Singhal, Disaster Management, Laxmi Publications. C. K. Rajan, Navale Pandharinath, Earth and Atmospheric Disaster Management: Nature andManmade, B SPublication	**12**

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

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CEE11 029	Disaster Manage ment	CO110 29.1	3	3	2	2	2	2	1	-	2	-	-	3	2	1	1
CEE11 029	Disaster Manage ment	CO110 29.2	3	3	2	2	2	3	3	-	1	-	-	3	2	2	1
		CO110 29.3	**3**	**3**	**3**	**2**	**3**	**1**	**2**	**-**	**2**	**-**	**-**	**3**	**1**	**2**	**1**
		CO110 29.4	3	3	2	3	2	3	1	-	3	-	-	3	1	1	1

		CO110 29.3	**3**	**3**	**3**	**2**	**3**	**1**	**2**	**-**	**2**	**-**	**-**	**3**	**1**	**2**	**1**
		CO110 29	3. 0	3. 0	2. 25	2. 25	2. 25	2. 25	1. 75	-	2. 0	-	-	3.0	1.5	1.5	1.0

CSE11131	**Web Technology**	**L**	**T**	**P**	**C**
Version 1.0	**Contact hour -45**	**3**	**0**	**0**	**3**
Pre-requisites/Exposure	**Browser compatibility knowledge /HTML**				
Co-requisites	**--**				

Course Objectives:

- To help the pupils to develop an understanding of client /server model.
- To enable students a precise understanding of web protocol.
- To give the students a perspective of web design language for designing a web site.
- To enable students design a structure of web page model for any organization.

Course Outcomes:

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

CO1. Understanding of E- Mail, Telnet, FTP, E-Commerce, Video Conferencing, E-Business. CO2. Formalize HTML Tag Reference, Global Attributes, Event Handlers, Document Structure.CO3. Classify a detailed analysis of form, frame and CSS in HTML.

CO4. Demonstrate effectively a web page with HTML/JavaScript/XML style.CO5. Create rich internet application using XML

Course Description:

The methods by which computers communicate with each other through the use of markup languages and multimedia packages is known as web technology. In the past few decades, web technology has undergone a dramatic transition, from a few marked-up web pages to the ability to do very specific work on a network without interruption. Let's look atsome 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:

Units	Lecture Hours
Unit-I: 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)	**08**
Unit-II: 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, ImageAnd 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 analysisin Online Job portal. Forms: Creating Forms, The<FORM> Tag, Named Input Fields, The <INPUT> Tag, Multiple Lines Text Windows, Drop Down And List Boxes, HiddenText, 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.	**12**

Units	Lecture Hours
Unit-III: 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: 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	**08**
Unit-IV: Unit Heading: Introduction Client-Side JavaScript, Server-Side Javascript, Javascript Objects, JavascriptSecurity. 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: 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	**10**
Unit-V	**07**

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

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE11 131	Web Technol ogy	CO1113 1.1	1	1	2	2	1	3	2	-	2	-	-	2	2	2	3
CSE11 131	Web Technol ogy	CO1113 1.2	2	1	1	1	3	3	3	-	3	-	-	2	3	3	3
CSE11 131	Web Technol ogy	CO1113 1.3	2	1	3	1	3	1	1	-	3	-	-	3	3	3	3
		CO1113 1.4	**3**	**3**	**1**	**3**	**1**	**2**	**2**	**-**	**3**	**-**	**-**	**3**	**2**	**3**	**1**
		CO1113 1.5	2	1	3	2	2	1	3	-	3	-	-	2	2	2	1
		CO1113 1	2. 0	1. 4	2. 0	1. 8	2. 0	2. 0	2. 2	-	2. 8	-	-	2.4	2.4	2.6	2.2

CSE11132	**Compiler Design**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Finite Automata, Data structures, Computer Organization.**				
Co-requisite	**NIL**				

Course Objectives:

- To understand students how the process of language transla tion process.
- To interpret students the theory and practice of compiler implementation.
- To enhance the skills of student to implement lexical analysis, a variety of parsing techniques andsemantic analysis of a programming language, along with error
- detection and recovery.
- To allow the students to identify the various storage allocation, code optimization techniques and codegeneration.

- 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 andBottom-up parser.

CO3: Demonstrate the use of formal attributed grammars for specifying the syntax and semantics ofProgramming 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:

Units	Lecture Hours
Unit-I: 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.	**09**

Units	Lecture Hours
Unit-II: Syntax Analysis and Yacc/Bison: Syntax Analysis discussion on CFG, LMD,RMD, parse trees, Role of a parser classification of parsing techniquesBrute 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.	**09**
Unit-III: 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.	**09**
Unit-IV: 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.	**09**
Unit-V: 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, Referencecounting garbage collectors. Code generation: Issues, target language, Basic blocks & flow graphs, Simple code generator, Peephole optimization, Register allocation and assignment.	**09**

Text Books:

- Compilers, Principles Techniques and Tools- Alfred V Aho, Monica S Lam, Ravi Sethi, Jeffrey D. Ullman,2ndEdition, Pearson,2007.
- piler construction, Principles and Practice, Kenneth C Louden, 1st Edition, CENGAGE

Reference Books:

- piler Design, K. Muneeswaran, Oxford. 2012
- Engineering a compiler, Keith D.Cooper& Linda Torczon, Morgan Kaufman, 2nd edition. MK publishers,2012. ciples of compiler design, V. Raghavan, 2nd Edition, Tata Mcgraw Hill, 2011.

Examination Scheme:

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

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

1 = Weakly Mapped

2 = Moderately Mapped3 =

Strongly Mapped

Course Code	Cours e Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE111	Compi	CO1113	2	3	2	2	3	3	1	-	1	-	-	2	3	1	1
32	ler	2.1															
	Design	CO1113	2	3	2	2	1	1	2	-	1	-	-	3	2	2	2
		2.2															
		CO1113	3	3	3	1	3	1	2	-	3	-	-	3	3	2	1
		2.3															
		CO1113	3	1	1	2	2	1	1	-	2	-	-	2	3	2	2

Course Code	Cours e Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
		2.4															
		CO1113	3	2	3	2	3	2	3	-	2	-	-	3	3	1	3
		2.5															
		CO1113	2.	2.	2.	1.	2.	1.	1.	-	1.	-	-	2.6	2.8	1.6	1.8
		2	6	4	2	8	4	6	8		8						

CSE11133	Mobile Computing and Android	L	T	P	C
Version 1.0	Contact Hours 45	3	0	0	3
Pre-requisite/Exposure					
Co-requisite					

Course Objectives:

- Encourage students to learn by building increasingly more sophisticated and meaningful mobileapplications for Android
- Enable students to build their own complete Android application incorporating most of the key aspects ofthe platform

Course Outcomes:

CO1: Explain concepts of JAVA and SQL

CO2: Understand basic concepts of Android

CO3: Build basic applications, interfaces and UI

CO4: Explore advanced concepts of Android

CO5: Utilize various services provided by android.

Course Description:

-source platform. It will be a

combination of lecture and laboratory course which will help the student understand the philosophy of developing

Course Content:

Units	Lecture Hours
Unit-I: 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	**9**
Unit-II: 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)	**9**
Unit-III: Application Structure: AndroidManifest.xml, uses-permission & uses-sdk, Resources & R.java o AssetsLayouts & Drawable Resources, Activities and Activity lifecycle, First sample Application Emulator-Android Virtual Device, Basic UI design, Form widgets, Text Fields, Layouts	**9**
Unit-IV: Preferences: Shared Preferences, Preferences from xml, Examples, Menu : Option menu, Context menuSub 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 TabActivity, Styles and Themes	**9**
Unit-V: Content Providers, SQLite, Android Debug Bridge, Linkfy, Adapters and Widgets, Notifications, Threads, Advanced Services: Maps, GPS, Call, SMS etc., Network connectivity, Sensors	**9**

Examination Scheme:

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

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

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

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE11	Mobile	CO1113	2	2	3	3	3	1	3	-	2	-	3	2	1	3	2
133	Comput	3.1															
	ing and Android	CO1113 3.2	1	3	2	3	2	3	3	-	3	-	3	2	3	3	3
		CO1113	2	2	2	3	2	3	1	-	3	-	2	2	1	1	3
		3.3															
		CO1113	3	3	3	2	3	2	2	-	1	-	3	3	3	3	2
		3.4															
		CO1113	1	2	3	2	2	1	1	-	1	-	2	2	1	2	3
		3.5															
		CO1113	1.	2.	2.	2.	2.	2.	2.	-	2.	-	2.6	2.2	1.8	2.4	2.6
		3	8	4	6	6	4	0	0		0						

CSE11134	**Machine Learning**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Probability & Statistics**				
Co-requisite	**NIL**				

Course Objectives:

- Understand the concepts of machine learning.
- Understand the clustering techniques and their utilization in machine learning.

- Study the neural network systems for machine learning.
- Learn and understand the linear learning models in machine learning.
- Study the tree based machine learning techniques and to appreciate their capability.

Course Outcomes:

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

CO1: List the various types of machine learning techniques CO2 : Explain basic machine learning techniques

CO3: Compare classification and clustering techniques

CO4: Design modern machine learning techniques

CO5: Apply machine learning techniques in various domains

Course Description:

This subject aims to introduce undergraduate students to the world of Machine Learning. This course serves as a first course and expect the learners pile their fundamentals in this field. . The course introduces the motivation for machine learning and other cognitive techniques by different learning methods. It emphasizes on different categories of machine learning like supervised, unsupervised learning. Each of these categories is further described in detail through several problems in each class.

Course Content:

Units	**Lecture Hours**
Unit-I: Overview of Machine Learning The Landscape. The Learning Problem. Feasibility of Learning. General-to- SpecificHypotheses Ordering. Find-S and Candidate Elimination Algorithm. Version Space and Inductive Bias. Linear Classification. Linear Regression. Non-linear Transformation. Logistic Regression.	**9**
Unit-II: Bayesia n Learning : Probability Overview. MLE and MAP Estimates. Naive Bayes Classifier. Gaussian Naive Bayes Classifier. Bayesian Networks. Decision Trees: Decision Tree Representation and Learning Algorithm (ID3). Attribute Selection using Entropy Measures and Gains. Hypotheses Space and Inductive bias. Overfitting, Generalization and Occam's Razor.	**9**

Units	**Lecture Hours**
Unit-III: Instance based Learning : k-Nearest Neighbour (kNN) Classifier, Voronoi Diagram and Distance-Weighted kNN. Distance Metrics and Curse of Dimensionality. Computational Complexity: Condensing and High Dimensional Search(kd-tree). Clustering: Partitional Clustering and Hierarchical Clustering. Cluster Types, Attributes and Salient Features. k- Means, Hierarchical and Density-based Clustering Algorithms. Inter and Intra Clustering Similarity, Cohesion and Separation.MST and DBSCAN Clustering Algorithms.	**9**
Unit-IV: Neural Networks : Advanced Topics: Perceptron Learning Algorithm: Delta Rule and Gradient Descent. Multi- layerPerceptron Learning: Backpropagation and Stochastic Gradient Descent. Hypotheses Space, Inductive Bias and Convergence. Variants of Neural Network Structures. Support Vector Machine: Decision Boundary and Support Vector: Optimization and Primal-Dual Problem. Extensionto SVM: Soft Margin and Non-linear Decision Boundary. Kernel Functions and Radial Basis Functions (detailed later).	**12**
Unit-V: Applied Machine Learning : Accuracy, Precision, Recall and F-Measures. Scores, Sampling, Bootstraping and ROC. Hypotheses Testing and Cross-validation. Bagging and Boosting. Adaboost and Random Forest. Dimensionality Reduction and Principal Component Analysis (PCA). Modern Learning Techniques: Reinforcement Learning, Deep Learning, Transfer Learning, Semi-supervised Learning, Active Learning.	**6**

Examination Scheme:

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

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

1 = Weakly Mapped

2 = Moderately Mapped3 = Strongly Mapped

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CSE11134	Machine	CO11134.1	3	3	3	3	3	3	1	-	3	-	3	2	3	1	1
	Learning	**CO11134.2**	**2**	**2**	**3**	**3**	**3**	**2**	**3**	**-**	**3**	**-**	**2**	**2**	**3**	**2**	**2**
	Learning	CO11134.3	3	2	2	2	3	2	3	-	2	-	3	1	2	1	3
	Learning	CO11134.4	3	3	2	2	2	1	1	-	3	-	2	1	1	2	2
	Learning	CO11134.5	2	3	2	2	3	1	1	-	3	-	3	1	1	1	2
	Learning	CO11134	2. 6	2. 6	2. 4	2. 4	2. 8	1. 8	1. 8	-	2. 8	-	2.6	1.4	2.0	1.4	2.0

CSE11135	**Real Time Analytics**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Statistical Modelling for data analytics**				
Co-requisite	**Machine Learning**				

Course Objectives:

- To enable students to understand various challenges in real time data processing.
- To provide the fundamentals of building blocks for real time solution design.
- To enhance the skill of students to understand speed and complexity issues while designing real time systems.
- To allow students to identify challenging areas in prediction and forecasting.

Course Outcomes:

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

Course Description:

This course requires minimal knowledge in probability and high school statistics. The course starts from basic conceptsof 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, withthe condition that the time required for processing. The objective of this course is to provide students an understandingof real-time solution aspects, from the source to the presentation to persistence.

Course Content:

Units	**Lecture Hours**
Unit-I: 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	**9**
Unit-II: Stochastic process: Introduction to stochastic process, discrete stochastic process, autocorrelation, stationary stochastic process, casestudies of stochastic process.	**9**
Unit-III: 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.	**9**
Unit-IV: Machine Learning Models for Time Series Analysis: Ways to work with ML models for Time Analysis models, time series analysis using decision trees, analysis withrandom forests	**9**

Units	Lecture Hours
Unit-V: Applications and Case Studies: Insurance and Premium, credit card detection, product sales analysis, stock prediction analysis, sales/demandforecasting.	**9**

Examination Scheme:

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

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

Course Code	Cours e Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE111	Real	CO1113	2	3	2	2	3	1	2	-	1	-	-	3	3	1	1
35	Time	5.1															
	Analyt ics	CO1113 5.2	3	2	2	2	3	3	3	-	3	-	-	3	2	3	2
		CO1113	2	2	2	2	3	3	3	-	3	-	-	1	1	2	2
		5.3															
		CO1113	3	2	2	2	2	2	3	-	3	-	-	1	1	1	2
		5.4															
		CO1113	3	1	3	2	1	3	1	-	1	-	-	3	2	2	1
		5.5															
		CO1113	2.	2.	2.	2.	2.	2.	2.	-	2.	-	-	2.2	1.8	1.8	1.6

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
		5	6	0	2	0	4	4	4		2						

CSE11136	**Virtualization and Applied Cloud Computing**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Familiarity with Java, Python**				
Co-requisite	**NIL**				

Course Objectives:

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

Course Outcomes:

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

CO1: Understand the fundamentals of Cloud Computing and VirtualizationCO2: 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, parallelprocessing 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 executedover Amazon Web Services.

Course Content:

Units	**Lecture Hours**
Unit-I: Introduction 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.	**9**
Unit-II: Cloud Infrastructure 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.	**9**
Unit-III: Virtualization 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 technologyclassification, X86, IBM power VM virtualization.	**5**
Unit-IV: Server Virtualization 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	**10**
Unit-V: Case Study Unit Heading: Amazon EC2; Software Defined Networks (SDN); Software Defined Storage (SDS), 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 acloud, Migration Risks and Mitigation.	**12**

Examination Scheme:

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

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

1 = Weakly Mapped

2 = Moderately Mapped3 = Strongly Mapped

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE11 136	Virtualiza tion and	CO1113 6.1	3	3	3	2	2	3	3	-	1	-	-	3	2	1	1
	Applied Cloud Computin g	**CO1113 6.2**	**2**	**3**	**2**	**2**	**2**	**1**	**3**	**-**	**1**	**-**	**-**	**3**	**1**	**2**	**1**
	Applied Cloud Computin g	CO1113 6.3	3	2	2	3	3	3	2	-	3	-	-	3	2	1	2
	Applied Cloud Computin g	CO1113 6.4	3	2	1	1	2	2	3	-	1	-	-	3	1	1	3
	Applied Cloud Computin g	CO1113 6.5	2	2	2	3	2	3	2	-	2	-	-	2	3	1	2
	Applied Cloud Computin g	CO1113 6	2. 6	2. 4	2. 0	2. 2	2. 2	2. 4	2. 6	-	1. 6	-	-	2.8	1.8	1.2	1.8

CSE11137	**Network Security**	**L**	**T**	**P**	**C**

	Applied Cloud Computing	CO11136.2	2	3	2	2	2	1	3	-	1	-	-	3	1	2	1

Version 1.0	**Contact Hours 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Computer Network**				
Co-requisite	**NIL**				

Course Objectives:

- The course content should be taught and implemented with the aim to develop different types of skills so that students are able to acquire following competencies:
- Determine appropriate mechanisms for protecting networked systems by applying various cryptographictechniques.
- Secure the network by using firewalls on various networks in order to identify various network attacks andresolve 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 natureof 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 encryptdata 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 incurrent 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 mechanismsfor operating systems as well as private and public network to protect them from various threats.

Course Content:

Units	**Lecture Hours**
Unit-I: 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	**09**
Unit-II: 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 goodpassword.	**09**
Unit-III: Cryptography and Public key Infrastructure: Introduction to Symmetric encryption & Asymmetric encryption; 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.	**09**
Unit-IV: 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	**09**

Units	Lecture Hours
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: 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.	**09**

Examination Scheme:

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

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

1 = Weakly Mapped

2 = Moderately Mapped3 = Strongly Mapped

Course Code	Cours e Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE111	Netwo	CO1113	3	2	2	2	1	3	2	-	3	-	-	2	2	3	3
37	rk	7.1															
	Securi ty	CO1113 7.2	3	2	3	3	2	3	1	-	3	-	-	2	2	2	2
		CO1113	3	1	2	1	3	3	1	-	2	-	-	2	3	3	3
		7.3															

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
		CO1113	2	2	3	3	3	1	2	-	1	-	-	3	1	3	3
		7.4															
		CO1113	3	2	3	3	2	1	3	-	3	-	-	2	2	1	2
		7.5															
		CO1113	2.	1.	2.	2.	2.	2.	1.	-	2.	-	-	2.2	2.0	2.4	2.6
		7	8	8	6	4	2	2	8		4						

CSE11138	**Application Development with Python**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Python**				
Co-requisite					

Course Objectives:

- To allow students to develop desktop applications using python
- To allow students to develop web applications using python
- To allow students to develop data science applications using python

Course Outcomes:

CO1: Recall concepts of python

CO2: Compare popular packages in python

CO3: Understand the concepts of GUI Design with Tkinter

CO4: Apply Django Framework for web development

CO5: Implement machine learning systems with sklearn

Course Description:

Python app development can be used for multiple purposes including web development, logical and numeric computing, software development, creating desktop GUIs, and building eCommerce mobile apps or ERP systems.With such a wide-ranging application domain, it turns out to be the most compatible and featured-rich technology.This course will explore various principles for development of desktop, web and data science applications.

Course Content:

Units	Lecture Hours
Unit-I: Python Refresher :Datatypes, expressions, statements, conditions, loops, classes, objects, functions, data structures,I/O, packages.	**9**
Unit-II: Popular Python Packages : Numpy, Scipy, Pandas, Matplotlib	**9**
Unit-III: GUI Design with Tkinter : mainloop, windows, widgets, pack, grid, place, buttons, canvas, check, entry, frame, label, listbox, menu, messages, scale, radiobutton, scrollbars, Toplevel, Spinbox	**9**
Unit-IV: Django Framework for web development: Django URL Patterns and Views, Django Forms, Django & REST APIs, Unit Testing with Django.	**9**
Unit-V: Machine Learning Applications with scikit-learn : Dimensionality Reduction, Classification, Clustering, Visualization	**9**

Examination Scheme:

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

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

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

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE11	Applicati	CO1113	1	3	3	3	2	2	2	-	3	-	-	3	2	3	1
138	on	8.1															
	Develop	CO1113	3	3	3	3	3	2	3	-	1	-	-	2	1	3	2
	ment	8.2															
	with Python	CO1113 8.3	3	2	3	3	2	2	3	-	2	-	-	2	3	1	3
		CO1113	1	3	2	2	3	2	1	-	1	-	-	3	2	1	2
		8.4															
		CO1113	1	2	2	2	2	3	2	-	3	-	-	2	3	1	1
		8.5															
		CO1113	1.	2.	2.	2.	2.	2.	2.	-	2.	-	-	2.4	2.2	1.8	1.8
		8	8	6	6	6	4	2	2		0						

CSE11139	**Neural Networks and Deep Learning Application**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Discrete Mathematics, Calculus, Machine Learning**				
Co-requisite	**NIL**				

Course Objectives:

- To enable students to analyze different components of a neural network
- To provide the fundamentals of building problem specific neural networks
- To enhance the skill of students to manipulate the parameters of deep learning models
- To allow students to identify challenging areas where deep learning solutions can be implemented

Course Outcomes:

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

CO1: Understand the fundamental building blocks neural networks

CO2: Analyze the different parameters that controls the performance of neural networksCO3: Explain various types of deep learning techniques

CO4: Compare several key deep learning models for different types of problemsCO5: 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:

Units	Lecture Hours
Unit-I: 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	9
Unit-II: 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.	9
Unit-III: Deep Learning Techniques: Vanishing gradients, deep belief networks, long short-term memory, representation learning, convolutional neuralnetworks, Subsampling, rectified-linear units, deep convolutional auto-	9

Units	Lecture Hours
encoders, layer-wise training, auxiliary classifiers, residual connections, adversarial learning.	
Unit-IV: Deep Learning Models: Classification: LeNet-5, AlexNet, VGG-Net, GoogLeNet, ResNet, DenseNet, MobileNet. Detection: R-CNN, YOLO Segmentation: Seg-Net, U-Net, SegFastSequential Learning: LSTM, GRU Generative Learning: Variational auto-encoder, GAN, Conditional GAN	**9**
Unit-V: Deep Learning Tools: PyTorch: Installation, Tensors, autograd, modules, dataset and dataloader, Training and TestingTensorFlow: Installation, Loading dataset, Model, Training, Testing	**9**

Examination Scheme:

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

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

1 = Weakly Mapped

2 = Moderately Mapped3 = Strongly Mapped

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE11	Neural	CO1113	2	3	2	3	1	2	2	-	3	-	-	2	3	2	1
139	Networ	9.1															
	ks and	CO1113	3	2	2	3	3	1	3	-	2	-	-	2	1	1	2
	Deep	9.2															

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
	Learnin g Applicat ion	CO1113 9.3	2	2	3	2	2	1	1	-	2	-	-	3	3	2	1
	Learnin g Applicat ion	CO1113 9.4	3	2	3	2	2	2	1	-	2	-	-	1	3	1	2
		CO1113	2	3	2	1	2	1	2	-	1	-	-	3	1	2	2
		9.5															
		CO1113	2.	2.	2.	2.	2.	1.	1.	-	2.	-	-	2.2	2.2	1.6	1.6
		9	4	4	4	2	0	4	8		0						

CSE11140	Statistical Modelling for Data Analytics	L	T	P	C
Version 1.0	Contact Hours 45	3	0	0	3
Pre-requisite/Exposure	Probability and Statistics				
Co-requisite	High School Statistics				

Course Objectives:

- To enable students to understand use of statistics in real life.
- To provide the fundamentals of analysing problem using statistics.
- To enhance the skill of students to understand whether the problem could be solve using descriptive orinferential statistics.
- To allow students to identify challenging areas where analysing and interpreting results using statistics willhelp 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 realworld 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:

Units	**Lecture Hours**
Unit-I: Basic concepts of statistics: Introduction to statistics, need of statistics in modeling real world problems, types of statistics, descriptivestatistics: graphical and tabular methods, descriptive statistics: measure of central tendency, variance and dispersion, skewness. Probability and Random Variables: Discrete and continuous random variables, distributions	**9**
Unit-II: Exploratory data analysis: Data collection, sampling, variables, temporal and spatial data Data Analysis Pipeline: Collect, Import, Clean, Transform, Visualize, Model, Communicate	**9**
Unit-III: Regression Modelling Techniques: Simple and multiple linear regression models, least square estimation techniques, residuals, goodness of fit, test ofsignificance and confidence intervals, polynomial regression model, detection of outliers, multicollinearity, logistic regressions models.	**9**

Units	Lecture Hours
Unit-IV: 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 usingtools, NumPy and SciPy package, matplotlib, data visualisation, inferential statistics analysis using tools.	**9**
Unit-V: Applications and Case Studies: Importing data and analyse using descriptive statistics: dataset from various sectors like e-commerce, business,healthcare, Olympic games project	**9**

Examination Scheme:

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

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

1 = Weakly Mapped

2 = Moderately Mapped3 = Strongly Mapped

Course Code	Course Name	COs	P O1	P O2	P O3	P O4	P O5	P O6	P O7	P O8	P O9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE111	Statisti	CO1114	3	2	2	3	1	2	2	-	2	-	-	1	2	1	1
40	cal	0.1															
	Modell	CO1114	1	3	3	2	2	3	1	-	1	-	-	2	2	2	1
	ing for	0.2															
	Data Analyti cs	CO1114 0.3	2	2	2	2	3	1	3	-	1	-	-	2	1	3	3

Course Code	Course Name	COs	P O1	P O2	P O3	P O4	P O5	P O6	P O7	P O8	P O9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
	Data Analytics	CO1114	3	3	3	2	2	2	1	-	1	-	-	2	2	2	2
		0.4															
		CO1114	1	2	2	2	2	2	2	-	3	-	-	3	1	2	3
		0.5															
		CO1114	2.	2.	2.	2.	2.	2.	1.	-	1.	-	-	2.0	1.6	2.0	2.0
		0	0	4	4	2	0	0	8		6						

CSE11141	**Cloud Management**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure					
Co-requisite					

Course Objectives:

- To allow students manage cloud infrastructure
- To develop concepts of metering and billing in cloud services

Course Outcomes:

CO1: Gain Knowledge of Service, security management in cloud.CO2 : Understand the concept of Cloud service management.

CO3: Analyze, manage metering and billing of Cloud service applicationCO4 : 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 securityof all the component that support service delivery: the hardware, software and services in the data center and throughout the network setup.

Course Content:

Units	Lecture Hours
Unit-I: Service Management in Cloud: Concept of Service Management, ITSM-ITIL framework, ANEKA Cloud Architecture, WINSAT, Characteristics of Cloud Service Management, Cloud Service Management, WorkflowsIn Cloud, Case study: VM task scheduling	**9**
Unit-II: 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,	**9**
Unit-III: 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	**9**
Unit-IV: Patch management in enterprise solution, Patch management in Cloud, Cloud patch management workflow,Google cloud patch management case study	**9**
Unit-V: Cloud Computing environment, Operational view of Cloud Management, Application Hosting On Cloud, Customer Application Hosting	**9**

Examination Scheme:

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

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

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

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE11 141	Cloud Manage ment	CO1114 1.1	3	3	3	3	3	2	2	-	3	-	2	3	3	2	1
CSE11 141	Cloud Manage ment	CO1114 1.2	2	2	2	3	3	3	2	-	1	-	3	1	2	1	1
CSE11 141	Cloud Manage ment	CO1114 1.3	2	3	2	3	3	3	1	-	1	-	2	1	1	3	1
CSE11 141	Cloud Manage ment	CO1114 1.4	2	2	3	2	2	1	3	-	2	-	3	2	1	3	1
CSE11 141	Cloud Manage ment	CO1114 1.5	2	2	3	2	2	1	1	-	1	-	2	2	2	3	3
CSE11 141	Cloud Manage ment	CO1114 1	2. 2	2. 4	2. 6	2. 6	2. 6	2. 0	1. 8	-	1. 6	-	2.4	1.8	1.8	2.4	1.4

		L	T	P	C
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**				

Code	Name		O 1	O 2	O 3	O 4	O 5	O 6	O 7	O 8	O 9	10	11	12	O1	O2	O3

Co-requisite	NIL

Course Objectives:

- To enable students to about the modern malware and anti-malware landscape.
- their weakest points, exploiting these weaknesses after infection.
- To enhance the skill of students to learn all the m
- 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 cellphonesis becoming easier. Every day, Gadgets360 reports 8400 new Android malware incidents. It appears every ten seconds.Worms are a serious cyber danger that may disrupt online banking and social networking. Every day, the AV-Test Institute predicts 250,000 new malicious samples across several platforms (Android, Windows, Linux). Manual disassembly and reverse engineering of these samples take time. So it annoys security analysts. As a result, low-human-interaction malware analysis solutions are vitally needed Antivirus software works by comparing newly downloaded executables to known malware signatures. However, zero-day malware, which lacks a signature, cannot be discovered using this approach. Static and dynamic analysis are also popular. It forecasts results without launching executables. It works fine unless malware is packed, encrypted, or camouflaged. Dynamic analysis is used to overcome static restrictions. To collect data for detection and classification, the sample is run in a sandbox. There are no virtual environments or code coverage issues. As a result, scientists are using a hybrid strategy that incorporates both.

Course Content:

Units	Lecture Hours
Unit-I: Introduction: Malware classification, types, and platform-specific issues with malware, Intrusion into IT and operationalnetwork (OT) and their signs	**9**
Unit-II: Basic Malware Analysis signature-based Manual Malware Infection analysis, signature-based malware detection and classification pros and cons, andneed for machine learning-based techniques	**9**
Unit-III: Advanced Techniques Malware Analysis: Static Analysis, Dynamic Analysis and Hybrid Analysis of Windows Malware, Linux Malware and Android Malware	**9**
Unit-IV: Basic Intrusion Detection: Intrusion into the network Firewalls, Rule-based techniques, signature-based Techniques, Simple MachineLearning Models on Network Data	**9**
Unit-V: 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	**9**

Examination Scheme:

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

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

1 = Weakly Mapped

2 = Moderately Mapped3 = Strongly Mapped

Course Code	Cours e Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE111	Malw	CO1114	2	3	3	3	1	3	1	-	3	-	-	1	2	2	2
42	are	2.1															
	Analy sis	CO1114 2.2	2	3	3	2	1	3	3	-	2	-	-	3	3	1	3
		CO1114	3	2	2	1	2	3	1	-	3	-	-	3	1	1	2
		2.3															
		CO1114	2	2	2	3	3	1	3	-	1	-	-	3	3	2	3
		2.4															
		CO1114	3	3	2	2	3	2	2	-	2	-	-	3	2	2	3
		2.5															
		CO1114	2.	2.	2.	2.	2.	2.	2.	-	2.	-	-	2.6	2.2	1.6	2.6
		2	4	6	4	2	0	4	0		2						

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:

- To introduce students how to design static webpage using HTML and CSS
- To provide knowledge on web architecture, web services, client side and server side scripting technologies to focus on the development of web-based information systems and web services
- To provide skills to design interactive and dynamic web sites

- To develop students knowledge for implementing web applications using PhP

Course Outcomes:

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

CO1: Design a static webpage by applying HTML elements CO2: Apply CSS concepts for designing HTML web pages. CO3: Develop DHTML pages by using JavaScript with DOM events CO4: Implement a webpage with database connectivity using PhP CO5: Create rich internet application using XML.

Course Description:

The main objective of this course is on the World Wide Web as a platform for interactive applications, content publishing and social services. The development of web-based applications requires knowledge about the underlying technology and the formats and standards the web is based upon. In this course you will learn about the HTTP communication protocol, the markup languages HTML, XHTML and XML, the CSS and XSLT standards for formatting and transforming web content, interactive graphics and multimedia content on the web, client-side programming using JavaScript.

Course Content:

Units	**Lecture Hours**
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	

Units	Lecture Hours
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

Examination Scheme:

Components	Internal Assessment	ETE
Weightage (%)	50	50

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

1=weakly mapped

2= moderately mapped

3=strongly mapped

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE12143	Web Technology Lab	CO12143.1	1	1	1	2	3	2	1	-	1	3	-	1	1	1	3
CSE12143	Web Technology Lab	CO12143.2	1	2	1	3	1	2	2	-	2	3	-	1	3	2	2

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE12143	Web Technology Lab	CO12143.3	1	3	3	2	3	2	3	-	3	3	-	1	2	3	1
CSE12143	Web Technology Lab	CO12143.4	2	2	3	1	2	1	2	2	1	-	-	2	1	3	3
CSE12143	Web Technology Lab	CO12143.5	3	1	2	2	2	3	2	2	1	-	-	2	2	1	1
CSE12143	Web Technology Lab	CO12143	1.6	1.8	2.0	2.0	2.2	2.0	2.0	2.0	1.6	3.0	-	1.4	1.8	2.0	2.0

CSE12145	**Android Application Development Lab**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours – 30**	**0**	**0**	**2**	**1**
Pre- requisite/Exposure					
Co-requisite					

Course Objectives:

- Know the components and structure of mobile application development frameworks for Android and windows OS based mobiles.
- Understand how to work with various mobile application development frameworks.
- Learn the basic and important design concepts and issues of development of mobile applications. Understand the capabilities and limitations of mobile devices.

Course Outcomes:

CO1: Understand GUI components, Layout Managers and Event Listeners CO2 : Create basic applications using databases

CO3: Apply Android Service based modules to create advanced applications CO4 : Solve issues related to notifications and alert

Course Description:

This course contains several key lab assignments to give an overview of all the components of android development

Course Content:

Units	Lecture Hours
List of Experiments Develop an application that uses GUI components, Font and Colors. Develop an application that uses Layout Managers and event listeners. Develop a native calculator application. Write an application that draws basic graphical primitives on the screen. Develop an application that makes use of database. Develop an application that makes use of RSS Feed. Implement an application that implements Multi-threading. Develop a native application that uses GPS location information. Implement an application that writes data to the SD card. Implement an application that creates an alert upon receiving a message. Write a mobile application that creates alarm clock.	

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

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

Course Code	Course Name	COs	P O 1	PO 2	P O 3	P O 4	PO 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE12 145	Android Application Development Lab	CO1214 5.1	3	3	3	2	2	1	2	-	1	-	2	3	1	3	2
CSE12 145	Android Application Development Lab	CO1214 5.2	1	3	2	3	3	3	2	-	2	-	3	2	2	3	2
CSE12 145	Android Application	CO1214 5.3	3	2	3	3	3	2	3	-	2	-	2	3	1	1	1

Course Code	Course Name	COs	P O 1	PO 2	P O 3	P O 4	PO 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
	Development Lab																
CSE12145	Android Application Development Lab	CO12145.4	1	3	2	2	3	2	1	-	3	-	2	2	1	2	2
CSE12145	Android Application Development Lab	CO12145	2. 0	2. 75	2. 5	2. 5	2. 75	2. 0	2. 0	-	2. 0	-	2.2 5	2.5	1.2 5	2.2 5	1.7 5

CSE12146	**Machine Learning Lab**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours 30**	**0**	**0**	**2**	**1**
Pre-requisite/Exposure	**Probability & Statistics**				
Co-requisite	**NIL**				

Course Objectives:

- Understand the overview of the various machine learning techniques and can able to demonstratethose using python.
- Make use of Data sets in implementing the machine learning algorithms.
- Implement the machine learning concepts and algorithms in any suitable language of choice. Learnand understand the linear learning models in machine learning.
- Study the tree based machine learning techniques and to appreciate their capability.

Course Outcomes:

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

CO1: Understand complexity of Machine Learning algorithms and their limitations and modern

notionsin 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:

The programs can be implemented in either JAVA or Python.

For Problems 1 to 6 and 10, programs are to be developed without using the built in classes or APIs ofJava/Python.

Data sets can be taken from standard repositories (https://archive.ics.uci.edu/ml/datasets.html) orconstructed by the students.

Course Content:

Units	**Lecture Hours**
Unit-I: Introduction: The probability that it is Friday and that a student is absent is 3 %. Since there are 5 school days in a week, theprobability 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%) Extract the data from database using python Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given setof training data samples. Read the training data from a .CSV file. 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. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate dataset for building the decision tree and apply this knowledge to classify a new sample.	**6**
Unit-II: Clustering Approaches: plement k-nearest neighbours classification using python Given the following data, which specify classifications for nine combinations of VAR1 and VAR2 predict aclassification 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	**6**

Units	Lecture Hours
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 plement Naïve Bayes theorem to classify the English text 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. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct andwrong predictions. Java/Python ML library classes can be used for this problem.	
Unit-III: Neural Networks: plement the finite words classification system using Back-propagation algorithm Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same usingappropriate data sets. plement an algorithm to demonstrate the significance of genetic algorithm.	**6**
Unit-IV: u	**6**

Examination Scheme:

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

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

Mapping Legend:

1: Weakly Mapped

2: Moderately Mapped

3: Strongly Mapped

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
CSE12146	Machine Learning Lab	3	3	3	3	-	-	-	-	-	3	-	-	3	3	-

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:

- To enable students to understand use of statistics in real life.
- To provide the fundamentals of analysing problem using statistics.
- To enhance the skill of students to understand whether the problem could be solve using descriptive orinferential statistics.
- To allow students to identify challenging areas where analysing and interpreting results using statistics willhelp 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 realworld 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

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

Study of various data structures to store dataset.

Study on importing various format of data.

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

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

Study of IQR(Internal Quartile Range) and outlier detection.7.Study on random numbers to simulate probability.

Study on probability distribution.

Study and interpret results on covariance and correlation.

Project 1: Analyze, visualize and interpret Titanic dataset.

Study on Inferential statistics: Central Limit Theorem

Study and implementing hypothesis testing.

Practical study on Z-test(One Sample).

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

Study on ANOVA

Case Study and Project 2: House Prices Dataset

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

Modes of Evaluation:

Quiz/Assignment/Presentation/Extempore/ Written

ExaminationExamination Scheme:

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

Course Code	Course Name	COs	P O1	P O2	P O3	P O4	P O5	P O6	P O7	P O8	P O9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE121	Statisti	CO1214	3	3	3	2	2	1	1	-	2	-	-	3	1	1	3
47	cal	7.1															
	Modell	CO1214	2	3	2	2	3	3	3	-	3	-	-	2	2	3	2
	ing for	7.2															
	Data Analyti cs Lab	CO1214 7.3	3	3	3	3	2	2	3	-	1	-	-	3	3	2	2
	Data Analyti cs Lab	CO1214	2	2	3	2	2	2	3	-	2	-	-	2	2	3	1
		7.4															
		CO1214	3	2	3	3	1	2	2	-	3	-	-	2	1	2	2
		7.5															
		CO1214	2.	2.	2.	2.	2.	2.	2.	-	2.	-	-	2.4	1.8	2.2	2.0
		7	6	6	8	4	0	0	4		2						

CSE12148	**Virtualization and Applied Cloud Computing Lab**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours 30**	**0**	**0**	**2**	**1**
Pre-requisite/Exposure	**NIL**				
Co-requisite	**NIL**				

Course Objectives:

- To enable student to develop a knowledge on virtualization
- To provide the fundamentals of Virtual Disks

- To enhance the skill of the students to have a concept on Destop and Server Virtualization
- To enable students to create Virtual Networks

Course Outcomes:

On the completion of this course the student will be able to CO1: Understanding the Basics of Virtualization

CO2: Demonstrate Virtual Storage

CO3: Explain Different Destop Virtualization CO4: Analyze Vitrtualization techniques for

ServersCO5: 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:

Units	Lecture Hours
a a a a a a a	

Examination Scheme:

Components	Class Assessment	End Term
Weightage (%)	50	50

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

1 = Weakly Mapped

2 = Moderately Mapped3 = Strongly Mapped

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CSE12148	Virtualization and Applied Cloud Computing Lab	CO12148.1	2	2	1	1	2	2	3	-	2	-	-	1	2	3	3
CSE12148	Virtualization and Applied Cloud Computing Lab	CO12148.2	2	2	2	1	1	2	1	-	2	-	-	2	2	3	2
CSE12148	Virtualization and Applied Cloud Computing Lab	CO12148.3	2	3	1	2	3	2	1	-	1	-	-	2	2	3	2
CSE12148	Virtualization and Applied Cloud Computing Lab	CO12148.4	3	2	3	2	2	1	1	-	1	-	-	1	2	1	2
CSE12148	Virtualization and Applied Cloud Computing Lab	CO12148.5	3	3	3	1	3	3	2	-	1	-	-	3	2	2	3
CSE12148	Virtualization and Applied Cloud Computing Lab	CO12148	2. 4	2. 4	2. 0	1. 4	2. 2	2. 0	1. 6	-	1. 4	-	-	1.8	2.0	2.4	2.4

Code	Name		O 1	O 2	O 3	O 4	O 5	O 6	O 7	O 8	O 9	10	11	12	O1	O2	O3

CSE12149	**Network Security Lab**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours 30**	**0**	**0**	**2**	**1**
Pre-requisite/Exposure	---				
Co-requisite					

Course Objectives:

- To introduce several modern tools to perform network breaches
- To provide platforms for defending against network breaches

Course Outcomes:

CO1: Understand the use of Netcat and Nmap

CO2: Apply Wireshark and Dumpsec tools

CO3: Explain wireless audit, ARP poisoning and Intrusion detectionCO4 : 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 todefend against the same. This course covers a large number of tools and techniques related to network security

Course Content:

Units	Lecture Hours
Perform an experiment to grab a banner with telnet and perform the task using Netcat utility. Using Nmap find open ports on a system Using Nmap find the machines which are active Using Nmap find the version of remote OS on other systems Using Nmap find the version of s/w installed on other system Perform an experiment to demonstrate how to sniff for router traffic by using the tool Wireshark. Perform an experiment to show how to use DumpSec Perform a	

Units	Lecture Hours
wireless audit of an access point / router and decrypt WEP and WPA. Perform an experiment to sniff traffic using ARP poisoning. Demonstrate intrusion detection system (ids) using any tool e.g., Snort or any other s/w Install rootkits and study variety of options Generating password hashes with openssl Setup a honey pot and monitor the honeypot on network Install JCrypt tool (or any other equivalent) and demonstrate asymmetric, symmetric crypto algorithm, hashand digital/PKI signature Install IPCop on a linux system and learn all the function available on the software. Use John the ripper to crack password Use IP Spoofing for packet transfer Use and Implement SQL injection	

Examination Scheme:

Components	Class Assessment	End Term
Weightage (%)	50	50

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

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

Year IV Semester VII

SEMESTER VII

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CSE121	Netwo	CO1214	3	1	2	1	2	1	2	-	1	-	-	2	3	3	1
49	rk	9.1															
	Security Lab	CO1214 9.2	3	2	1	3	3	2	3	-	1	-	-	2	2	2	3
		CO1214	3	3	1	2	2	2	1	-	3	-	-	2	3	3	3

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
		9.3															
		CO1214	2	2	2	3	3	2	1	-	2	-	-	3	3	2	1
		9.4															
		CO1214	2	3	2	1	3	1	1	-	3	-	-	2	1	2	3
		9.5															
		CO1214	2.	2.	1.	2.	2.	1.	1.	-	2.	-	-	2.2	2.4	2.4	2.2
		9	6	2	6	0	6	6	6		0						

CSE15144	Technical Seminar	L	T	P	C
Version 1.0	Contact Hours - 30	0	0	2	1
Pre-requisites/Exposure	Knowledge on Computer domain				
Co-requisites	--				

Course Objectives:

- To develop skills in doing literature survey, technical presentation and report preparation.
- To enable project identification and execution of preliminary works on final semester project
- Know the components and structure of mobile application development frameworks for Android andwindows OS based mobiles.
- Understand how to work with various mobile application development frameworks.
- Learn the basic and important design concepts and issues of development of mobile applications.
- Understand the capabilities and limitations of mobile devices.

Course Outcomes:

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 andmanager

CO3. Plan for lifelong learning towards industry readiness

CO4. Build the ability to identify an engineering problem, analyze it and propose a work plan toSolve it.

CO1: Understand GUI components, Layout Managers and Event ListenersCO2 : Create basic applications using databases

CO3: Apply Android Service based modules to create advanced applicationsCO4 : Solve issues related to notifications and alert

Course Description:

The course involves presentation and report submission by every student. Reference search and technical writing skillsalong with effective presentation skills are focused. The course strengthens the research attributes including literature survey.

This course contains several key lab assignments to give an overview of all the components of android development

Course Content:

Units	Lecture Hours
List of Experiments Develop an application that uses GUI components, Font and Colors. Develop an application that uses Layout Managers and event listeners. Develop a native calculator application. Write an application that draws basic graphical primitives on the screen. Develop an application that makes use of database. Develop an application that makes use of RSS Feed. Implement an application that implements Multi-threading. Develop a native application that uses GPS location information. Implement an application that writes data to the SD card. Implement an application that creates an alert upon receiving a message. Write a mobile application that creates alarm clock.	

Examination Scheme:

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

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

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

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	P O5	PO 6	P O7	P O 8	P O9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE15 144	Techni cal Semin ar	CO1514 4.1	2	2	2	2	3	3	2	-	3	-	-	3	3	1	3
CSE15 144	Techni cal Semin ar	CO1514 4.2	1	2	2	2	2	2	1	-	3	-	-	3	3	2	1
CSE15 144	Techni cal Semin ar	CO1514 4.3	3	2	2	3	2	1	2	-	1	-	-	3	1	3	3
CSE15 144	Techni cal Semin ar	CO1514 4.4	1	3	3	2	3	3	3	-	1	-	-	2	2	1	3
CSE15 144	Techni cal Semin ar	CO1514 4	1. 75	2. 25	2. 25	2. 25	2. 5	2. 25	2. 0	-	2. 0	-	-	2.7 5	2.2 5	1.7 5	2.5

Course Code	Course Name	COs	P O1	PO 2	P O3	PO 4	P O5	PO 6	P O7	P O8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE151	Techni	CO1514	1	2	3	3	3	1	3	-	3	-	2	1	1	2	3

44	**cal Seminar**	**4.1**															
44	cal Seminar	CO1514 4.2	2	2	3	2	2	2	1	-	1	-	2	3	2	1	2
44	cal Seminar	CO1514 4.3	2	2	3	2	2	3	2	-	1	-	2	2	1	2	1
44	cal Seminar	CO1514 4.4	3	3	3	2	3	3	2	-	2	-	2	2	3	3	1
44	cal Seminar	CO1514 4	2. 0	2. 25	3. 0	2. 25	2. 5	2. 25	2. 0	-	1. 75	-	2.0	2.0	1.7 5	2.0	1.7 5

ECE11046	**Digital Signal Processing**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours 45**	**3**	**0**	**0**	**3**
Pre-requisites/Exposure	**12th level Mathematics, Knowledge of Signal and Systems**				
Co-requisites	**--**				

Course Objectives:

- To get basic idea about basic of Signals, Systems and Signal Processing.
- To analyze discrete time signals using Fourier and Z-Transform
- To familiarize with the different Structures of Discrete-Time Systems
- To acquire the knowledge of different filter design. Course Outcomes
- On completion of this course, the students will be able to
- CO1. Illustrate the basic of Signals, Systems and Signal Processing CO2. Examine the discrete time signals using Fourier and Z-TransformCO3. 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:

Units	**Lecture Hours**
Unit-I: Introduction to Digital Signal Processing: Types of Signal and systems, Sampling theorem, Frequency domain representation of sampling, Reconstructions ofband limited signals from its samples, Aliasing, Linear Time Invariant (LTI) system, Stability and causality.	**7**
Unit-II: 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 FourierAnalysis, All pass systems, Minimum/Maximum phase systems, Discrete Cosine Transform.	**11**
Unit-III: 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	**09**

Units	Lecture Hours
Unit-IV: 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, Designof FIR differentiators, Design of Hilbert transformers	**09**
Unit-V: IIR Filter Design Design of Discrete-time IIR filters from Continuous-time Filters: Filter design by Impulse invariant and bileartransformation method: Butterworth, Chebyshev and Elliptic approximation Filter, Frequency transformation.	**09**

Text Books:

- Digital Signal Pro cessing Principles, Algorithms and Applications by J. G. Proakis and D. G. Manolakis, 4thEdition, Pearson
- Discrete Time Signal Processing by A.V. Oppenheim, R. W. Schafer, & John R. Buck, , 2nd Edition, PrenticeHall, 1999.

Reference Books:

- Digital Signal Processing: Fundamentals and Applications Li Tan, Academic Press, Elsevier.
- Digital Signal Pro cessing S. Salivahan, A. Vallavraj and C. Gnanapriya, TMH.

Modes of Evaluation:

Quiz/Assignment/ presentation/ extempore/ Written ExaminationExamination Scheme:

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

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
ECE11 046	Digital Signal Process ing	CO1104 6.1	2	3	3	2	3	3	1	-	2	-	-	2	3	1	2
ECE11 046	Digital Signal	CO1104 6.2	2	3	3	1	3	1	2	-	2	-	-	3	2	3	3

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
	Process ing																
		CO1104 6.3	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**-**	**3**	**-**	**-**	**1**	**2**	**1**	**1**
		CO1104 6.4	3	2	3	3	2	3	2	-	2	-	-	2	3	2	1
		CO1104 6.5	3	2	2	2	2	1	2	-	3	-	-	3	3	3	1
		CO1104 6	2. 6	2. 4	2. 6	2. 2	2. 6	2. 2	2. 0	-	2. 4	-	-	2.2	2.6	2.0	1.6

		L	T	P	C
ECE11048	**VLSI Systems Design**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours 45**	**3**	**0**	**0**	**3**
Pre-requisites/Exposure	**12th level Math ematics, Knowledge of 12th level**				
Co-requisites	**Understanding of Electronic Devices, Understanding of Analog Electronics**				

Course Objectives:

- To help to understand the functionality of VLSI design.
- To familiar with different types of VLSI fabrication technology
- To explain the use of MOS and CMOS Circuits
- To acquire the knowledge of fabrication of VLSI chip.
- To study the system hardware design. Course Outcomes
- On completion of this course, the students will be able toCO1. 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 ofSemiconductor 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 millionsof MOS transistors onto a single chip. VLSI began in the 1970s when MOS integrated circuit chips were widelyadopted, 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 alimited 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:

Units	Lecture Hours
Unit-I: Introduction to VLSI Design: Historical Perspective and Future 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.	**9**
Unit-II: 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.	**9**
Unit-III: 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; RCCircuit 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: StaticDissipation, Dynamic Dissipation.	**9**

Units	Lecture Hours
Unit-IV: 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 DRAMCell; Non-volatile memories: MOSFET nonvolatile memory devices, Flash Memory Arrays, Floating-Gate Non-volatile Memory Cells, Nonvolatile Memory Cells with Charge Stored in Insulator	**9**
Unit-V: VLSI system hardware design Basics of system hardware design: Hierarchical design using top-down and bottom-up methodology, System partitioningtechniques, 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. Testingin VLSI: Defects, Fault Models, Path Sensitization,Scan, Built-in-self Test (BIST), IDDQ.	**9**

Text Books:

- 1. Digital Integrated Circuit, J.M.Rabaey, Chandrasan, Nicolic, Pearson Education,2nd edition 20032.

Reference Books:

- 1.
- PHI 3rd
- 2.

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

Course Code	Cours e Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
ECE110	VLSI	CO1104	3	2	3	3	1	1	3	-	3	-	-	1	1	1	1
48	Syste	8.1															
	ms	CO1104	3	2	3	3	3	3	3	-	3	-	-	3	2	1	1
	Desig	8.2															
	n	CO1104	3	3	2	2	2	2	1	-	1	-	-	2	1	3	1
		8.3															
		CO1104	2	3	3	2	2	2	2	-	3	-	-	2	2	2	2
		8.4															
		CO1104	3	2	2	3	3	2	1	-	3	-	-	3	1	2	3
		8.5															
		CO1104	2.	2.	2.	2.	2.	2.	2.	-	2.	-	-	2.2	1.4	1.8	1.6
		8	8	4	6	6	2	0	0		6						

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:

- Prepare engineering students to function in the business and management side ofprofessional engineering practice.
- Help students in general to analyse, understand and explain the past, present economicconditions of the country.

- To forecast the future course of changes and development through their knowledge ofpolicies and programmes set by the governments and other development agencies.
- Evaluate the economic theories, cost concepts and pricing policies.5.Apply the concepts of financial management for project appraisal.
- To introduce students how to design static webpage using HTML and CSS
- To provide knowledge on web architecture, web services, client side and server side scripting technologies tofocus on the development of web-based information systems and web services
- To provide skills to design interactive and dynamic web sites
- To develop students knowledge for implementing web applications using PhP
- students how to design static webpage using HTML and CSS
-
- To intro duce
- To provide knowledge on web architecture, web services, client side and server side scripting technologies to focus on the development of web-based information systems and web services
- To provide skills to design interactive and dynamic web sites
- To develop students knowledge for implementing web applications using PhP

Course Outcomes:

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

CO1. Illustrate the basic economic concepts and make economic analyses in the decisionmaking.

CO2. Apply principals of economics to analyse the behaviour of consumers and producers ina 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.

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

CO1: Design a static webpage by applying HTML elementsCO2: Apply CSS concepts for designing HTML web pages.

CO3: Develop DHTML pages by using JavaScript with DOM eventsCO4: Implement a webpage with database connectivity using PhP CO5: Create rich internet application using XML.

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:

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 morethan 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.

The main objective of this course is on the World Wide Web as a platform for interactive applications, content publishingand 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 andtransforming web content, interactive graphics and multimedia content on the web, client-side programming using JavaScript.

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Course Content:

Units	Lecture Hours
Module-1: Basic Concepts of Economics Introduction to the Literature of Microeconomics centering around Decision Making at Individual Level. Some Fundamental Concepts: Maximization, Equilibrium and Efficiency.	**10**
Module-2: Theories of Economics The Theory of Consumer Choice and Demand, the Theory of Supply, market equilibrium, market structure, market failure and	**12**

Units	Lecture Hours
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 Budget plan, estimation of the project cost, prices, fees and cost recovery, financing of recurrent costs, sustainability ofthe activities generated by the project.	**5**
Module-4: Economic Feasibility Study Problem of pricing under oligopoly, problem of market stagnation, problem of volatility in open economy, problem of global meltdown, problem of financing a project.	**12**
Module-5: Project Report Facets of project viability commercial, technical, financial, outline of a model project report, a real life case study. Suggested assignments to be framed based on the following Programming Language such asHTML, 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 someE-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) inOnline 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 themtogether, or divide them on request. 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	**6**

Units	Lecture Hours
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:

- R. Panneersalvam, Engineering Economics, 2nd Ed., Prentice Hall of India, 2014.
- James Riggs, Engineering Economics, 4th Ed., McGraw Hill Education, 2004.
- “Web Design The Complete Reference”, Thomas Powell, Tata McGraw-Hill

Reference Books:

- Donald G. Newnan, Ted G. Eschenbach and Jerome P. Lavelle, Engineering Economic Analysis, 13th Ed.,Oxford University Press, 2017.
- Chan S. Park, Contemporary Engineering Economics, 6th Ed., Pearson, 2015.
- -Hill
- -Hill The Easy Guide to Operating Systems,
- Larry Miller, 2012.
- “PHP : The Complete Reference”, Steven Holzner, Tata McGraw-Hill The Easy Guide to Operating Systems, Larry Miller, 2012.
- “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 Course Outcomes (COs) and Program Outcomes (POs):

1=weakly mapped

1=weakly mapped

2= moderately mapped 3=strongly mapped

Course Code	Course Name	COs	PO 1	PO 2	P O 3	PO 4	P O 5	P O 6	PO 7	P O 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
ECO11 505	Econo mics for Engine ers	CO1150 5.1	2	3	3	2	2	2	2	-	1	-	-	3	3	1	1
ECO11 505	Econo mics for Engine ers	CO1150 5.2	2	1	3	2	3	3	2	-	2	-	-	3	3	1	2
ECO11 505	Econo mics for Engine ers	CO1150 5.3	1	1	2	3	2	3	2	-	1	-	3	2	2	3	1
ECO11 505	Econo mics for Engine ers	CO1150 5.4	2	2	2	2	1	2	3	-	1	-	3	3	3	3	1
ECO11 505	Econo mics for	CO1150 5	1. 75	1. 75	2. 5	2. 25	2. 0	2. 5	2. 25	-	1. 25	-	3.0	2.7 5	2.7 5	2.0	1.2 5

Course Code	Course Name	COs	PO 1	PO 2	P O 3	PO 4	P O 5	P O 6	PO 7	P O 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
	Engine ers																

ECO21=1m5o mappe 3=stro mapped	Econo diecrsatelfyor dEngine negly	-	2	3	2	-	2	-	-	-	-	2	3	2	-	2	

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
ECO11	Econo	CO1150	3	3	1	2	1	3	1	-	1	3	-	2	3	2	2
505	mics for	5.1															
	Enginee rs	CO1150 5.2	3	1	1	3	1	3	2	-	1	3	-	1	1	1	1
		CO1150	1	1	2	3	3	3	3	-	2	2	-	1	2	1	1
		5.3															
		CO1150	1	2	3	3	3	3	2	3	1	-	-	2	2	1	3
		5.4															
		CO1150	2	3	2	1	3	2	1	2	1	-	-	2	1	1	3
		5.5															
		CO1150	2.	2.	1.	2.	2.	2.	1.	2.	1.	2.6	-	1.6	1.8	1.2	2.0
		5	0	0	8	4	2	8	8	5	2	7					

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE12	Web	CO1214	3	3	2	3	1	2	2	-	3	3	-	2	3	1	2
143	Technol	3.1															
	ogy Lab	CO1214	2	3	1	2	2	2	1	-	1	2	-	2	1	3	1
		3.2															
		CO1214	1	3	2	2	1	2	3	-	3	3	-	1	1	1	2
		3.3															
		CO1214	1	3	3	1	3	2	1	3	1	-	-	2	3	3	3
		3.4															
		CO1214	3	1	3	1	2	2	3	3	2	-	-	2	2	3	1
		3.5															
		CO1214	2.	2.	2.	1.	1.	2.	2.	3.	2.	2.6	-	1.8	2.0	2.2	1.8
		3	0	6	2	8	8	0	0	0	0	7					

MGT11402	**Industrial Management**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours - 45**	**3**	**0**	**0**	**3**
Pre-requisites/Exposure	**Basic Calculation Skill**				
Co-requisites	**-**				

Course Objectives:

- To enable students to understand operational complexities of a business.
- To enable students to conceptualize the process, functions and theories of management.
- To enable students to provide knowledge about quality control processes.

- To enable students to conceptualize different strategies relating to people management

Course Outcomes:

CO1 Understand the concepts related to Industrial Management. CO 2 Demonstrate skills to perform Different Managerial Functions

CO3 Define and analyze the importance of Quality control procedures.

CO4 Illustrate different techniques to be used in Materials Management process CO 5 Understand the concepts of production planning and implications of the sameinindustrial management processes.

CO6 Evaluate importance of project management and its applications throughPERT CPM method.

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

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 thinkcritically 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:

Units	Lecture Hours
Module-1: Introduction [] Industrial management - Introduction: Concept, Development, application and scope of Industrial Management. Productivity: Definition, measurement, productivity index, types of production system,Industrial Ownership.	**6**
Module-2: Managerial Functions [] Management Function: Principles of ManagementTime and motion study, work simplification process charts	**10**

Units	Lecture Hours
andflow diagrams, Production Planning. Inventory Control: Inventory, Cost, Deterministic Models, and Introduction to supply chain management.	
Module-3: Quality Assurance [] Quality Control: Process control, SQC, Control charts, Single, Double and Sequential Sampling,Introduction to TQM.	**6**
Module-4: Materials Management [] Fundamentals of Materials Management; Material cycle; Forecasting; Material Classification-need and usage, Singleand Multidimensional classifications; Materials Codification-Usage, Codificationtypes;	**8**
Module-5: Production Planning [] Production Planning and Materials Requirements, Materials Procurement; Tendering; Types of Tenders, Storage and warehousing concepts, Receipt, Warehouse type, Layout, issue of materials andUpdation of records; Manpower and equipment;	**8**
Module-6: Project Management [] 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).	**7**

Text Books:

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

Reference Books:

- Gopal Krishnan &Sundarsan: Material Management: An Integrated Approach, Prentice HallofIndia Private Limited, New Delhi, 2003
- Industrial Engineering and Management by OP Khanna, DhanpatRai Publications, Delhi. ManagementInformation Systems by Larry Long (Prentice Hall)
- Industrial Management by VK Sharma, OP Harkut.

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

Course Code	Course Name	COs	P O1	P O2	P O3	P O 4	P O5	P O6	P O7	P O 8	P O9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
MGT11	Industria	CO114	3	1	2	3	1	3	1	-	1	-	-	2	1	3	3
402	l	02.1															
	Manage ment	CO114 02.2	1	1	3	2	3	3	1	-	2	-	-	3	3	2	2
		CO114	2	1	2	3	1	1	1	2	2	-	-	3	2	1	1
		02.3															
		CO114	3	2	1	3	1	3	2	-	1	-	-	2	2	2	3
		02.4															
		CO114	2	1	1	3	2	3	2	-	1	-	-	2	3	2	2
		02.5															
		CO114	3	2	2	1	3	1	3	2	1	-	2	3	2	1	2
		02.6															
		CO114	2.	1.	1.	2.	1.	2.	1.	2.	1.	-	2.0	2.5	2.1	1.8	2.1
		02	33	33	83	5	83	33	67	0	33				7	3	7

CSE11036	**Cloud Computing**	**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	**Knowledge of Logical Reasoning and Analysis**				

Course Objectives:

- To introduce the fundamental concepts of cloud computing, including its evolution, enabling technologies, and service models.

- To explore cloud infrastructure, focusing on datacenter design, components, and challenges.
- To provide an understanding of virtualization and its role in cloud computing.
- To familiarize students with cloud storage systems, distributed file systems, and cloud databases.
- To impart knowledge about distributed programming models and analytics frameworks for the cloud.

Course Outcomes:

CO1: Understand the evolution, architecture, service models, and challenges of cloud computing. CO2: Analyze the components, design considerations, and challenges of cloud data centers. CO3: Demonstrate knowledge of virtualization techniques and their applications in cloud computing. CO4: Explore cloud storage solutions, distributed file systems, and cloud databases. CO5: Apply distributed programming models and analytics frameworks for processing large-scale data in the cloud.

Course Description:

This course provides an in-depth introduction to cloud computing, covering its evolution, service and deployment models, and enabling technologies. It delves into cloud infrastructure design, data center components, and challenges, with a focus on virtualization techniques. Students will learn about cloud storage systems, including distributed file systems and cloud databases, and gain hands-on knowledge of distributed programming models such as Hadoop, Spark, and GraphLab. The course prepares students to understand and apply cloud computing concepts to real-world scenarios.

Course Content:

Units	**Lecture Hours**
Unit-I: 9 lecture hours	
Module-1: 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.	

Units	Lecture Hours
Unit-II: 12 lecture hours	
Module-2: Cloud Infrastructure: 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: 10 lecture hours	
Module-3: Virtualization (CPU, Memory, I/O); Case Study: Amazon EC2; Software Defined Networks (SDN); Software Defined Storage (SDS)	
Unit-IV: 9 lecture hours	
Module-4: Cloud Storage Introduction to Storage Systems; Cloud Storage Concepts Distributed File Systems (HDFS, Ceph FS); Cloud Databases (HBase, MongoDB, Cassandra, DynamoDB) ; Cloud Object Storage (Amazon S3, OpenStack Swift, Ceph)	
Unit-V: 5 lecture hours	
Module-5: Programming Models Distributed Programming for the Cloud; Data-Parallel Analytics with Hadoop; MapReduce (YARN); Iterative Data-Parallel Analytics with Apache Spark ; Graph-Parallel Analytics with GraphLab 2.0 (PowerGraph)	

CSE11081	**Fundamentals of Quantum Computing**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours - 45**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Elementary Linear Algebra**				

Units		Lecture Hours
Co-requisite	**Knowledge of Logical Reasoning and Analysis**	

Course Objectives:

- To get acquainted with knowledge of quantum computing
- To analyze the quantum circuits
- To learn Qiskit for quantum programming
- To utilize the modern quantum computing tools
- To understand example cases and explore its applications

Course Outcomes:

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

CO1. Understand the fundamentals of quantum computing

CO2. Apply quantum gates with single-qubit / multi-qubit and Construct simple quantum circuits

CO3. Develop quantum programs using Qiskit

CO4. Incorporate the Quantum Algorithms: Deutsch-Jozsa, Grover's Search and BB84

CO5. Demonstrate the different Quantum Simulators (IBM / CDAC) to solve real world applications

Course Description:

Quantum computing promises exponential speedups for a class of important problems. With the rapid advancement of technology, Quantum computers are now available with more than hundred qubits and expected to cross thousand in near future. At the outset, the objective of this course is to provide students in computer science and information technology with the fundamental background on quantum computing and equip them with the skills to write code and optimize quantum programs on real quantum computers in IBM. A basic introduction to quantum mechanics, linear algebra and familiarity with Python essentials and Qiskit programming is delivered in this course. It covers the important aspects of quantum computing such as, quantum entanglement, superposition, different quantum gates to produce quantum circuits. So, this course introduces an elementary quantum computing using the IBM quantum computer and associated simulators.

Course Content:

Units	Lecture Hours
Unit-I: Introduction - Quantum Mechanics, Turing machine concepts, Church—Turing Thesis, Polarization of light, The Circuit Model of Computation, Reversible Computation. Vector Algebra: basis vectors and orthogonality, complex numbers and preliminaries, Bloch Sphere, inner product and Hilbert spaces, matrices and tensors, unitary operators and projectors, Dirac notation	**09**
Unit-II: Quantum Gates and Circuits- Model of computation (movement on Bloch Sphere), Quantum states, Single quantum / Pauli gates - X, Y, Z, S, H gates, multi-qubit gates - CNOT and Toffoli, Single qubit notation, Circuits using Qubits and gates, Measurement of Qubit. Hands on Qiskit - Installing and configuring Qiskit, building first quantum circuit: $\|0\rangle \rightarrow H \rightarrow$ Measure and Visualize circuits and states. Simulation results using qubits in Qiskit and measurement	**09**
Unit-III: Quantum Computation - no cloning theorem, superposition, quantum entanglement, Bell states and Bell inequalities. Pure and mixed state, Quantum Circuits, Pauli, Hadamard, phase, quantum teleportation universality of two qubit gates reversible computing. Hands on Qiskit - Bell States and Bell Inequalities, GHZ states and circuits, Entanglement and Teleportation.	**09**
Unit-IV: Quantum Algorithms - Classical computations on a quantum computer, Quantum parallelism, Deutsch's algorithm, The Deutsch–Jozsa algorithm, Grover's Search algorithm Hands on Qiskit - Demonstration of Deutsch's algorithm, The Deutsch–Jozsa algorithm, Grover's Search algorithm using Qiskit and verification of results using quantum simulation	**09**
Unit-V: Quantum Information and Cryptography: Quantum noise: Gate noise and channel noise, Shannon entropy, classical cryptography, quantum cryptography, Quantum Key Distribution – BB84 and B92 protocols. Hands on Qiskit – Demonstration of BB84 protocol varying qubits and noises using Qiskit, verification of results using quantum simulation and in IBM quantum computer.	**09**

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

1 = Weakly Mapped

2 = Moderately Mapped

3 = Strongly Mapped

Course Code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSEXXXXX	Fundamentals of Quantum Computing	COXXXXX.1	3	3	2	2	1	-	-	-	2	1	1	3	1	3	3
CSEXXXXX	Fundamentals of Quantum Computing	COXXXXX.2	3	3	2	1	3	-	-	-	2	2	2	3	3	3	3
CSEXXXXX	Fundamentals of Quantum Computing	COXXXXX.3	3	2	3	3	3	-	-	-	3	2	2	2	2	2	2
CSEXXXXX	Fundamentals of Quantum Computing	COXXXXX.4	3	2	3	2	2	-	-	-	2	3	3	3	2	2	2
CSEXXXXX	Fundamentals of Quantum Computing	COXXXXX.5	3	2	3	2	3	-	-	-	3	2	2	3	2	2	3
CSEXXXXX	Fundamentals of Quantum Computing	COXXXXX	3	2.4	2.6	2.0	2.4	-	-	-	2.4	2.0	2.0	2.8	2.0	2.4	2.6

MEE11060	Computer-Aided Simulation & Analysis	L	T	P	C
Version 1.0	**Contact Hours - 45**	**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 volumemethod 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:

Units	Lecture Hours
Module-1: Introduction Introduction: Simulation: a tool, advantages and disadvantages of simulation, areas of application, systems and systemenvironment, components of a system, discrete and continuous systems, discrete event system simulation.	**9**
Module-4: Basic Finite Element Analysis 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.	**12**

Units	Lecture Hours
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	**12**
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	**12**

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

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
MEE11	Comput	CO1106	1	1	3	3	1	1	1	-	1	-	-	3	3	1	3
060	er-	0.1															
	Aided	CO1106	3	3	3	3	2	1	3	-	3	-	-	3	2	1	1
	Simulat	0.2															
	ion & Analysi s	CO1106 0.3	2	1	2	1	1	2	1	-	3	-	-	3	1	3	1
	ion & Analysi s	CO1106	3	1	1	2	3	3	3	-	3	2	-	2	2	2	2
		0.4															
		CO1106	3	1	2	2	3	2	3	-	1	-	-	3	3	3	1

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
		0.5															
		CO1106	2.	1.	2.	2.	2.	1.	2.	-	2.	2.0	-	2.8	2.2	2.0	1.6
		0	4	4	2	2	0	8	2		2						

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:

- Outline the history of computing devices.
- Develop programs for microprocessor and microcontrollers.
- 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 of8051 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 anexternal 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 using8051 I/O ports.

Course 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 willbe able to incorporate these concepts into their electronic designs for other courses where control can be achieved via amicroprocessor/controller implementation.

Course Content:

Units	**Lecture Hours**
Unit-I: 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.	**9**
Unit-II: 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.	**9**
Unit-III: 8051 Stack, I/O Port Interfacing and Programming: 8051 Stack, Stack and Subroutine instructions. Assembly language program examples on subroutine and involvingloops. Interfacing simple switch and LED to I/O ports to switch on/off LED with respect to switch status.	**10**
Unit-IV: 8051 Timers and Serial Port: 8051 Timers and Counters Operation and Assembly language programming to generate a pulse using Mode-1 and asquare 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.	**8**
Unit-V: 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. Janice Gillespie Mazidi and Rollin D. McKinlay; PHI, 2006 / Pearson, 2006. 2.	**9**

Reference Books:

- 1. -
- 93-
- 329-0125-4.
- 2.
- Education, 2005.

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

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
ECE11	Microcontr	CO110	3	1	3	3	2	1	3	-	2	-	-	1	1	1	2
049	**oller and Interfacing**	**49.1**															
049	oller and Interfacing	CO110 49.2	3	2	1	3	3	1	2	-	1	-	-	2	3	3	1
049	oller and Interfacing	CO110 49.3	2	1	1	1	3	2	2	-	2	-	-	3	1	1	1
049	oller and Interfacing	CO110 49.4	3	2	1	3	3	3	3	-	3	-	3	3	1	2	1
049	oller and Interfacing	CO110 49.5	3	3	3	2	3	2	3	-	3	-	-	2	3	2	2
049	oller and Interfacing	CO110 49	2. 8	1. 8	1. 8	2. 4	2. 8	1. 8	2. 6	-	2. 2	-	3.0	2.2	1.8	1.8	1.4

BIT11074	**Bioinformatics**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours - 45**	**3**	**0**	**0**	**3**
Pre-requisites/Exposure	**Plus two level science**				
Co-requisites	**--**				

Course Objectives:

- To provide those students with apt the knowledge to bioinformatics
- It will also provide in depth knowledge of the general database, and biological databases.
- Elaborating the alignment techniques
- Explore the knowledge of the applications of bioinformatics Course Outcomes
- On completion of this course, the students will be able to
- CO1. explain basic of bioinformatics and its techniques and tools.
- CO2. demonstrate the biological database and their role in bioinformatics.CO3. interpret the knowledge of sequence alignments techniques
- CO4. explain protein structure and functional analysis
- CO5. demonstrate the applications of bioinformatics and current research activities in the field ofbioinformatics

Course Description:

The core- ductory 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:

Units	**Lecture Hours**
Unit-I: (Contact Hours 9) Introduction & NCBI:	
Unit-II: (Contact Hours 9) Biological databases: Biological databases; primary sequence databases; Composite sequence databases; Secondary databases; composite protein pattern databases; structure classification databases;	

Units	Lecture Hours
Genome Information Resources; DNA sequence databases; specialized genomic resources.	
Unit-III: (Contact Hours 9) Alignment techniques: Pairwise Alignment Technique; Database searching; algorithms & programs; comparing two sequences; identity & similarity; global & local alignments; pairwise database searching; Multiple sequence Alignment; computational Complexity; Manual methods; Simultaneous methods; Progressive methods; Databases of multiple alignment; Secondary database searching; Analysis packages.	
Unit-IV: (Contact Hours 9) Protein analysis: Protein identity based on composition, Motifs & patterns; secondary structure prediction; specializedsecondary structures; tertiary structures.	
Unit-V: (Contact Hours 9) Introduction to perl: Using PERL to facilitate biological analysis; Strings, numbers, variables; Basic input and output; Filehandles; Conditional Blocks and loops; Pattern matching; Arrays-Hashes.. SUGGESTED BOOKS: T K Attwood and D J Parry-edition, 2005.	

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

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
BIT11 074	Bioinform atics	CO110 74.1	3	3	3	2	2	3	1	-	2	-	-	3	1	2	2
BIT11 074	Bioinform atics	CO110 74.2	2	3	3	2	3	2	3	-	3	-	-	2	2	1	3

		CO110 74.3	**2**	**2**	**3**	**2**	**1**	**3**	**1**	**-**	**3**	**-**	**-**	**3**	**1**	**2**	**1**
		CO110 74.4	1	1	2	1	3	2	3	-	1	-	-	3	2	3	2
		CO110 74.5	3	3	3	2	3	3	1	2	2	-	-	3	1	3	2
		CO110 74	2. 2	2. 4	2. 8	1. 8	2. 4	2. 6	1. 8	2. 0	2. 2	-	-	2.8	1.4	2.2	2.0

CSE11150	**Operating System**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours 45 Hours**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Data structures, Programming Languages, and Computer Architecture.**				
Co-requisite	**NIL**				

Course Objectives:

- To understand the students to study the basic principles and functionality of operating systems
- To provide the students to identify the concepts of CPU scheduling, concurrent processes, deadlock
- To allow the students to identify the significance of memory management and virtual memory.
- To enhance the skill of students to identify the disk scheduling, file systems, and device management.
- To understand the students to explain the performance trade-offs inherent in advance OSimplementation.

Course Outcomes:

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

CO1: Understand functionalities and features of Operating System

CO2: Analyze various scheduling algorithms and threading concepts to identify a suitable algorithm for aGiven criteria.

CO3: Assess various solutions for critical Section problem. Applying deadlock avoidance principles andCheck for the occurrence of deadlock.

CO4: Explain different memory management techniques and its uses. Structuring an overview of fileSystems 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 toprovide 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 systemarchitecture.

Course Content:

Units	**Lecture Hours**
Unit-I: 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.	**09**
Unit-II: Introduction to Process and Process Scheduling : Process Management Process concept- process scheduling, operations, Inter process communication. Multi Threadprogramming models. Process scheduling criteria and algorithms (FCFS, SJF, Priority, RR, Multilevel queue Scheduling), and their evaluation.	**09**
Unit-III: Inter-process Communication and Deadlock : Process synchronization, the critical- 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	**09**

Units	Lecture Hours
Unit-IV: 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.	**09**
Unit-V: Modern OS Architectures : Case Study on: Android, Windows 11, Mac, oxygen OS and other contemporary Operating system.	**09**

Examination Scheme:

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

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

1 = Weakly Mapped

2 = Moderately Mapped3 = Strongly Mapped

Course Code	Course Name	COs	P O1	P O2	P O3	P O4	P O5	P O6	P O7	P O8	P O9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE111	Operat	CO1115	2	2	3	1	3	1	2	-	2	-	-	2	3	3	3
50	ing	0.1															
	System	CO1115	2	2	2	3	3	3	2	-	3	-	-	1	2	2	3
		0.2															
		CO1115	3	3	2	2	1	3	3	-	3	-	-	2	1	1	3

Course Code	Course Name	COs	P O1	P O2	P O3	P O4	P O5	P O6	P O7	P O8	P O9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
		0.3															
		CO1115	2	2	2	1	2	3	1	-	1	-	-	1	2	1	1
		0.4															
		CO1115	3	1	2	2	3	2	3	-	2	-	-	3	3	2	1
		0.5															
		CO1115	2.	2.	2.	1.	2.	2.	2.	-	2.	-	-	1.8	2.2	1.8	2.2
		0	4	0	2	8	4	4	2		2						

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

Course Objectives:

- To provide the concepts of full stack web development
- Introduce the MERN stack to make students industry-ready

Course Outcomes:

CO1: Define basic concepts of HTML and CSS

CO2: Explain concepts of bootstrap, javascript and jquery

CO3: Apply concepts of Node.js to develop backends

CO4: Design databases for web applications

CO5: Build attractive front-end for web applications

Course Description:

This course will allow students to master both front and back-end development, becoming a full-stack developer bythe end of the course. They can build fully-fledged websites and web apps, master frontend development with Reactand will learn the latest technologies, including Javascript, React, Node and even Web3 development.

Course Content:

Units	Lecture Hours
Unit-I: HTML-Refresher, The Anatomy of an HTML Tag, HTML Lists, HTML Image Elements, HTML Links andAnchor 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	**10**
Unit-II: 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 ModulesIntroduction to Express.js, Express Servers,	**10**
Unit-IV: Database Design : SQL, Basic SQL commands, MongoDB CRUD Operations, Relationships, Database management with Mongoose.	**8**
Unit-V: Frontend Web Development : What is React, JSX and Babel, JSX Expressions, React Styling, Components, React Props, React DevTools, React Hooks, Forms, Event Handling.	**8**

Examination Scheme:

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

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

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

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE11 151	Advance d Web Technolo gies	CO1115 1.1	2	3	2	2	2	1	1	-	2	2	3	1	1	3	2
CSE11 151	Advance d Web Technolo gies	CO1115 1.2	2	3	2	2	2	1	2	-	1	2	2	1	3	3	2
CSE11 151	Advance d Web Technolo gies	CO1115 1.3	1	3	3	3	3	1	3	-	3	3	3	2	2	2	2
		CO1115 1.4	**3**	**2**	**3**	**3**	**2**	**2**	**3**	**-**	**2**	**2**	**3**	**2**	**2**	**1**	**1**
		CO1115 1.5	1	2	3	3	2	3	3	-	1	3	3	1	2	2	3
		CO1115 1	1. 8	2. 6	2. 6	2. 6	2. 2	1. 6	2. 4	-	1. 8	2.4	2.8	1.4	2.0	2.2	2.0

CSE11152	**Applied Machine Intelligence.**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours 45 Hours**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Basics of Algorithm, Linear Algebra, Probability, and Statistics**				
Co-requisite	**NIL**				

Course Objectives:

- To help the student to acquire knowledge of basics of artificial intelligent computing.
- To enable students to gain basic knowledge of machine learning.
- To incorporate the evolutionary computational knowledge.

- To enable students to acquire various problem solving, learning, and planning ability.
- To enable students to apply machine learning models to solve real-life problems

Course Outcomes:

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

CO1: Understand applications of Machine Learning in industry scenarios.

CO2: Analyse different parameters that control implementation of Machine Learning in a practicalscenario.

CO3: Explain different data modelling techniques

CO4: Compare among different practical implementations and their effects on businessCO5: 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

Course Content:

Units	Lecture Hours
Unit-I: Data Analysis Refresher : Descriptive Statistics, Feature Extraction, Curse of dimensionality, DimensionalityReduction, Types of Machine Learning Techniques, Neural Networks, CNNs, LSTMs	**9**
Unit-II: 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.	**9**
Unit-III: Computer Vision : Grayscale Image Processing, Detection of edges, shapes, textures and gradient based features,Image classification, feature	**9**

Units	Lecture Hours
extraction using CNNs, image denoising, image-to-image translation, image segmentation, object detection	
Unit-IV: Natural Language Processing tf-idf, bag-of-words, language models, POS-Tagging, dependency parsers, WordSense Disambiguation, Named Entity Recognition, Deep learning in language processing - word embeddings, glove, Word2Vec, Natural Language Generation, Translation, RNN, GRU, LSTMs, Transformers- BERT Transformer.	**9**
Unit-V: Modern Case Studies Sequential Analysis : Video processing with convolutional LSTMs Time Series Forecasting : Stock Market Predictions Graph based approaches : Bioinformatics	**9**

Examination Scheme:

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

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

1 = Weakly Mapped

2 = Moderately Mapped3 = Strongly Mapped

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE11	Applied	CO1115	2	2	1	2	1	1	2	-	2	-	-	1	1	2	1
152	Machine	2.1															
	Intellige nce.	CO1115 2.2	2	2	2	2	3	3	1	-	3	-	-	1	3	1	3
		CO1115	3	2	3	2	2	2	2	-	3	-	-	1	1	2	1

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
		2.3															
		CO1115	1	3	2	3	3	3	3	-	1	-	-	3	2	1	1
		2.4															
		CO1115	1	2	3	3	3	1	2	-	1	-	-	1	2	1	2
		2.5															
		CO1115	1.	2.	2.	2.	2.	2.	2.	-	2.	-	-	1.4	1.8	1.4	1.6
		2	8	2	2	4	4	0	0		0						

CSE11153	**Data Analysis**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours 45 Hours**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Discrete Mathematics, Calculus, Machine Learning**				
Co-requisite	**NIL**				

Course Objectives:

- To introduce fundamental concepts of data analysis
- To develop statistical models to represent data
- To provide intelligent solutions for data mining processes

Course Outcomes:

On the completion of this course the student will be able to CO1: Define different types of data analysis

techniquesCO2: Compare various statistical tests

CO3: Explain data using different types of data distributionsCO4: 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:

Units	**Lecture Hours**
Unit-I: 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.	**10**
Unit-II: 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.	**11**
Unit-III: 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 datasources	**12**
Unit-IV: Social Media and Text Analytics: Data preparation: Removing unwanted data, missing data handling Data Visualization: Introduction, Types of datavisualization, 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.	**12**

Examination Scheme:

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

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

1 = Weakly Mapped

2 = Moderately Mapped3 = Strongly Mapped

Course Code	Cours e Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE111	Data	CO1115	3	2	3	2	1	1	1	-	3	-	-	1	3	2	3
53	Analy	3.1															
	sis	CO1115	2	2	2	2	3	3	3	-	3	-	-	3	2	1	3
		3.2															
		CO1115	2	3	3	2	2	2	2	-	2	-	-	3	2	1	2
		3.3															
		CO1115	1	2	3	3	3	3	1	-	3	-	-	3	2	3	2
		3.4															
		CO1115	1	1	2	2	3	3	2	-	2	-	-	2	2	3	1
		3.5															
		CO1115	1.	2.	2.	2.	2.	2.	1.	-	2.	-	-	2.4	2.2	2.0	2.2
		3	8	0	6	2	4	4	8		6						

CSE11154	Cloud Architecture and Deployment	L	T	P	C

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

Version 1.0	**Contact Hours 45 Hours**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**NIL**				
Co-requisite	**NIL**				

Course Objectives:

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

Course Outcomes:

On the completion of this course the student will be able to CO1: Understand the fundamentals of Cloud Based

ApplicationsCO2: Explain different cloud computing architectures

CO3: Analyzing the designing code for cloud CO4: Evaluating the Delivery models of Cloud

ComputingCO5: 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:

Units	Lecture Hours
Unit-I: Introduction to Cloud Based Application 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 cloudapps. Understanding Cloud ecosystems what is SaaS/PaaS, popular APIs, mobile.	**9**
Unit-II: Cloud Architectures 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)	**9**
Unit-III: Designing Code For The Cloud 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.	**5**
Unit-IV: Overview of the Delivery models in Cloud Computing 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 andworkflow, IAAS architecture case study: AWS EC2	**10**
Unit-V: Private, Public and Hybrid Cloud Deployment Models 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	**12**

Examination Scheme:

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

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

1 = Weakly Mapped

2 = Moderately Mapped3 = Strongly Mapped

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE11	Cloud	CO1115	2	1	2	2	2	1	3	-	1	-	-	3	3	1	3

154	**Architecture and Deployment**	**4.1**															
154	Architecture and Deployment	CO1115 4.2	3	2	1	3	1	3	1	-	1	-	-	2	2	2	2
154	Architecture and Deployment	CO1115 4.3	2	3	3	2	3	2	2	-	2	-	-	3	1	3	2
154	Architecture and Deployment	CO1115 4.4	2	2	2	2	3	1	3	-	2	-	-	1	3	2	3
154	Architecture and Deployment	CO1115 4.5	3	3	3	2	1	1	1	-	1	-	-	1	3	1	3
154	Architecture and	CO1115 4	2. 4	2. 2	2. 2	2. 2	2. 0	1. 6	2. 0	-	1. 4	-	-	2.0	2.4	1.8	2.6

154	**Architecture and Deployment**	**4.1**															
	Deployment																

CSE11155	**Application Security**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours 45 Hours**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Web Technology**				
Co-requisite	**NIL**				

Course Objectives:

- To enable students to identify different security needs for different applications.
- To provide the fundamentals of E-Commerce application security requirements.
- To enhance the skill of students to identify security requirements of Web Applications.
- To allow students to identify challenging areas in a proposed security protocol for web applications.

Course Outcomes:

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

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 we b 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 securethe 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 qualityassurance testing.

Course Content:

Units	**Lecture Hours**
Unit-I: 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	**9**
Unit-II: 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.	**9**
Unit-III: 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.	**9**
Unit-IV: Web Application Security Controls: Defending Against Injection, Mitigating SQL Injection, Detecting SQL Injection, Prepared Statements, Generic	**9**

Units	Lecture Hours
Injection Defences, Exploiting Third-Party Dependencies, Methods of Integration, Self-Hosted Application Integrations.	
Unit-V	**9**

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

1 = Weakly Mapped

2 = Moderately Mapped3 = Strongly Mapped

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE11	Applicat	CO1115	2	3	2	2	2	3	1	-	2	-	-	2	3	2	3
155	ion	5.1															
	Security	CO1115	3	3	2	3	1	1	3	-	1	-	-	3	3	3	2
		5.2															
		CO1115	2	1	3	2	3	1	2	-	3	-	-	2	1	3	2
		5.3															
		CO1115	3	2	3	2	2	1	3	-	1	-	-	3	2	3	3
		5.4															
		CO1115	3	2	3	3	3	1	3	-	2	-	-	1	2	2	1
		5.5															
		CO1115	2.	2.	2.	2.	2.	1.	2.	-	1.	-	-	2.2	2.2	2.6	2.2
		5	6	2	6	4	2	4	4		8						

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

CSE12156	**Operating System Lab**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours 30 Hours**	**0**	**0**	**2**	**1**
Pre-requisite/Exposure	**Data structures, Programming Languages, and Computer Architecture.**				
Co-requisite	**NIL**				

Course Objectives:

- To introduce basic Unix commands, system call interface for process management, interprocess communicationand I/O in Unix.
- To understand the students to study the basic principles and functionality of operating systems.
- To provide the students to identify the concepts of CPU scheduling, concurrent processes, deadlock
- To allow the students to identify the significance of memory management and virtual memory.
- To enhance the skill of students to identify the disk scheduling, file systems, and device management.
- .

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 systemcalls 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 andCheck 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:

Units	**Lecture Hours**
Unit-I: Linux Commands/Shell Programming: tudy about the basics of Linux commands. lementation of shell scripting using conditional/branching statement. lementation of shell scripting using Loop statement. lementation of shell scripting using Array. lementation of shell scripting using String. lementation of shell scripting using Function and recursion.	**09**
Unit-II: Process Scheduling Algorithm: Simulate the following non-preemptive CPU scheduling algorithms to find turnaround time and waiting time. S b) SJF c) Priority Simulate the following non-preemptive CPU scheduling algorithms to find turnaround time and waiting time. rtest Remaining Time First b) Round Robin c) Priority Simulate multi-level queue scheduling algorithm considering the following scenario. All the processes in the system are divided into two categories system processes and user processes. System processes are to be given higher priority than user processes. Use FCFS scheduling for the processes in each queue.	**09**
Unit-III: Process Synchronization Problems /Deadlock: ulate producer-consumer problem using semaphores. ulate the concept of Dining-Philosophers problem. ulate Bankers algorithm for the purpose of deadlock avoidance.	**09**
Unit-IV: Memory Management Techniques: ulate page replacement algorithms O b) LRU c) Optimal ulate disk scheduling algorithms S b) SCAN c) C-SCAN Simulate selection partition algorithm a). Best Fit b). First Fit c). Worst Fit	**09**
Unit-V	**09**

Examination Scheme:

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

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

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

Course Code	Course Name	COs	P O1	P O2	P O3	P O4	P O5	P O6	P O7	P O8	P O9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE121	Operat	CO1215	3	1	3	3	2	3	2	-	1	-	-	3	1	1	1
56	ing	6.1															
	System Lab	CO1215 6.2	3	3	2	1	1	3	1	-	3	-	-	1	2	2	1
		CO1215	3	2	2	1	1	1	1	-	3	-	-	3	2	3	1
		6.3															
		CO1215	1	2	3	3	2	3	3	-	3	-	-	3	1	1	1
		6.4															
		CO1215	2	3	2	1	3	2	2	-	1	-	-	1	1	3	1
		6.5															
		CO1215	2.	2.	2.	1.	1.	2.	1.	-	2.	-	-	2.2	1.4	2.0	1.0
		6	4	2	4	8	8	4	8		2						

CSE12157	Advanced Web Technologies Lab	L	T	P	C
Version 1.0	**Contact Hours 30 Hours**	**0**	**0**	**2**	**1**
Pre-requisite/Exposure					

Course Code	Course Name	COs	P O1	P O2	P O3	P O4	P O5	P O6	P O7	P O8	P O9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3

Co-requisite	

Course Objectives:

- To provide the concepts of full stack web development
- Introduce the MERN stack to make students industry-ready

Course Outcomes:

CO1: Define basic concepts of HTML and CSS

CO2: Explain concepts of bootstrap, javascript and jquery

CO3: Apply concepts of Node.js to develop backends

CO4: Design databases for web applications

CO5: Build attractive front-end for web applications

Course Description:

This course will allow students to master both front and back-end development, becoming a full-stack developer by the end of the course. They can build fully-fledged websites and web apps, master frontend development with Reactand will learn the latest technologies, including Javascript, React, Node and even Web3 development.

Course Content:

Units	Lecture Hours
List of Experiments: Create a static HTML Page Create a stylised HTML Page with CSS Create a dynamic HTML Page with javascript elements Use bootstrap to create a carousel Create an express server to deploy a webpage Using Node.js and MongoDB create a login, registration page Create a profile page after login using reactJS Create a Employment Webpage Create a simple mouse based game using event listener Create a portal to behave as payment gateway Create a graph plotting webpage Create a webpage to create an online calculator Create a webpage for a e-commerce platform Create a webpage to deploy a messenger service.	

Units						Lecture Hours
CSE12158	**Applied Machine Intelligence Lab**	**L**	**T**	**P**	**C**	
Version 1.0	**Contact Hours 30 Hours**	**0**	**0**	**2**	**1**	
Pre-requisite/Exposure	**Basics of Algorithm, Linear Algebra, Probability, and Statistics**					
Co-requisite	**NIL**					

Course Objectives:

- To help the student to acquire knowledge of basics of artificial intelligent computing.
- To enable students to gain basic knowledge of machine learning.
- To incorporate the evolutionary computational knowledge.
- To enable students to acquire various problem solving, learning, and planning ability.
- To enable students to apply machine learning models to solve real-life problems

Course Outcomes:

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

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 businessCO5: 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

nse to the tremendous growth of the software development industry.

Course Content:

Units	Lecture Hours
Implement PCA using python Implement KNN Classification using python Implement KMeans Clustering using python Build a MLP using Pytorch Build a CNN using Pytorch Build an LSTM using Pytorch Edge Detection Shape Feature extraction, LBP and GLCM Features Implement a segmentation network using pytorch Import and deploy the YOLO-V3 in tensorflow Compute tf-idf from a set of documents Measure similarity between two sentence using word2vec embedding Use LSTMs to train a chatbot. Import and use the BERT transformer for language transaltion	

Modes of Evaluation:

Quiz/Assignment/Presentation/Extempore/ Written ExaminationExamination Scheme:

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

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSE12	Applied	CO1215	3	2	2	1	3	1	2	-	3	-	-	1	1	2	1
158	Machine	8.1															
	Intelligence Lab	CO1215 8.2	1	2	3	3	3	1	3	-	3	-	-	1	2	3	2
		CO1215	2	2	1	3	2	2	3	-	3	-	-	1	3	1	3
		8.3															
		CO1215	2	3	3	3	2	2	1	-	1	-	-	2	1	1	3
		8.4															

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
		CO1215	3	1	3	3	2	1	3	-	1	-	-	3	1	3	1
		8.5															
		CO1215	2.	2.	2.	2.	2.	1.	2.	-	2.	-	-	1.6	1.6	2.0	2.0
		8	2	0	4	6	4	4	4		2						

CSE12159	Data Analysis Lab	L	T	P	C
Version 1.0	Contact Hours 30 Hours	0	0	2	1
Pre-requisite/Exposure	Discrete Mathematics, Calculus, Machine Learning				
Co-requisite	NIL				

Course Objectives:

- To introduce fundamental concepts of data analysis
- To develop statistical models to represent data
- To provide intelligent solutions for data mining processes

Course Outcomes:

On the completion of this course the student will be able to CO1: Define different types of data analysis

techniquesCO2: Compare various statistical tests

CO3: Explain data using different types of data distributionsCO4: 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:

Units	Lecture Hours
List of Experiments Introduction to Data Analytics: Calculate mean, median and mode from a dataset Calculate variance and s.d. from a dataset Calculate the correlation between two sequences Perform Z-Test, T-Test, F-Test Perform Chi-square Test Implement Linear Regression Scatter Plots, Time-series plots, error bars line plots bar graphs frequency histograms Compute similarity between two images based on colour distribution Classify twitter texts into positive or negative sentiment classes	

Modes of Evaluation:

Quiz/Assignment/Presentation/Extempore/ Written

ExaminationExamination Scheme:

CSE12160	Cloud Architecture and Deployment Lab	L	T	P	C
Version 1.0	Contact Hours – 30 Hours	0	0	2	1
Pre-requisite/Exposure	Concept in Linux Operationg Syatem				
Co-requisite	NIL				

Course Objectives:

- Understand cloud architecture
- Explore the caveats of deploying cloud infrastructure

Course Outcomes:

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

Understanding the Basics of Virtualization

Demonstrate instances over different Operating Systems and Databases.

Explain Applications ove rCloud

Analyze Vitrtualization techniques on Linux nodes

Develop and design applications over cloud.

Course Description:

The course presents a top-down view of cloud computing, from applications and administration to programming and infrastructure. Its main focus is on parallel programming techniques for cloud computing and large-scale distributed systems that form the cloud infrastructure. The topics include Basics of Virtualization, Creating Instances on Different Operating Systems and Databases, Setting up Different Applications over Cloud, Creating nodes in Linux using VMWare and Developing Applications over Cloud. Students will study how to use different advanced virtualization tools and to able to design applications . Students will also have a concept of developing applications over cloud.

Course Content:

Units	Lecture Hours
Unit-I: Basics of Virtualization Desktop Virtualization using Chrome Remote Desktop Create Nested Virtual Machine(VM under another VM) Secure IOT integration with Cloud	**5**
Unit-II: Creating Instances on Different Operating Systems and Databases Create EC2 Linux instance on Amazon AWS and create SSH client configuration through PUTTY. Create WINDOWS Server instance in AWS and Microsoft Azure. Create MySQL database through AWS RDS. Connect AWS RDS through MySQL workbench from any remote location.	**9**
Unit-III: Setting up Different Applications over Cloud Setup Wordpress web application through Amazon AMI Create a PHP based web application using Elastic Beansta	**7**

Units	Lecture Hours
Unit-IV: Creating nodes in Linux using VMWare Install KVM emulator(Virtual Machine Manager) in Linux and Create Nested Virtual Machine(VM under another VM) Configure and run integrated software packeges from virtual appliances(VMWARE marketplace	**9**
Unit-V: Developing Applications over Cloud Message queue service using AWS SNS and SQS Creation of ChatBot using Amazon Lex Create virtual IT infrastructure cost of company and make component wise comparison usin AWS TCO calculator Create Software Application developement environment in AWS:Cloud9	**15**

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

1 = Weakly Mapped

2 = Moderately Mapped

3 = Strongly Mapped

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CSE12160	Cloud Architecture and Deployment Lab	CO12160.1	3	1	2	3	2	3	1	-	3	-	-	3	3	3	3
CSE12160	Cloud Architecture and Deployment Lab	CO12160.2	2	2	3	3	3	1	3	-	2	-	-	3	1	3	3

Code	Name		1	2	3	4	5	6	7	8	9	10	11	12	O1	O2	O3
CSE12160	Cloud Architecture and Deployment Lab	CO12160.3	2	3	3	2	3	2	1	-	1	-	-	2	3	2	1
CSE12160	Cloud Architecture and Deployment Lab	CO12160.4	2	1	2	1	2	1	1	-	1	-	-	2	3	1	1
CSE12160	Cloud Architecture and Deployment Lab	CO12160.5	2	3	3	2	3	3	3	-	1	-	-	2	2	3	2
CSE12160	Cloud Architecture and Deployment Lab	CO12160	2. 2	2. 0	2. 6	2. 2	2. 6	2. 0	1. 8	-	1. 6	-	-	2.4	2.4	2.4	2.0

CSE12161	Application Security Lab	L	T	P	C
Version 1.0	Contact Hours 30 Hours	0	0	2	1
Pre-requisite/Exposure	Web Technology				
Co-requisite	NIL				

Course Objectives:

- To enable students to develop code for classical Encryption Techniques to solve the problems.
- To provide the fundamentals of building code for authentication algorithms.
- To enhance the skill of students to develop a signature scheme using the Digital signature standards.
- To allow students to identify the use of network security systems using open-source tools.

Course Outcomes:

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

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 ispartly 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 againstthat 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 includesmalware, but it is possible that they may not be able to notify you if your website contains vulnerabilities.

Course Content:

Units	**Lecture Hours**
Unit-I: 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	**18**

Units	Lecture Hours
Unit-II: 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	**9**
Unit-III: 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')	**9**
Unit-IV: Align Compliance Requirements to FISMA, SOX, HIPAA, GLBA , PCI DSS and AICPA: Align Compliance Requirements to FISMA, SOX, HIPAA, Develop a web application having defence against all leading vulnerabilities.	**9**

Examination Scheme:

Components	Class Assessment	End Term
Weightage (%)	50	50

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

1 = Weakly Mapped

2 = Moderately Mapped3 = Strongly Mapped

Course	Course	COs	PO	P	PO	P	PO	P	PO	P	PO	PO	PO	PO	PS	PS	PS
Code	**Name**		**1**	**O 2**	**3**	**O 4**	**5**	**O 6**	**7**	**O 8**	**9**	**10**	**11**	**12**	**O1**	**O2**	**O3**
CSE12 161	Applicat ion Security Lab	CO1216 1.1	2	1	3	1	1	3	2	-	2	-	-	2	3	3	3

Code	Name		1	O 2	3	O 4	5	O 6	7	O 8	9	10	11	12	O1	O2	O3
CSE12 161	Applicat ion Security Lab	CO1216 1.2	3	2	3	2	2	3	3	-	3	-	-	1	3	1	2
CSE12 161	Applicat ion Security Lab	CO1216 1.3	2	2	2	3	1	1	1	-	1	-	-	2	1	2	3
CSE12 161	Applicat ion Security Lab	CO1216 1.4	2	3	3	2	1	3	1	-	3	-	-	3	2	3	1
CSE12 161	Applicat ion Security Lab	CO1216 1	2. 25	2. 0	2. 75	2. 0	1. 25	2. 5	1. 75	-	2. 25	-	-	2.0	2.2 5	2.2 5	2.2 5

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

Course Objectives:

- To Give and overview of Internship.
- To enable students building team.
- To give the students a outline of technical internship.
- To expound Idea dissemination for internship. Course Outcomes
- On completion of this course, the students will be able to CO1 Interpret importance of Internship.
- CO2.Construct the real-life scenario with internship.
- CO3.Analyse and practical implementation with emerging application.CO4. Classify understanding in technology upgradation.

Course 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:

Units	Lecture Hours
An internship enables you to gain first-hand exposure of working in the real world. It also allows students toharness the skill, knowledge, and theoretical practice they learnt in university. You can acquire endless amounts about internships is that it teaches young professionals about the specific industries and companies they are interested in.	

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

Course	Course	COs	PO	P	PO	PO	PO	PO	P	P	PO	PO	PO	PO	PS	PS	PS
Code	**Name**		**1**	**O 2**	**3**	**4**	**5**	**6**	**O 7**	**O 8**	**9**	**10**	**11**	**12**	**O1**	**O2**	**O3**
CSE14 162	Summe r Interns hip #	CO1416 2.1	3	3	2	2	3	1	1	-	3	2	3	2	1	2	3
CSE14 162	Summe r Interns hip #	CO1416 2.2	2	2	3	2	2	2	3	2	2	3	-	3	1	2	1
CSE14 162	Summe r Interns hip #	CO1416 2.3	3	2	2	3	3	2	1	-	3	2	-	3	2	1	1
CSE14 162	Summe r	CO1416 2.4	3	3	2	2	3	2	3	-	3	-	-	2	3	3	1

Code	Name		1	O 2	3	4	5	6	O 7	O 8	9	10	11	12	O1	O2	O3
	Interns hip #																
CSE14 162	Summe r Interns hip #	CO1416 2	2. 75	2. 5	2. 25	2. 25	2. 75	1. 75	2. 0	2. 0	2. 75	2.3 3	3.0	2.5	1.7 5	2.0	1.5

CSE14163	Minor Project	L	T	P	C
Version 1.0	Contact Hours -90	0	0	6	3
Pre-requisites/Exposure	Basic idea of the required subjects				
Co-requisites					

Course Objectives:

- To be able to design, develop, document, and test software using current techniques.
- To understand the fundamentals of computer architecture and computing theory.
- To be able to solve problems working in group settings.
- To demonstrate the ability to give presentations and write technical reports.
- 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 studentsCO4. 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:

Units	Lecture Hours
The Evaluation of the project work are to be carried out in the following way: In-depth study of a topic proposed by the supervisor Continuous Evaluation through guide. An open pre-submission seminar by the student. End-semester University Examination (An open seminar followed by a Viva voce)	

Modes of Evaluation:

Quiz/Assignment/ presentation/ extempore/ Written ExaminationExamination Scheme:

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

SEMESTER VIII

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CSE141	Mino	CO1416	3	2	3	1	1	1	2	-	2	-	-	2	2	1	1
63	r	3.1															
	Project	CO1416 3.2	3	2	2	1	3	2	3	-	1	-	-	2	1	3	2
		CO1416	3	1	1	3	1	2	3	-	2	-	-	2	3	1	3
		3.3															
		CO1416	1	2	3	3	2	1	2	-	2	-	3	2	2	2	3
		3.4															

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
		CO1416	3	3	3	3	1	1	2	-	2	-	-	3	2	2	3
		3.5															
		CO1416	2.	2.	2.	2.	1.	1.	2.	-	1.	-	3.0	2.2	2.0	1.8	2.4
		3	6	0	4	2	6	4	4		8						

ECE11047	**Sensors and Actuators for IOT**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours 45**	**3**	**0**	**0**	**3**
Pre-requisites/Exposure	**Physics**				
Co-requisites	**Electronics Measurement, Basic Networking**				

Course Objectives:

- To study basic concepts of various sensors and actuators.
- To develop knowledge in selection of suitable sensor based on requirement and application.
- To understand the operation of resistive, inductive, capacitive, magnetic, thermal, radiation and piezoelectric sensorsfor the identification of appropriate sensors.
- To introduce the concept of M2M (machine to machine) with necessary protocols.
- To introduce the Raspberry PI platform, that is widely used in IoT applications. Course Outcomes
- On completion of this course, the students will be able to
- CO1. Identify the appropriate sensor, including powering of the sensor and signal conditioning (electrical andCalculation 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.

Course 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:

Units	Lecture Hours
Module-1: Introduction Definition, classification, static and dynamic parameters, Characteriz ation Electrical, mechanical, thermal, optical, biological and chemical, Classificationof errors Error analysis, Static and dynamic characteristics of transducers, Performance measures of sensors.	**7**
Module-2: Sensors Classification of sensors basic working principles, Displacement Sensor - Linear and rotary potentiometers, LVDT andRVDT, 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 tactilesensors PVDF tactile sensor, micro-switch and reed switch Piezoelectric sensors, vision sensor.	**12**
Module-3: Actuators 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.	**10**
Module-4: Physical Devices and Endpoints 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.	**6**

Units	Lecture Hours
Module-5: Introduction to IoT and M2M 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 IoTSystem Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER. Text Books 1. 2017. Ian Sinclair, Sensors and Transducers, Elsevier, 2011. D. Patranabis, Sensors and Transducers, 2nd Ed., Prentice Hall of India Learning Pvt. Ltd., 2003. Internet of Things - A Hands-on Approach, Ars deep Bahga and Vijay Madisetti, Universities Press, 2015,ISBN: 9788173719547 Getting Started with Raspberry Reference Books 1. 9789350239759 Dhanpat Rai Publications, 2012. Ernest O. Doeblin, Edition, 2008 Ltd., 5th Ronald K. Jurgen, Sensors and Transducers (Progress in Technology), 2nd Ed., SAE International, 2003. S. M. Sze, Semiconductor Sensors, Willy Interscience Publications.	**10**

Modes of Evaluation:

Quiz/Assignment/ presentation/ extempore/ Written ExaminationExamination Scheme:

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

Course	Course	COs	P	P	P	P	P	P	P	P	P	PO	PO	PO	PS	PS	PS
Code	Name		O1	O2	O3	O4	O5	O6	O7	O8	O9	10	11	12	O1	O2	O3
ECE11047	Sensors and Actuators for IOT	CO11047.1	2	3	2	2	3	3	3	-	1	-	-	3	3	3	2
ECE11047	Sensors and Actuat	CO11047.2	2	2	2	1	3	3	1	-	2	-	-	3	3	2	2

Code	Name		O1	O2	O3	O4	O5	O6	O7	O8	O9	10	11	12	O1	O2	O3
	ors for IOT																
ECE110 47	Sensors and Actuators for IOT	CO1104 7.3	2	2	3	2	1	3	3	-	3	-	-	3	1	1	2
ECE110 47	Sensors and Actuators for IOT	CO1104 7.4	2	2	3	3	3	2	1	-	3	-	-	3	1	1	1
ECE110 47	Sensors and Actuators for IOT	CO1104 7.5	2	3	2	3	2	1	3	-	3	3	-	3	1	2	2
ECE110 47	Sensors and Actuators for IOT	CO1104 7	2. 0	2. 4	2. 4	2. 2	2. 4	2. 4	2. 2	-	2. 4	3.0	-	3.0	1.8	1.8	1.8

MEE11071	**Robotics & Automation**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hourse - 45**	**3**	**0**	**0**	**3**
Pre-requisites/Exposure	**Engineering Physics, Mechanics, Basic Electronics**				
Co-requisites					

Course Objectives:

- 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 areasEngross 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 thefeatures and operation of automation products.
- Understand ethical and professional responsibilities Communicate effectively and work in interdisciplinary groupsReview, comprehend and report technological development.

Course Description:

This interdisciplinary course helps you design, implement and commercialise innovative systems and technologies. Youwill 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 economyand get to strengthen your soft and hard skills thanks to our project and skills-based concept.

Course Content:

Units	Lecture Hours
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	**12**
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	**12**

Units	Lecture Hours
Ranging, Reflective beacons, Laser Range Sensor (LIDAR). Strain Gage, Load Cell, and Magnetic Sensors types, principle, requirement and advantages: Magneto resistive Hall Effect Current sensorHeading Sensors Compass, Gyroscope, Inclinometers.	
Module-3: Robot Actuation Systems Actuators: Electric, Hydraulic and Pneumatic, Transmission: Gears, Timing Belts and Bearings, Parameters for selectionof actuators. Basics of control: open loop- closed loop, Transfer functions, and Control laws: P, PD, PID, Linear and Non-linear controls.	**12**
Module-4: Robotics in Industry 4.0 Industry 4.0 and Technologies 1Industry 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 AnalysisData storage and data security Industry 4.0 and the national high technology strategies	**9**

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

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
MEE11	Robotics	CO1107	1	3	3	1	2	2	3	-	3	-	-	3	2	3	3
071	&	1.1															
	Automat ion	CO1107 1.2	3	3	3	3	2	1	3	-	3	-	-	3	2	2	2
		CO1107	3	1	1	3	1	3	2	-	1	-	-	3	1	2	3
		1.3															
		CO1107	1	2	2	1	3	1	1	-	2	2	-	3	2	2	3
		1.4															

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
		CO1107	3	2	1	3	3	3	1	-	2	-	-	3	2	3	3
		1.5															
		CO1107	2.	2.	2.	2.	2.	2.	2.	-	2.	2.0	-	3.0	1.8	2.4	2.8
		1	2	2	0	2	2	0	0		2						

PHY11203	**Medical Image Processing and Analysis**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours 45 Hours**	**3**	**0**	**0**	**3**
Pre-requisite/Exposure	**Basic programming skills**				
Co-requisite	**Mathematical transforms**				

Course Objectives:

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

Course Outcomes:

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

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 moregeneral 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:

Units	Lecture Hours
Unit-I: 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-Raygeneration, 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.	**20**
Unit-II: Image Processing Fundamentals: Image Perception, image fidelity criteria, image model, image sampling andquantization 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.	**10**
Unit-III: Image Enhancement and reconstruction: Image enhancement point operation, histogram modelling, spatial operation, transforms operations. Image restoration- image degradation model, inverse and wiener filtering, spatialand 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.	**15**

Units	Lecture Hours
Unit-IV: 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-basedmethods; Applications in automated medical diagnosis and treatment planning.	**10**

Examination Scheme:

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

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

1 = Weakly Mapped

2 = Moderately Mapped3 = Strongly Mapped

Course Code	Course Name	COs	P O 1	P O 2	PO 3	P O 4	PO 5	PO 6	P O 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
PHY11 203	Medical Image Process ing and Analysi	CO1120 3.1	3	3	2	1	3	2	1	3	3	-	-	3	1	1	2
PHY11 203	Medical Image Process ing and Analysi	CO1120 3.2	3	3	1	2	2	3	1	-	2	-	-	1	3	1	1
PHY11 203	Medical Image Process ing and Analysi	CO1120	2	2	3	2	3	3	2	2	1	-	-	1	3	1	3

	s	**3.3**															
	s	CO1120 3.4	2	2	3	3	3	3	2	3	3	-	-	2	1	2	3
	s	CO1120 3	2. 5	2. 5	2. 25	2. 0	2. 75	2. 75	1. 5	2. 67	2. 25	-	-	1.7 5	2.0	1.2 5	2.2 5

CSE14164	**Major Project**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours - 180**	**0**	**0**	**12**	**6**
Pre-requisites/Exposure	**Basic idea of the required subjects**				
Co-requisites					

Course Objectives:

- To be able to design, develop, document, and test software using current techniques.
- To understand the fundamentals of computer architecture and computing theory.
- To be able to solve problems working in group settings.
- To demonstrate the ability to give presentations and write technical reports.
- 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 studentsCO4. 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:

Units	Lecture Hours
The Evaluation of the project work are to be carried out in the following way: In-depth study of a topic proposed by the supervisor Continuous Evaluation through guide. An open pre-submission seminar by the student. End-semester University Examination (An open seminar followed by a Viva voce)	

Modes of Evaluation:

Quiz/Assignment/ presentation/ extempore/ Written ExaminationExamination Scheme:

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

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CSE141	Majo	CO1416	3	2	2	2	3	1	1	-	1	-	-	2	3	1	3
64	r	4.1															
	Project	CO1416 4.2	3	2	1	3	3	1	3	-	2	-	-	3	1	3	2
		CO1416	3	3	1	2	3	2	1	-	3	3	-	3	3	3	3
		4.3															
		CO1416	3	1	2	3	1	3	2	-	2	-	3	3	3	3	3
		4.4															
		CO1416	3	2	3	3	2	3	3	-	2	-	-	2	1	1	3

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
		4.5															
		CO1416	3.	2.	1.	2.	2.	2.	2.	-	2.	3.0	3.0	2.6	2.2	2.2	2.8
		4	0	0	8	6	4	0	0		0						

CSE15165	Comprehensive Viva Voce	L	T	P	C
Version 1.0		0	0	0	2
Pre-requisites/Exposure	Willing to knowledge acquisition				
Co-requisites	--				

Course Objectives:

- To Give an overview of emerging technology and relate to subject.
- To enable students to improve their reasoning ability.
- To give the students a outline of technical question.
- 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.

Course Description:

The course tests the technical knowledge acquired during the study, spoken skills, and the ability to think logically undertime pressure. The course proves extremely useful for placement interviews

Course Content:

Units	Lecture Hours
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.	

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

Course Code	Course Name	COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
165	**nsive Viva Voce**	**CO151 65.1**	**3**	**1**	**3**	**2**	**3**	**3**	**3**	**-**	**2**	**-**	**-**	**1**	**1**	**2**	**3**
165	nsive Viva Voce	CO151 65.2	2	3	2	3	2	3	2	-	3	3	-	1	1	3	2
165	nsive Viva Voce	CO151 65.3	3	3	2	3	2	3	1	-	3	-	2	3	2	1	3
165	nsive Viva Voce	CO151 65.4	2	3	3	1	2	2	2	-	3	-	-	1	3	3	1
165	nsive Viva Voce	CO151 65	2. 5	2. 5	2. 5	2. 25	2. 25	2. 75	2. 0	-	2. 75	3.0	2.0	1.5	1.7 5	2.2 5	2.2 5