

**COURSE STRUCTURE  
AND  
DETAILED SYLLABI**

**A22 Regulation**

**FOR**

**B. Tech. CSE- Artificial Intelligence and Machine Learning  
I to IV Year**

(Applicable for the Batches admitted in the year 2022-2023)



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)**

**SREENIDHI INSTITUTE OF SCIENCE AND TECHNOLOGY**

(An Autonomous Institution approved by UGC and affiliated to JNTUH)

Yamnapet, Ghatkesar, Hyderabad - 501 301

**November - 2023**

**B. Tech. CSE- Artificial Intelligence & Machine Learning****Course Structure Regulation - A22****I Year I Semester**

Sl. No.	Course Category	Dept. Course	Course Code	Course	L	T	P/D	C	Max. Marks	
									CIE	SEE
1	BS	S&H	9HC07	Engineering Physics	2	1	0	3	40	60
2	ES	IT	9FC01	Problem Solving using C	3	0	0	3	40	60
3	BS	S&H	9HC11	Matrix Algebra and Calculus	2	1	0	3	40	60
4	HS	S&H	9HC01	Essential English Language Skills	2	0	0	2	40	60
5	HS	S&H	9HC61	Oral Communication Lab – I	0	0	2	1	40	60
6	BS	S&H	9HC66	Engineering Physics Lab	0	0	3	1.5	40	60
7	ES	IT	9FC61	Problem Solving using C Lab	0	0	3	1.5	40	60
8	ES	S&H	9BC01	Engineering Graphics	1	0	4	3	40	60
9	HS	S&H	9HC18	Induction Program	2-weeks in the beginning of the semester			Satisfactory/Not Satisfactory		
<b>Total</b>					<b>10</b>	<b>2</b>	<b>12</b>	<b>18</b>	<b>320</b>	<b>480</b>

**I Year II Semester**

Sl. No.	Course Category	Dept. Course	Course Code	Course	L	T	P/D	C	Max. Marks	
									CIE	SEE
1	BS	S&H	9HC04	Engineering Chemistry	2	1	0	3	40	60
2	ES	CSE	9EC01	Data Structures	3	0	0	3	40	60
3	BS	S&H	9HC12	Advanced Calculus	2	1	0	3	40	60
4	ES	EEE and ECE	9AC48	Basic Electrical and Electronics Engineering	3	0	0	3	40	60
5	HS	S&H	9HC62	Oral Communication Lab - II	0	0	3	1.5	40	60
6	BS	S&H	9HC64	Engineering Chemistry Lab	0	0	3	1.5	40	60
7	ES	CSE	9EC61	Data Structures using C Lab	0	0	3	1.5	40	60
8	ES	S&H	9BC61	Workshop / Manufacturing Processes Lab	0	1	3	2.5	40	60
<b>Total</b>					<b>10</b>	<b>3</b>	<b>12</b>	<b>19</b>	<b>320</b>	<b>480</b>

**B.Tech. CSE- Artificial Intelligence and Machine Learning****Course Structure Regulation A22****II Year I Semester**

Sl. No.	Course Category	Dept Course	Course Code	Course	L	T	P/D	C	Max. Marks	
									CI	SEE
1	PC	CSE	9EC02	Object Oriented Programming through Java	2	1	0	3	40	60
2	BS	S&H	9HC15	Probability and Statistics	2	1	0	3	40	60
3	BS	S&H	9HC16	Quantitative Aptitude and Logical Reasoning	3	0	0	3	40	60
4	PC	IT	9FC02	Python Programming	2	1	0	3	40	60
5	BS	IT	9F303	Discrete Mathematics	2	1	0	3	40	60
6	HS	S&H	9HC03	Universal Human Values	3	0	0	3	40	60
7	PC	CSE	9EC62	Object Oriented Programming through Java Lab	0	0	4	2	40	60
8	PC	CSE-AI & ML	9LC61	Python Programming Lab and IT workshop	0	0	3	1.5	40	60
9	ES	EEE and ECE	9AC95	Basic Electrical and Electronics Engineering Lab	0	0	3	1.5	40	60
				<b>Total</b>	<b>14</b>	<b>4</b>	<b>10</b>	<b>23</b>	<b>360</b>	<b>540</b>

**B. Tech. CSE- Artificial Intelligence and Machine Learning****Course Structure Regulation A22****II Year II Semester**

Sl. No.	Course Category	Dept Course	Course Code	Course	L	T	P/D	C	Max. Marks	
									CIE	SEE
1	ES	ECE	9CC56	Computer Organization and Architecture	2	0	0	2	40	60
2	PC	IT	9FC04	Database Management Systems	3	0	0	3	40	60
3	PC	CSE	9EC16	Introduction to Data Science	3	0	0	3	40	60
4	ES	IT	9EC04	Design and Analysis of Algorithms	2	1	0	3	40	60
5	HS	SMS	9ZC01	Business Economics And Financial Analysis	3	0	0	3	40	60
6	HS	S&H	9HC05	Environmental Science	3	0	0	0	Pass / Fail	
7	HS	S&H	9HC63	Soft Skills Lab	0	1	2	2	40	60
8	PC	CSE-AI & ML	9LC62	R Programming Lab and Design and Analysis of Algorithms Lab	0	0	3	1.5	40	60
9	PC	IT	9FC63	Database Management Systems Lab	0	0	3	1.5	40	60
10	ES	ECE	9CC83	Computer Organization Lab	0	0	2	1	40	60
11	PS	CSE – AI & ML	9L484	Technical Seminar	0	1	0	1	100	--
<b>Total</b>					<b>16</b>	<b>3</b>	<b>10</b>	<b>21</b>	<b>460</b>	<b>540</b>

**Note: Summer Industry Internship-I is to be carried out during the summer vacation between 4<sup>th</sup> and 5<sup>th</sup> Semesters.**

**B. Tech. CSE- Artificial Intelligence and Machine Learning****Course Structure Regulation A22****III Year I Semester**

Sl.No.	Course Category	Dept Course	Course Code	Course	L	T	P/D	C	Max. Marks	
									CIE	SE E
1	OE	MBA/ME		Open Elective-I	3	0	0	3	40	60
2	PE	CSE-AI &ML/IT		Professional Elective –I	3	0	0	3	40	60
3	PC	IT	9FC05	Data Warehousing and Data Mining	2	1	0	3	40	60
4	PC	CSE	9EC03	Software Engineering	2	0	0	2	40	60
5	PC	CSE-AI &ML	9LC01	Introduction to Artificial Intelligence	3	0	0	3	40	60
6	PC	CSE	9EC05	Computer Networks	3	0	0	3	40	60
7	PC	CSE	9EC06	Operating Systems	2	1	0	3	40	60
8	PC	CSE-AI &ML	9LC63	Software Engineering Lab and Computer Networks Lab	0	0	2	1	40	60
9	PC	CSE-AI &ML	9LC64	Artificial Intelligence Lab and Data Mining Lab	0	0	2	1	40	60
10	PS	CSE-AI &ML	9L591	Summer Industry Internship -I	-	-	-	1	40	60
				<b>Total</b>	<b>18</b>	<b>2</b>	<b>4</b>	<b>23</b>	<b>400</b>	<b>600</b>

**B. Tech. CSE- Artificial Intelligence and Machine Learning****Course Structure Regulation A22****III Year II Semester**

Sl.No.	Course Category	Dept Course	Course Code	Course	L	T	P/D	C	Max. Marks	
									CIE	SEE
1	PE	CSE/IT/ CSE- IOT		Professional Elective –II	3	0	0	3	40	60
2	PE	CSE-CS/ CSE-AI & ML/IT		Professional Elective -III	3	0	0	3	40	60
3	PC	CSE-AI & ML	9LC03	Machine Learning	3	0	0	3	40	60
4	PC	CSE-AI & ML	9LC04	Compiler Design	2	1	0	3	40	60
5	HS	CSE- IOT	9IC04	Intellectual Property Rights	2	0	0	-	Pass/Fail	
6	PC	IT	9FC06	Web Technologies	2	1	0	3	40	60
7	PC	CSE-AI & ML	9LC65	Machine Learning Lab and Compiler Design Lab	0	0	3	1.5	40	60
8	PC	IT	9FC66	Web Technologies Lab	0	0	3	1.5	40	60
10.	ES	CSE – AI&ML	9L680	Comprehensive Viva Voce	-	-	-	1	100	--
<b>Total</b>					<b>15</b>	<b>2</b>	<b>6</b>	<b>19</b>	<b>380</b>	<b>420</b>

**Note: Summer Industry Internship-II is to be carried out during the summer vacation between 6<sup>th</sup> and 7<sup>th</sup> Semesters**

**B. Tech. CSE- Artificial Intelligence and Machine Learning****Course Structure Regulation A22****IV Year I Semester**

Sl.No.	Course Category	Dept. Course	Course Code	Course	L	T	P/D	C	Max. Marks	
									CIE	SEE
1	OE	MBA/ME		Open Elective -II	3	0	0	3	40	60
2	PE	IT/CSE-AI &ML /CSE-CS		Professional Elective - IV	3	0	0	3	40	60
3	PE	CSE-AI &ML/IT/ CSE-DS		Professional Elective - V	3	0	0	3	40	60
4	PC	CSE- AI &ML	9LC02	Advanced Artificial Intelligence and Deep Learning	3	0	0	3	40	60
5	PC	CSE- AI &ML	9LC18	Natural Language Processing	3	0	0	3	40	60
6	PC	IT	9FC15	Big Data Analytics	3	0	0	3	40	60
7	PC	CSE- AI &ML	9LC66	Deep Learning Lab and Big Data Analytics Lab	0	0	3	1.5	40	60
8	PC	CSE-AI &ML	9LC67	PE -IV Lab	0	0	3	1.5	40	60
9	PS	CSE-AI &ML	9L792	Summer Industry Internship-II	-	-	-	1	40	60
				<b>Total</b>	<b>18</b>	<b>0</b>	<b>6</b>	<b>22</b>	<b>360</b>	<b>540</b>

**B.Tech. CSE- Artificial Intelligence and Machine Learning**

**Course Structure Regulation A22**

**IV Year II Semester**

Sl.No.	Course Category	Dept Course	Course Code	Course	L	T	P/D	C	Max. Marks	
									CIE	SEE
1	OE	MBA/EE E		Open Elective -III	3	0	0	3	40	60
2	PC	IT	9FC07	Cyber Security and Cyber Laws	2	0	0	2	40	60
3	PS	CSE- AI & ML	9L896	Project	0	0	20	10	40	60
<b>Total</b>					<b>5</b>	<b>0</b>	<b>20</b>	<b>15</b>	<b>120</b>	<b>180</b>

**Note: All End Examinations (Theory and Practical) are of Three hours duration.**

**T – Tutorial, L – Theory, P/D – Practical/Drawing, C – Credits, Int. - Internal Exam, Ext. - External Exam**

**Course Code Definitions**

BS- Basic Science Courses

ES- Engineering Science Courses

HS- Humanities and Social Sciences including Management courses

PC-CSE Professional core courses

PE -CSE Professional Elective courses

OE- Open Elective courses

**CIE: Continuous Internal Evaluation**

**SEE: Semester End Evaluation**

PS- Summer Industry Internship, Projects, Comprehensive Viva Voce, Technical Seminars



## List of Professional and Open Elective Subjects

### Course Structure Professional Elective (PE)

Professional Elective (PE)									
Branch	PE – I (3-1)	Branch	PE – II (3-2)	Branch	PE – III (3-2)	Branch	PE – IV (4-1)	Branch	PE – V (4-1)
CSE-AI & ML	Software Testing Methodologies(9LC11)	CSE	Cryptography and Network Security (9EC09)	CSE-CS	Block chain Technologies(9JC05)	IT	Scripting Languages (9FC77)	IT	Cloud Computing(9FC17)
CSE-AI & ML	Data Visualization Techniques (9LC06)	IT	Software Project Management (9FC13)	CSE-AI & ML	Unified Modeling Language (9LC16)	IT	Agile Software Development(9FC16)	CSE-DS	Business Intelligence(8EC19)
CSE-AI & ML	Design Thinking (9LC13)	IT	Information Retrieval Systems (9FC08)	CSE-AI & ML	Augmented Reality and Virtual Reality (9LC08)	CSE-AI&ML	DevOps (9LC17)	CSE-AI & ML	Quantum Computing (9LC21)
IT	Human Computer Interaction (9FC10)	CSE-IOT	Introduction to Internet of Things (9IC45)	IT	Image Processing (9FC09)	CSE-CS	Ethical Hacking (9JC04)	CSE-AI & ML	Parallel and Distributed Computing (9LC22)

### Course Structure –Open Electives

Sl. No	Stream	OE-I	OE-II	OE-III
1	Code	9ZC05	9ZC15	9ZC19
	Finance	Banking Operations and Insurance	Financial Markets and services	Project and Risk Management
2	Code	9ZC22	9ZC23	9ZC24
	Entrepreneurship	Basics of Entrepreneurship	Advanced Entrepreneurship	Product and Services
3	Code	9ZC08	9ZC09	9ZC10
	Innovation and Design Thinking	Design literacy and Design Thinking	Co-Creation and Product Design	Entrepreneurship & Business Design

B. Tech – CSE-AI&ML - A22 – I, II, III, IV Year

4	<b>Code</b>	<b>9EC42</b>	<b>9FC79</b>	<b>9EC43</b>
	<b>CSE Stream</b>	Programming in Java	Database Systems Concepts	Operating Systems Concepts
5	<b>Code</b>	<b>9CC36</b>	<b>9CC37</b>	<b>9CC38</b>
	<b>ECE Stream</b>	Fundamentals of digital circuits and Microprocessors	Fundamentals of Communication	Embedded Systems
6	<b>Code</b>	<b>9AC44</b>	<b>9AC45</b>	<b>9AC47</b>
	<b>EEE stream</b>	Fundamentals of Measurements and Instrumentation	Fundamentals of Renewable energy sources	Power Electronic Devices and Converters
7	<b>Code</b>	<b>9BC51</b>	<b>9BC52</b>	<b>9BC53</b>
	<b>Mechanical Stream</b>	Introduction To Additive Manufacturing Processes	Principles of Operations Research	Principles of Automation and Robotics

**CREDIT ANALYSIS****AICTE vs B. Tech. (CSE-AI and ML)-SNIST - A22 REGULATION**

Sl. No.	Category		AICTE Suggested Breakup of Credits(Total 159) In UG Program in B. Tech. (CSE)	A22- B. Tech.(CSE-AI and ML), SNIST
1	Humanities and Social Sciences including Management courses	HS	12	12.5
2	Basic Science courses	BS	24	24
3	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc	ES	29	26
4	Professional core courses	PC	49	60.5
5	Professional Elective courses relevant to chosen specialization/branch	PE	18	15
6	Open subjects – Electives from other technical and /or emerging subjects	OE	12	9
7	Project work, seminar and internship in industry or elsewhere	PS	15	13
8	Mandatory Courses [Environmental Sciences, Induction training, Indian Constitution, Essence of Indian traditional knowledge	MC	(non-credit)	0
	<b>TOTAL</b>		<b>159</b>	<b>160</b>

**SYLLABUS FOR B.TECH. I YEAR I SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
ENGINEERING PHYSICS**

	<b>L</b>	<b>T</b>	<b>P/D</b>	<b>C</b>
<b>Code: 9HC07</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>3</b>

**Course Objectives:**

1. Explain about the Quantum Mechanics to understand wave particle duality, necessity of quantum mechanics to explore the behavior of subatomic particles. Schroedinger's Time Independent Wave Equation, Physical Significance of the Wave Function – Application of Schroedinger wave equation.
2. To understand the basic concepts of normal light, Laser and its applications and to know about the fiber optics, principle (TIR), Numerical Aperture, Types of optical Fibers, Step index and graded index Fibers, attenuation in optical fibers. Applications: optical fiber communication system, fiber optic sensors, medical endoscopy.
3. To study the concepts of magnetism and superconductivity, Bohr magneton, Hysteresis nature, domain structure, Meissner effect, types of superconductors, BCS theory and applications of superconductors.
4. To understand the concepts of dielectrics, polarizations and its types, internal fields, Clausius-Mossotti equation, Frequency and temperature effect on dielectrics and its applications – Piezo-electricity, Pyro-electricity and ferro-electricity.
5. To know about the semiconductors, types, carrier concentration, Thermistor, Hall effect and also to understand the concept of PN-junction, I-V Characteristics, LED, Solar Cell and Photo diode.
6. To discuss about the nano-technology, preparation techniques and characterization (XRD, SEM & TEM), CNTs and to know about the fundamentals of radioactivity and its applications.

**Course Outcomes:**

After completion of the course, the student will be able to learn:

1. Differentiate the wave and particle, de-Broglie matter waves-its experimental evidence, Schroedinger's wave concept and its application for a particle in one dimension box.
2. Explain about emission, its types, laser principle, types, working and its applications and to reveals about TIR principle, optical fiber-types and signal propagation, attenuation, communication system and applications of optical fibers (sensors and medical endoscopy)
3. Classify magnetism types, Hysteresis, domain theory, Anti-ferro and ferri-magnetism, Superconductivity, experimental facts, theoretical analysis, types of superconductors and its applications.
4. Explain the basic concepts of dielectric materials, polarization and its types, local

fields, frequency and temperature effect on dielectrics and their applications (piezo, ferro and Pyro electricity).

5. Elaborate semiconductor behavior, types, carrier concentration, Hall effect, Thermistor, demonstrate and analyze semiconductor devices like a PN-junction, I-V characteristics, LED, solar cell, photo diode and their applications.
6. Summarize nano& bulk concepts, surface to volume ratio, quantum confinement, CNTs and preparation methods (physical & chemical), analysis the techniques like XRD, SEM, TEM and also to understand the radioactivity, fusion & fission, alpha, beta and gamma rays decay and its applications.

## **UNIT-- I**

### **Wave nature of particles, Schroedinger equation and its application:**

Waves and Particles, de Broglie Hypothesis, Matter waves, Davisson and Germer's Experiment, G.P. Thomson Experiment, Heisenberg's Uncertainty Principle, Schroedinger's Time Independent Wave Equation – Physical Significance of the Wave Function – Application of Schroedinger wave equation - Particle in One Dimensional Potential Box.

## **UNIT-- II**

### **Lasers and Fiber Optics:**

**Lasers:** Characteristics of LASER, Spontaneous and Stimulated Emission of Radiation, Einstein's Coefficients and their significance. Meta-stable State, Pumping, Population Inversion. Ruby Laser, Helium-Neon Laser, Semiconductor Diode Laser, Applications of Lasers.

**Fiber optics:** Principle and construction of optical fiber, Acceptance Angle and Numerical Aperture. Based on refractive index profile classification of Optical Fibers: Single mode & Multimode mode Step index fibers, Single mode & Multimode mode graded index fibers. Attenuation in Optical Fibers (scattering, absorption and bending losses) Applications: Optical Fiber communication system, Fiber Optic Sensors and Medical Endoscopy.

## **UNIT -- III**

### **Magnetic and Superconducting materials:**

**Magnetic Materials:** Permeability, Field Intensity, Magnetic Induction, Magnetization, Magnetic Susceptibility, Origin of Magnetic Moment, Bohr Magneton. Hysteresis behavior of Ferro Magnetic materials based on Domain theory. Hard and Soft Magnetic Materials, Properties of Anti-Ferro and Ferri Magnetic Materials and their applications,

**Super conducting Materials:** Effect of Magnetic Field, Critical current density, Meissner effect, Type-I and Type-II superconductors, BCS theory, applications of superconductors.

## **UNIT -- IV**

### **Dielectric materials**

Department of CSE-AI&ML

Electric Dipole, Dipole Moment, Dielectric Constant, Electric Susceptibility, Electronic and Ionic polarizability (Quantitative) Orientation Polarization (Qualitative), Internal fields in Solids, Clausius - Mossotti equation, Frequency and temperature effect on Dielectrics (Qualitative), Applications - Piezo-electricity, Pyro-electricity and Ferro-electricity.

#### **UNIT-- V**

##### **Semiconductors and Semiconductor devices**

**Semiconductors:** Fermi Level in Intrinsic and Extrinsic Semiconductors. Carrier concentration of Intrinsic Semiconductor. Carrier concentration of Extrinsic Semiconductor (qualitative). Direct & Indirect Band Gap Semiconductors: Thermistor and Hall Effect in semiconductors.

**Semiconductor devices:** Formation of a PN Junction and working of a PN Junction diode, Energy band Diagram of open circuited PN Diode, I-V Characteristics of PN Junction diode. Applications: LED, Solar Cell and Photo diode.

#### **UNIT -- VI**

##### **Nanotechnology and Nuclear Energy**

**Nanotechnology:** Origin of Nanotechnology, Nano Scale, Surface to Volume Ratio, Quantum Confinement, Bottom-up Fabrication, Sol-gel, Precipitation, Chemical vapor Deposition (CVD); Top-down Fabrication; Thermal evaporation, Ball Milling, Characterization of Nano materials (XRD & TEM), carbon nano tubes (CNTs), Applications of Nano Materials.

**Nuclear Energy:** Mass Defect, binding energy, Nuclear fission, Nuclear fusion. Radioactivity:  $\alpha$ ,  $\beta$ ,  $\gamma$  rays decay, Geiger-Muller counter. Introduction of nuclear power plant.

##### **Text Books:**

1. B.K. Pandey & S. Chaturvedi Engineering Physics, Cengage Learning

##### **Reference Books:**

1. P K Palanisamy, Engineering Physics, Sitech Publications
2. Charles Kittel, Introduction to Solid State Physics, John Wiley Publisher
3. A.S. Vasudeva , Modern engineering Physics, S Chand
4. Dekker, Solid State Physics
5. Dr.M.N. Avadhanulu, Engineering Physics, S Chand
6. Dekker, Solid State Physics
7. Halliday and Resnick, Physics
8. S.O. Pillai, Solid State Physics
9. A. Ghatak - Optics

### **SYLLABUS FOR B.TECH. I YEAR I SEM. COMPUTER SCIENCE AND ENGINEERING (AI & ML)**

## PROBLEM SOLVING USING C

Code: 9FC01

L	T	P/D	C
3	0	0	3

### Course Objectives:

1. To acquire problem solving skills
2. To be able to develop flowcharts
3. To understand structured programming concepts
4. To be able to write programs in C Language

### Course Outcomes:

After completion of the course, the student will be able to learn:

1. To formulate simple algorithms for arithmetic, logical problems and to translate the algorithms to programs(in C language)
2. To test and execute the programs and correct syntax and logical errors, to implement conditional branching, iteration and recursion
3. To use arrays to formulate algorithms and programs and apply programming to solve matrix addition and multiplication problems and searching
4. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
5. To use pointers to formulate algorithms and programs.
6. To apply files to do various file manipulation functions.

### UNIT – I

**Problem solving Techniques** – Algorithms, pseudo code, flowcharts with examples.

**Introduction to Computer Programming Languages** – Machine Languages, Symbolic Languages, High-Level Languages.

**Introduction to C Programming Language** – Characteristics of C language, Structure of a C Program. Syntax and semantics. Data Types, Variables – declarations and initialization, formatting input and output.

### UNIT – II

**C Tokens:** Identifiers, Keywords, Constants, variables and operators.

**Expressions** – Arithmetic expressions, Precedence and Associativity, evaluating expressions.

**Decision control structures** – if, Two-way selection – if else, nested if, dangling else, Multi-way selection – else-if ladder and switch-case.

**Repetitive control structures** – Pre-test and post-test loops – initialization and updation, while, do-while and for loop and nested loops.

**Unconditional statements:** break, continue and goto statements with examples.

### UNIT -- III

**Arrays** – Definition and declaration, initialization, accessing elements of in arrays, storing values in arrays, 1-D arrays, 2-D arrays, character arrays and multidimensional arrays.

**Function and arrays:** passing individual elements to arrays, passing 1-D array, 2-D array to function.

**Applications:** Linear search, matrix addition, subtraction, multiplication and transpose

#### **UNIT – IV**

**Functions** – User – defined functions - Function definition, arguments, return value, prototype, arguments and parameters, inter-function communication. Standard functions – Math functions. Scope – local, global.

**Parameter passing** – Call by value and call by reference.

**Recursive functions** – Definition, examples, advantages and disadvantages.

**Macros** – Definition, examples, comparison with functions.

**Storage Classes** – auto, extern, static and Register

#### **UNIT -- V**

**Introduction to Pointers** – pointer constants, pointer values, pointer variables, accessing variables through pointers, pointer declaration and definition, declaration versus redirection, initialization of pointer variables, Pointer for inter function communication, pointer to pointers, pointer to function.

**Arrays and pointers** – Pointer arithmetic and arrays, array of pointers.

**Strings** – Declaration, Initialization, Input and Output functions, strings and pointer, string handling functions.

#### **UNIT-- VI**

**Files** – Concept of a file, streams, text and binary files, stream file processing, system created steams, Standard library I/O functions, file open and close, formatting I/O functions, character I/O functions, Binary I/O, command line arguments, file status functions ,positioning functions.

Applications: Basic operations on files.

#### **TEXT BOOKS :**

- (i) E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
- (ii) Let Us C by Yashavant Kanetkar

#### **REFERENCE BOOKS:**

- (i) Programming in C (2nd Edition) by Ashok N Kamthane.
- (ii) Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language  
Prentice Hall of India.



**SYLLABUS FOR B.TECH. I YEAR I SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
MATRIX ALGEBRA AND CALCULUS**

<b>Code: 9HC11</b>	<b>L</b>	<b>T</b>	<b>P/D</b>	<b>C</b>
	<b>2</b>	<b>1</b>	<b>0</b>	<b>3</b>

**Pre Requisites:** Mathematics Knowledge at Pre-University Level.

**Course Objectives:**

1. Basic operation of matrices and about the linear system and some analytical methods for solution.
2. Concept of Eigen value and Eigen vector and their properties and applications.
3. Quadratic form and its properties.
4. Mean value theorems and their applications to the given functions, series expansions of a function.
5. Various analytical methods to solve first order first degree and also the equations not of first degree ordinary differential equations.
6. Methods to solve higher order ordinary differential equations.

**Course Outcomes:**

After completion of the course, the student will be able to learn:

1. Check the consistency or inconsistency of a linear system and can solve the problems.
2. Find the Eigen values and Eigen vectors and can solve the problems associated with these concepts.
3. Find the nature, index and signature of the quadratic form.
4. Verify the applicability of mean value theorems and also can express the given standard function in series form using Taylor's and Maclaurin series.
5. Find the solutions of first order first degree differential equations and solve the problems on Newton's law of cooling, Natural growth and decay.
6. Solve higher order ordinary differential equations with constant coefficients using some standard methods.

**UNIT—I**

**System of Linear Equations:** Elementary row/column operations -Echelon form, Rank of a matrix, Inverse of a matrix by Gauss Jordan method. Non-Homogenous and Homogenous system of linear equations- consistency or inconsistency of a system, Gauss Elimination method, Rank method and problems. Symmetric, Skew-symmetric and Orthogonal matrices.

**UNIT-- II**

**Eigen values and Eigen vectors:** Definitions and Properties (without proofs). Evaluation of Eigen values and Eigenvectors for a given matrix. Cayley-Hamilton Theorem (without proof) and its applications in finding higher powers & inverse of a matrix, Diagonalization of a matrix. Hermitian, Skew-Hermitian and Unitary matrices.

**UNIT-- III**

**Quadratic forms:** Quadratic forms, Nature, rank, index and signature of a quadratic form.Reduction of quadratic form to canonical form.

**UNIT-- IV**

**Single Variable Calculus:** Rolle's Theorem, Lagrange's and Cauchy's mean value theorems (without proof); Taylor's and Maclaurin's series (without proof) and their application for series expansions of standard functions.

**UNIT-- V**

**First order ODE:**Exact differential equations, equations reduced to exact, Linear and Bernoulli's equations, Newton's law of cooling, Law of natural Growth/Decay.

**UNIT—VI**

**Higher order ODE:** Higher order linear differential equations with constant coefficients- Complementary function, Particular Integral, Method of variation of parameters.

**TEXT BOOKS:**

1. R K Jain and S R K Iyengar Advanced Engineering Mathematics, Narosa Publications.
2. B.S. Grewal, Elementary Engineering Mathematics, Khanna Publishers
3. Alan Jeffery, Advanced Engineering Mathematics, Academic Press

**REFERENCE BOOKS :**

1. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

**SYLLABUS FOR B.TECH. I YEAR I SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
ESSENTIAL ENGLISH LANGUAGE SKILLS (EELS)**

**Subject Code: 9HC01**

L	T	P/D	C
2	0	0	2

**Course Objectives:**

1. Recognize and distinguish between different parts of speech.
2. Learn the correct usage of articles in sentences.
3. Write sentences using tenses.
4. Identify when each punctuation marks is needed and its correct usage.
5. Recognize the difference between direct and indirect speech and form statements in them.
6. Understand the appropriate use of active and passive voice in certain context.

**Course Outcomes:**

After completion of the course, the student will be able to learn:

1. Demonstrate competence with suitable accuracy in vocabulary, and language fluency.
2. State the definition of nouns, verbs, adjectives, and adverbs.
3. Identify the differences of each tense and use the tenses accurately.
4. Identify specialized reading strategies for specific types of texts.
5. Produce written work that is substantive, organized, and grammatically accurate.

**UNITS:**

**1. Vocabulary-1:**

- 1.1 Root words
- 1.2 Synonyms and Antonyms
- 1.3 Homonyms, Homophones and Homographs
- 1.4 One word substitutes

**2. Vocabulary-2**

- 2.1 Idioms and Phrases
- 2.2 Confusables

**3. Grammar-1**

- 3.1 The Parts of Speech
- 3.2 Use of Articles
- 3.3 Omission of Articles

**4. Grammar-2**

- 4.1 Tenses
- 4.2 Prepositions
- 4.3 Concord

## **5. Reading & Writing**

5.1 Techniques of Reading, Reading Comprehension

5.2 Kinds of Sentences

5.3 Punctuation

## **6. Writing-2**

6.1 Voice – Active voice and Passive Voice

6.2 Speech-Direct & Reported Speech

6.3 Common errors in English

## **SUGGESTED READING & REFERENCES:**

1. Word Power Made Easy by Norman Lewis
2. English Grammar In Use: A Self Study Reference And Practice Book Intermediate Learners Book by Raymond Murphy
3. The Logic of English Words by Logophilia Education
4. English Vocabulary In Use Elementary Book With Ans And Cd-Rom by Felicity Odell (Second Edition)
5. Effective Technical Communication by M. Ashraf Rizvi
6. Intermediate grammar usage and composition; M.L. Tickoo, A.E. Subramanian, P.R. Subramanyam; OBS
7. An Interactive Grammar to Modern English by Shivendra K. Verma and Hemalatha Nagarajan, Frank Bros. & Co.

**SYLLABUS FOR B.TECH. I YEAR I SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
ORAL COMMUNICATION LAB – 1**

	<b>L</b>	<b>T</b>	<b>P/D</b>	<b>C</b>
<b>Code: 9HC61</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**Course Objectives:**

1. Comprehend the basic tactics to communicate effectively and set a road map to achieve their communication goals.
2. Know the importance of pronunciation in effective communication and work on mitigating the MTI in their spoken English;
3. Communicate in proper tense with conviction and also frame and pose questions aptly.
4. Describe people, objects and situations, using appropriate vocabulary, phrases and sequencing of ideas.
5. Use the right English language expressions in varying real life contexts.
6. Develop skill of narration through listening and coordination of ideas.

**Course Outcomes:**

After completion of the course, the student will be able to learn:

1. Describe people, objects and situations using simple sentences.
2. Use appropriate tenses and expressions in different contexts of conversations.
3. Identify major areas of concern in their oral communication and address them.
4. Create a SMART plan to enhance their communication skills in English

**OC LAB (2 per week)**

**UNIT-- I**

**Communication Skills:**Communication basics, essential elements of effective communication, barriers to communication, setting SMART communication goals.

**Activities:**

1. Ice-breaking activities
2. Personal Communication SWOT Analysis
3. Communication Case Studies: The Terrible & The Terrific

**UNIT-- II**

**Pronunciation Matters:** Importance of pronunciation, neutralizing mother tongue interference (MTI).

**Activities:**

1. Odd Word Out
2. Minimal Pairs Masti
3. Shadow reading

**UNIT-- III**

**Use apt expressions in diverse situations:**Self-introduction, Greetings, apologizing, complimenting, inviting, complaining etc.

**Activity:**Role play in different contexts using the appropriate expressions.

#### **UNIT-- IV**

**Mind your Tenses:**Describing present and past habits, states, and events.

Talking about actions in progress, relating past to the present, talking about the future.

Framing questions. (confirmation/information questions)

#### **Activities:**

1. Speaking activity on daily routine, how students spent their recent vacation, speaking about their childhood, speaking about future plans.
2. Dumb Charades (Present/Past continuous - Present/ Past perfect).
3. Guessing game (10/20 yes or no questions).

#### **UNIT-- V**

**Hone your Describing skills:** Describing people, objects, and situations.

#### **Activities:**

1. Picture descriptions.
2. Guessing games - listening to the descriptions.
3. Narrating memorable incidents from life.
4. Describe your ideal world
5. Once upon a time.....

#### **UNIT-- VI**

**The Art of Storytelling:**Story telling for career success, the basics of story telling

#### **Activities:**

1. Building stories - chain activity.
2. Story prompts activity.
3. Narrate the story. (all the hints are given except linking words and tenses)

#### **SUGGESTED READING & REFERENCES:**

1. “An Interactive Grammar of Modern English” by Shivendra K Verma and HemalathaNagarajan, Frank Bros. & Co.
2. “Skill Sutras” by JayashreeMohanraj, Prism Books Pvt. Ltd.
3. “Better English pronunciation” by J.D. Connor.
4. “Effective Communication” John Adair, Pan Macmillan Ltd.
5. “Body Language”, by Allan Pease, Sudha Publications.
6. “Communicative English”, by Hariprasad M. and Prakasam V, Neel Kamal Publications.

**SYLLABUS FOR B.TECH. I YEAR I SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
ENGINEERING PHYSICS LAB**

	<b>L</b>	<b>T</b>	<b>P/D</b>	<b>C</b>
<b>Code: 9HC66</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**Course Objectives:**

1. Understand the concept of photo electric effect using photo voltaic cell.
2. Discuss the dispersive power of prism-minimum deviation method.
3. Discussion of diffraction pattern using the grating – LASER.
4. To study the concepts (numerical aperture) of an optical fiber.
5. To explain about magnetic induction, Biot-Savart principle.
6. Study the frequency of AC mains using Sonometer.
7. Explaining about the electrical resonance by using the LCR circuit.
8. To understand the rigidity modulus, periodicity.
9. To discuss the energy gap ( $E_g$ ) of a semiconductor diode.
10. To study the LED characteristics and forward resistance.
11. To know the time constant of RC circuit.
12. To understand about the ionizing radiation by using the Geiger–Muller counter.

**Course Outcomes:**

After completion of the course, the student will be able to learn:

1. Understand the concepts of photo electric effect, importance, photo current, colour filters, optical sensors.
2. Know about the light properties-dispersion, prism, spectrometer and minimum deviation arrangement.
3. Recognize the difference between the interference and diffraction, grating, laser characteristics.
4. Analyze the concepts of fiber optics, fundamentals, numerical aperture its importance, attenuation in fiber and applications.
5. Understand and search to apply the fundamentals of magnetic induction, Ampere's law, Oersted's law and the Biot-Savart law.
6. Know the difference between AC and DC fundamentals, Magnetostriction, resonance, air column vibrations.
7. Analyze the LCR circuit combination, parallel, series electrical resonance, inductance, reactance, capacitance and electrical and electronic fundamentals.
8. Summarize the fundamentals of modulus-types, stress, strain, elasticity, plasticity and Hook's law.
9. Analyze the concept a semiconductors, types, calculation of energy gap of a semiconductor diode and importance.
10. Analyze the difference between normal diode, LED, forward bias, reverse bias, I-V characteristics, direct and indirect band gap semiconductors.
11. Characterize the RC network, time constant, capacitor functioning and its application.
12. Understand the concept of radiation, ionizing radiation, radiological protection and inverse square law.

**LIST OF EXPERIMENTS**

1. **Photo voltaic cell:**-Determination of Planck's constant by using photo voltaic cell.
2. **Dispersive power:**-Calculation of dispersive power of a given material of prism by using Spectrometer.
3. **Diffraction Grating:**-Determination of wavelength of a given laser source of light by using diffraction grating.
4. **Numerical Aperture:**-Determination of a Numerical Aperture (NA) of an optical fiber.
5. **Stewart-Gee's Experiment:**-Determination of magnetic induction flux density along the axis of a current carrying circular coil using Stewart and Gee's experiment.
6. **Sonometer:**-Calculating the frequency of AC supply by using the Sonometer.
7. **LCR Circuit:**-Study of series and parallel resonance of an LCR circuit – Electrical devices.
8. **Torsional pendulum:**-Determination of rigidity modulus of a given wire material using the Torsional pendulum.
9. **Energy Gap:**-Determination of the energy gap ( $E_g$ ) of a given semiconductor.
10. **Light Emitting Diode:**-Studying the LED characteristics and calculating the forward resistance of it.
11. **RC Circuit:**-Determination of time constant of an RC-circuit.
12. **Geiger-Muller Counter:**-Studying the characteristics of Geiger–Muller counter and verifying the inverse square law - Nuclear physics

**NOTE:** Any **TEN** of the above experiments are to be conducted.



**SYLLABUS FOR B.TECH. I YEAR I SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
PROBLEM SOLVING USING C-LAB**

**Code: 9FC61**

<b>L</b>	<b>T</b>	<b>P/D</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**Course Objectives:**

1. To be able to understand the fundamentals of programming in C Language
2. To be able to write, compile and debug programs in C
3. To be able to formulate problems and implement in C.
4. To be able to effectively choose programming components.
5. To solve computing problems in real-world.

**Course Outcomes:**

After completion of the course, the student will be able to learn:

1. Formulate the algorithms for simple problems
2. Translate the given algorithms to a working and correct program
3. Correct the syntax errors as reported by the compilers
4. Identify and correct logical errors encountered at run time
5. Write iterative as well as recursive programs
6. Represent data in arrays, strings and structures and manipulate them through a program
7. Declare pointers of different types and use them in defining self referential structures.
8. Create, read and write to and from simple text files.

**UNIT -- I (Cycle 1)**

1. Write an algorithm for converting a given Celsius temperature to its equivalent Fahrenheit temperature and draw a flowchart.
2. Write an algorithm to find the largest of three given numbers and draw a flowchart.
3. Write an algorithm and draw a flowchart for finding the roots and nature of roots of a quadratic equation, given its coefficients.
4. Write an algorithm and flowchart for finding the first n Fibonacci numbers, give n.

**UNIT -- II (Cycle 2)**

1. Write an algorithm, flowchart, and C program for:
  2. Finding the area and circumference of a circle of given radius.
  3. Finding the volume of a sphere of given radius.
  4. Finding the lateral surface area of a right circular cone of given base radius and height.
  5. Finding selling price of an item, given its cost price and profit percent.
  6. Finding the interest on a given principal for a given period of time at a given rate of per Year.
7. Write a C program to display all the sizes of data types in C.
8. Write a C program to display a given decimal integer into an equivalent octal number and hexadecimal number using %o and %x in printf function.

**UNIT -- II (Cycle 3)**

1. Write a C program to find the roots and nature of the roots of a quadratic equation, given its coefficients.
2. Write a C program for finding the largest of three given numbers.
3. A salesman gets a commission of 5% on the sales he makes if his sales is below Rs.5000/- and a commission of 8% on the sales that exceeds Rs.5000/- together with Rs.250/-. Write an algorithm or a flowchart and develop C program for computing the commission of the salesman, given his sales.
4. Write a C Program to demonstrate Marcos.

**UNIT -- III (Cycle 4)**

1. Write three C programs to print a multiplication table for a given number using while, do-while, and for loops.
2. Write a C program to compute the sum of:
3.  $1+x+x^2+x^3+\dots+x^n$ , given x and n.
4.  $1! + 2! + 3! + \dots + n!$ , given n.
5.  $1 - x^2/2! + x^4/4! - x^6/6! + x^8/8! - x^{10}/10! + \dots$  to n terms where the n<sup>th</sup> term becomes less than 0.0001.

**UNIT -- III (Cycle 5)**

1. Write a C program in the menu driven style to perform the operations +, -, \*, /, % between two given integers.
2. Write a C program to find the largest and the least of some numbers given by the user.
3. Write a C program to find the sum of the digits of a positive integer.

**UNIT -- III (Cycle 6)**

1. Write C functions for the following:
  - a) A function that takes an integer n as argument and returns 1 if it is a prime number and 0 otherwise.
  - b) A function that takes a real number x and a positive integer n as arguments and returns  $x^n$ .
  - c) A function that takes a positive integer n as an argument and returns the n<sup>th</sup> Fibonacci number.
2. Using recursion write C functions for the following:
  - a) Factorial of a non-negative integer n.
  - b) Number of combinations of n things taken r at a time.
  - c) Greatest Common Divisor of two integers.
  - d) Least Common Multiple of two integers.

**UNIT -- III (Cycle 7)**

1. Write a menu driven style program to compute the above functions (cycle 6) on the choice of the function given by the user.
2. Define macros for the following and use them to find sum of the squares of the minimum and maximum of two given numbers.
  - a) Larger of two numbers.
  - b) Smaller of two numbers.
  - c) Sum of the squares of two numbers.
3. Write a program to generate Pascal's triangle.
4. Write a program to count the number of letters, words, and lines in a given text.

**UNIT -- IV (Cycle 8)**

1. Write a program to store the numbers given by the user in an array, and then to find the mean, deviations of the given values from the mean, and variance.
2. Write a C program to initially store user given numbers in an array, display them and then to insert a given number at a given location and to delete a number at a given location.
3. Write a program to store user given numbers in an array and find the locations of minimum and maximum values in the array and swap them and display the resulting array.

**UNIT -- IV (Cycle 9)**

1. Write a C program to implement the operations of matrices – addition, subtraction, multiplication.
2. Write a program to find whether a given matrix is symmetric, lower triangular, upper triangular, diagonal, scalar, or unit matrix.

**UNIT -- V (Cycle 10)**

1. Write a function to swap two numbers.
2. Write a function to compute area and circumference of a circle, having area and circumference as pointer arguments and radius as an ordinary argument.

**UNIT -- VI (Cycle 11)**

1. Define a structure for complex number. Write functions on complex numbers (addition, subtraction, absolute value, multiplication, division, complex conjugate) and implement them in a menu driven style.
2. Define a structure point. Write a program to find the distance between two points.
3. Define a structure student having members roll no., name, class, section, marks. Create an array of 10 students give the data and find the average marks, section-wise.

**UNIT -- VI (Cycle 12)**

Write a program to:

1. Create a file by the name given by the user or by command line argument and add the text given by the user to that file.
2. Open the file created above and display the contents of the file.
3. Copy a file into some other file, file names given by the user or by command line arguments.
4. Append a user mentioned file to another file.
5. Reverse the first n characters of a file.

**TEXT BOOKS :**

- (i) E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.
- (ii) Let Us C by Yashavant Kanetkar.

**REFERENCE BOOKS :** Programming in C (2nd Edition) by Ashok N Kamthane.

**SYLLABUS FOR B.TECH. I YEAR I SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
ENGINEERING GRAPHICS**

<b>Code: 9BC01</b>	<b>L</b>	<b>T</b>	<b>P/D</b>	<b>C</b>
	<b>0</b>	<b>0</b>	<b>4</b>	<b>3</b>

**Course Objectives:**

- 1.To teach students the basic principles of Engineering graphics and instruments used.
- 2.To introduce the concept of projections in drawing and its applications for simple drawing entities.
- 3.To impart the knowledge of various types of solids and their projections in different position wrt principle planes.
4. To teach the concept of sections of solids and their applications.
5. To develop a clear understanding of the basic principles involved in three dimensional Engineering drawings.
6. To train the students for the extraction of multiple views from a solid model using AutoCAD.

**Course Outcomes:**

After completion of the course, the student will be able to learn:

1. Get familiar to use the instruments to solve the engineering problem and draw various type of curves used in engineering.
2. Understand and Implement Orthographic projections and draw projections of simple
3. Drawing entities such as points Lines, and Planes.
4. Draw projections of different types of regular solids in various positions wrt principal
5. planes of Projection.
6. Draw Sections of various Solids including Cylinders, cones, prisms and pyramids and draw
7. The developments of these solids and their sections.
8. Construct Isometric Scale, Isometric Projections and Views and convert 3D views to 2D orthographic views.
9. Understand from basic sketching through 2D and 3-D solid modelling using computer aided design (CAD) software.

**UNIT – I**

**Introduction to Engineering Drawing:** Drawing Instruments and their uses, types of lines, Lettering, Dimensioning-Terms & notations, placing of dimensions, general rules of dimensioning.

**Curves used in Engineering Practice and their Constructions:** Conic Sections including Rectangular Hyperbola - General method, Cycloid and Involute of circles.

**Scales:** Reducing, Enlarging and Full Scales, types of scales, Construction of plain scales and diagonal scales only-simple problems

## UNIT – II

**Orthographic Projection:** Principles of Projection – Methods of projection, First angle and third angle projections, Projections of Points, Projections of straight lines –line inclined to one plane and line inclined to both reference planes

## UNIT – III

**Projections of regular Planes:** types of planes, plane inclined to one reference plane, Oblique planes

**Projections of regular Solids:** types of solids, Projections of: Prisms, Cylinders, Pyramids, Cones – simple position and axis inclined to one plane only

## UNIT – IV

**Sections and sectional views of Solids:** Sections and Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views.

**Development of Surfaces:** Methods of development, Development of lateral Surfaces of Right Regular Solids – Prisms, Cylinders, Pyramids, Cones and their sections.

## UNIT – V

**Isometric Projection:** Meaning, Isometric axes, lines and planes, Isometric Scale – Isometric drawing or View – Isometric drawing of planes and simple solids such as prisms, pyramids, cylinder, cone.

## UNIT – VI

Conversion of isometric views to orthographic views of simple objects.

(Demonstration only) Overview of Computer Graphics : Demonstrating features of the CAD software - The Menu System, Toolbars, , Dialog boxes and windows, Drawing entities - lines, circles, arcs etc and editing commands, Dimensioning of objects, 2 D drawings-simple exercises , 3D wire-frame and shaded solids- Commands, Boolean operations.

## TEXT BOOKS:

Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House (In First-angle Projection Method)

## REFERENCE BOOKS:

- 1) Shah, M.B. &Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
- 2) Agrawal B. &Agrawal C. M. (2012), Engineering Graphics, TMH Publication

**SYLLABUS FOR B.TECH. I YEAR I SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
INDUCTION PROGRAM**

**L T P/D C**

**Code: 9HC18**

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**Course Objectives:**

- 1) To help the students appreciate the essential 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings.
- 2) To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
- 3) To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature. Thus, this course is intended to provide a much needed orientational input in value education to the young enquiring minds.

**Course Outcomes:**

After completion of the course, the student will be able to learn:

1. Learns Being a human, understands human values and purpose of education
2. Understands the importance of different harmony levels needed. Understand Self and being in the current moment are the sources of happiness.
3. Improves Learning capabilities and communication skills.
4. Improves Personality Development and Life Skills.
5. Understands and appreciate the importance of personality development and yoga for a holistic life.
6. Understands the essence and Values and Social responsibilities for successful life.

Unit	Name of the Module	Number of Periods
<b>a) Orientation Course for B. Tech I Year I semester Students – 3 weeks duration covering the following Two Units</b>		
I	Universal Human Values – Introduction	8
II	Universal Human Values – Relationships	8
<b>b) Orientation Course for B. Tech I Year II semester Students –covering the following Four Units</b>		
III	Improving Learning Capabilities (ILC) - Basic Skills of Learning	12
IV	Improving Learning Capabilities (ILC)- Personality Development and Life Skills	12

V	Literature , Proficiency Modules(PM) in English, Health, Yoga & Diet, Co-Curricular & Extracurricular activities	12
VI	Lectures by Eminent Persons on Science, Technology & Environment, Research, Innovation & Patents, Local Visit to Village and City including Hi-tech City. Feedback on last but one day of Orientation Course	12
<b>Total Number of Periods</b>		<b>64</b>

### UNIT -- I

#### Universal Human Values

**Introduction** -Self – Exploration, Basic human aspirations, Need for a holistic perspective, Role of Education, Understanding Happiness, Understanding the human being – Self and Body.

### UNIT -- II

#### Universal Human Values

**Relationships**-Understanding Relationship –Trust and Respect.Harmony in the Society, Natural Environment, Participation in nature Harmony in nature/existence.

### UNIT -- III

#### Improving Learning Capabilities-Basic Skills of Learning

Principles of Learning, Study Skills & E-Learning, Listening Skills, Effective Reading and Reviewing, Reading Comprehension, Textbook Reading Strategies, Test taking strategies, Introduction to Soft Skills and Employability Skills, Interpersonal skills.

### UNIT -- IV

#### Improving Learning Capabilities-Personality Development and Life Skills

Goal Setting, Motivation, Time Management, Positive Attitude, Decision Making, Building Self-confidence, Attributes of a Good Personality, Memory Management, Characteristics of a successful student, Responsibilities of Students in shaping themselves, Morals, Ethics & Values, Difference between Studying in a Professional College and High School / Junior College

### UNIT -- V

**Literature, Proficiency Modules (PM) in English, Health, Yoga & Diet, Co-Curricular & Extracurricular activities**

**Literature** -History of human civilization, Indian civilization, Indus valley civilization and culture, history of religions, the basic tenets of Christianity, Islam, Hinduism, Buddhism, Jainism, Sikkim and Judaism, Indian culture and values.

**Proficiency Modules in English** - Strategies to improve proficiency in English skills (L/S/R/W), Exercises based on Remedial grammar, Exercises on Remedial Vocabulary

**Health**- Dimensions of Health, Basic activities of daily living, Instrumental activities of daily living, Types of Health, Factors affecting health

**Yoga** - Introduction to Yoga, Kinds of Yoga, Pranayama and Dhyana (Meditation)

**Diet**- Balanced Diet, Components of Diet, Health Eating Pyramid.

**Co- curricular and Extra Curricular activities.**



**SYLLABUS FOR B. TECH. I YEAR II SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
ENGINEERING CHEMISTRY**

<b>Code: 9HC04</b>	<b>L T P/D C</b>
	<b>2 1 0 3</b>

**Course Objectives:**

1. To understand microscopic chemistry in terms of atomic and molecular orbitals
2. To learn the preparation and applications of commercial polymers and lubricant materials
3. To learn the industrial problems caused by water and municipal water treatment
4. To acquire knowledge about different types of batteries and their working mechanism
5. To develop the concepts and types of corrosion, control methods and protective coatings
6. To learn the chemical reactions that are used in the synthesis of drug molecules

**Course Outcomes:**

After completion of the course, the student will be able to learn:

1. Understand and analyse microscopic chemistry in terms of atomic orbital's, molecular orbital's and intermolecular forces.
2. Identify and differentiate polymers, thermoplastic, thermosetting plastics and various lubricants.
3. Recognize and select the domestic and industrial problems caused by hard water and also learn about the municipal water treatment using various methods.
4. Understand and interpret the important fundamental concepts of electro chemistry and solve the problems related to batteries.
5. Differentiate the types of corrosion and methods used to prevent the corrosion, surface coating techniques.
6. Learn and implement synthesis of drug molecules and learn fundamentals of analytical techniques like electronic, vibrational and rotational spectroscopy.

**UNIT -- I**

**Atomic and molecular structure (6L):** Molecular orbitals of diatomic molecules and plots of the multicentre orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic ( $F_2$ ,  $Cl_2$ ,  $CO$ ,  $NO$ ). Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

**UNIT-- II**

**Plastics and Lubricants (8L):**

**Plastics:** Polymerization-Addition and Condensation polymerization, Plastics – Thermosetting and Thermoplastics, preparation, properties and engineering applications of plastics: PVC, Teflon, Bakelite. Fibres : Nylon 6.6 and Dacron. Rubbers – natural and

artificial rubber, vulcanization of natural rubber, Buna-S, Buna-N and their engineering applications. Fabricated Reinforcing Polymers- engineering applications.

**Lubricants:** Definition, classification and function of lubricants, Types of lubrication and mechanisms – Thick Film or Hydrodynamic Lubrication, Thin Film or Boundary Lubrication, Extreme Pressure Lubrication. Classification and properties of lubricants – Viscosity, flash and fire point, cloud and pour point and acid value. Engineering applications.

### UNIT -- III

#### **Water Technology (8L):**

- (a) **Introduction:** - Hardness of water – types of hardness (temporary and permanent), calculation of hardness- Numerical problems. Estimation of hardness of water by EDTA Method.
- (b) **Water for Industrial purpose:** Food, sugar, textile, paper and pharma industries, water for steam making characteristics of boiler feed water, boiler troubles- scale and sludge & Carry over (priming & foaming), boiler corrosion, caustic embrittlement.
- (c) **Water Treatment:** Internal conditioning- phosphate, carbonate & calgon conditioning. External Treatment: Ion-exchange process. Desalination-reverse osmosis. Municipal water treatment-sedimentation, coagulation, filtration, disinfection-chlorination, ozonation. Engineering applications: Methodology and working of mineral water plant for drinking purpose.

### UNIT – IV

#### **Electrochemistry (8L):**

**Conductance:** conductors (metallic and electrolytic), types of conductance – specific, equivalent and molar conductance – effect of dilution on conductance.

Free energy and emf, cell potentials, electrode potential (oxidation and reduction). Types of electrodes - redox electrode (quinhydrode electrode), metal – metal insoluble salt electrode and Ion selective electrode. Cell notation and cell reaction – Nernst equation and applications. Engineering Applications.

**Batteries:** Types of Batteries

- (a) Primary batteries – Lechalanche cell (dry cell), Lithium cell
- (b) Secondary batteries (Accumulators) – Lead acid battery, Lithium-ion battery
- (c) Fuel cells-  $H_2 - O_2$  fuel cell and  $MeOH-O_2$  fuel cell-advantages and applications. Engineering applications – future water powered car, Hydrogen production and storage.

### UNIT -- V

#### **Corrosion and Surface treatment (8L)**

Corrosion – basic concepts – types of corrosion, chemical, electrochemical corrosion (absorption of  $O_2$  and evolution of  $H_2$ ) -factors affecting the rate of corrosion.

**Cathodic protection** – sacrificial anodic protection and impressed current cathodic protection method.

**Surface treatment** -Mechanical surface treatment and coatings, casehardening and surface coating, thermal spraying, vapour deposition, Ion implantation, Diffusion coating.

**Methods of metallic coatings**-hot dipping (tinning and galvanizing), metal cladding (Al cladding), electroplating (copper plating) and electroless plating (nickel plating), electroforming, ceramic, organic and diamond coating.

### UNIT-- VI

**Organic reactions and drug molecules (5L)**

Introduction: reactions involving substitution ( $S_N1$ ,  $S_N2$ ) addition to double bond( $C=C$ ), elimination ( $E^1$  and  $E^2$ ), oxidation (using  $KMnO_4$ ,  $CrO_3$ ), reduction (Hydrogenation by  $Ni/H_2$ ,  $Pd/C$ )

**Drugs:** Definition, classification structure and applications of commonly used drug molecules- paracetamol, aspirin, ibuprofen and diphenhydramine (Benadryl)

Principles of spectroscopy and selection rules: Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules- Applications.

**TEXT BOOKS:**

1. Engineering Chemistry: PK Jain & MK Jain, Dhanapathrai Publications (2018)
2. Engineering Chemistry: By Thirumala Chary Laxminarayana & Shashikala, Pearson Publications (2020)

**REFERENCE BOOKS:**

1. Textbook of Engineering Chemistry: Jaya Shree Anireddy, Wiley Publications (2019)
2. Engineering Chemistry: By B.Rama Devi, PrsantaRath & Ch.VenkataRamana Reddy, Cengage Publications (2018)
3. Engineering Chemistry: Shashi Chawla, Dhanapathrai Publications (2019)
4. Textbook of Engineering Chemistry: SS Dara, SS Umare S. Chand Publications (2004)

**SYLLABUS FOR B.TECH. I YEAR II SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
DATA STRUCTURES**

**Code: 9EC01**

L	T	P/D	C
3	0	0	3

**Course Objectives:**

1. To make the students to understand and expected to learn the applications of Abstract data Type, linear data structures such as stacks, queues and lists
2. Comprehend different nonlinear data structures such as trees and graphs and analyze their efficiency trade off using time complexities
3. Explore the concepts of object-oriented programming and advanced C++ concepts and be able to write programs with C++ features such as composition of objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, Templates etc.

**Course Outcomes:**

After completion of the course, the student will be able to learn:

- 1) Demonstrate the concepts of Abstract data type and also applications of stack and Queues
- 2) Select the data structure that efficiently model the information in a problem
- 3) Design programs using variety of data structures including Trees, AVL Trees and Graphs and their applications.
- 4) Solve problems and also assess efficiency trade off among searching and sorting using time complexity of each algorithm and also the applications of hashing and hash tables.
- 5) Describe the concepts of OOPs and implement programs using objects, classes, constructors and destructors.
- 6) Apply concepts of OOPs to write program on over loading functions and concepts of inheritance.

**UNIT-- I**

**Introduction to data structures:** Abstract data type (ADT), Stacks, Queues and Circular queues and their implementation with arrays.

**Applications of Stack:** infix to post fix conversion, postfix expression evaluation. Applications of Queues.

**UNIT-- II**

**Linked lists:** Singly linked lists, Advantages of Linked lists over Arrays, Doubly linked lists, Circular list and their operations, representing stacks and queues with Linked lists.

### **UNIT-- III**

**Trees-** Binary trees, terminology, representation, traversals. AVL trees, AVL tree operations: Insertion, deletion and searching. Graphs- terminology, representation, graph traversals (DFS and BFS).

### **UNIT-- IV**

**Searching** –Searching: Linear and binary search methods. Sorting: Quick sort, Merge sort. Performance analysis of Searching and Sorting Algorithms.

**Heaps:** Introduction, Min Heap, Max Heap, Operations on Heaps, Heap Sort.

**Hashing:** Hash Table, Hash functions, collision resolution-separate chaining, open addressing-linear probing, quadratic probing, double hashing.

### **UNIT-- V**

**Introduction to C++ programming**-object oriented programming concepts, Structured Vs OOP. Classes and objects-class definition, Objects, class scope and accessing members, Constructors-default constructor, parameterized constructor, copy constructor.Destructor.

### **UNIT-- VI**

Static class members, this pointer, friend functions, Dynamic memory management with operators new and delete. Overloading-function overloading, Operator overloading, restrictions on operator overloading, overloading unary and binary operators, templates, inheritance: single, multiple and multi level inheritance.

### **TEXT BOOKS:**

1. Data Structures and C++ by Reema Thareja.
2. Data Structure through C by Yashavant Kanetkar. The complete reference C++ By Herb Schildt.

### **REFERENCES:**

1. Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft. Data Structures and Algorithms. Addison Wesley,1983.
2. Data Structures using c Aaron M.Tenenbaum , YedidyahLangsam,MosheJAugenstein.
3. Introduction to Data Structures in C ByKamtane
4. Data Structures, A pseudocode Approach with C by Richard F. Gilberg and Behrouz A. Forouzan.

**SYLLABUS FOR B.TECH. I YEAR II SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
ADVANCED CALCULUS**

L	T	P/D	C
2	1	0	3

**Code: 9HC12**

**Pre Requisites:** Mathematics Knowledge at Pre-University Level.

**Course Objectives:**

1. Basic concepts of multivariable differential calculus.
2. Evaluation of double and triple integrals.
3. Solutions of first order linear and non-linear partial differential equations.
4. Series expansion of a given function in terms of sine and cosine terms.
5. Basic Concepts of vector differential calculus.
6. Concepts of vector integral calculus

**Course Outcomes:**

After completion of the course, the student will be able to learn:

1. Find the limits and test for the continuity and differentiability of a function.
2. Solve the problems on multiple integrals.
3. Solve linear and nonlinear first order partial differential equations.
4. Find Series expansion a function defined over the intervals.
5. Find directional derivative, gradient, divergence and curl of a function.
6. Solve problems of line, surface and volume integrals.

**UNIT-- I**

**Functions of several variables:** Limits, Continuity and partial derivative, total derivative, Jacobian, Maxima and minima of two variable functions (without constraints).

**UNIT-- II**

**Multiple Integrals:** Double integrals, change of order of integration, change of variables (Cartesian to polar), Triple integrals (Cartesian form).

**UNIT-- III**

**Partial Differential Equations:** Formation of partial differential equations, solutions to first order linear and non-linear partial differential equations - standard Forms,

**UNIT-- IV**

**Fourier series:** Dirichlet conditions, Fourier series of functions over the intervals of length  $2l$  &  $2\pi$ . Half range sine and cosine series, Problems on Parseval's theorem (without proof).

**UNIT-- V**

**Vector Differentiation:** Vector and scalar point functions, gradient, directional derivatives; divergence and curl of a vector point function and problems.

**UNIT-- VI**

**Vector Integration:** Line integrals, surface integrals, volume integrals, Green, Gauss divergence and Stokes theorems (without proofs) and problems.

**TEXT BOOKS:**

1. R K Jain and S R K Iyengar Advanced Engineering Mathematics, Narosa Publications.
2. B.S. Grewal, Elementary Engineering Mathematics, Khanna Publishers
3. Alan Jeffery, Advanced Engineering Mathematics, Academic Press
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
5. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

**REFERENCE BOOKS:**

- B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000
- S. S. Sastry, Introductory methods of numerical analysis. PHI, 4th Edition, 2005.
- G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
- Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
- Engineering Mathematics, Ravish R. Singh, McGraw Hill Education

**SYLLABUS FOR B.TECH. I YEAR II SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**

	<b>L</b>	<b>T</b>	<b>P/D</b>	<b>C</b>
<b>Code: 9AC48</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Objectives:**

To understand the basics of Electrical engineering concepts and applications

**Course Outcomes:**

After studying this course, the student will be able to learn:

1. Understand and apply the principles of electrical engineering to solve basic equations.
2. Apply the knowledge gained to explain the principles of single and three phase AC circuits.
3. Apply the knowledge gained to explain the principle and operation of DC machine along with its applications.
4. Use the principles of single phase transformer along with its applications and solve the equations.
5. Realize the principle and operation of three phase induction motor with its applications.
6. Understand the operation of different measuring instruments along with its applications.

**UNIT-- I**

**Fundamentals of Electrical Engineering and DC Machines:** Ohm's Law, Kirchhoff's Laws, types of sources, passive elements. Series parallel circuits, mesh and nodal analysis. Superposition, Reciprocity theorem.

**DC Machines:** Principle of operation of D.C generators, types, E.M.F equation. Principle of operation of D.C motors, Types motors, Torque equation, Losses and efficiency, simple problems on D.C Generators and motors.

**UNIT-- II**

**Fundamentals of AC circuits:** AC voltage wave form and basic definitions: Peak Value, R.M.S. value, Average values, Form factor and Peak factor, 'j' operator, Analysis of single phase AC circuits series and parallel (Simple circuits). Three phase circuits – Star - delta connection, Relation between line and phase voltages / currents in a 3-phase Star-Delta balanced system.

**UNIT-- III**

**Induction Motors and Instruments:** Concept of Faraday's laws, 3- phase induction motor working principle, operation and construction details.

**Instruments:** Introduction, classification of instruments, operating principles, essential features of measuring instruments, permanent magnet moving coil (PMMC) instruments, moving iron (MI) instruments.



**UNIT-- IV**

**DIODE:** Overview of Semiconductors, PN junction diode and Zener diode –Diode circuits: rectifiers (bridge type only), filters, clippers and clampers.

**UNIT-- V**

**TRANSISTOR:** BJT construction, operation, characteristics (CB, CE and CC configurations) and uses – JFET and MOSFET construction, operation, characteristics (CS configuration) and uses.

**UNIT-- VI**

**DIGITAL ELECTRONICS:** Number systems – binary codes –binary arithmetic - Boolean algebra, laws & theorems - simplification of Boolean expression using K maps - logic gates - implementation of Boolean expressions is using logic gates - standard forms of Boolean expression.

**TEXT BOOKS:**

1. Basic Electrical Engineering –T.K. Nagesarkar and M.S. Sukhja, Oxford University Press.2<sup>nd</sup> edition.
2. Basic electrical Engineering – M.S. Naidu and S. Kamakshiah – TataMcGraw-Hill, 2005 edition.
3. Principles of Electronics - V.K.Mehta, S.Chand Publications, 2nd edition.

**REFERENCES:**

1. Theory and problems of Basic electrical Engineering- D.P.Kotahari & I.J.Nagrath PHI.
2. Electronic Devices and Circuits, Millman & Halkias, TMH publications.

**SYLLABUS FOR B.TECH. I YEAR II SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
ORAL COMMUNICATION LAB - II**

<b>Code: 9HC62</b>	<b>L</b>	<b>T</b>	<b>P/D</b>	<b>C</b>
	<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**Course Objectives:**

1. Strike a conversation and engage in effective small talk.
2. Lose stage fear and confidently interact with others in different roles and tap their creative side.
3. Speak for a minute, fluently and cohesively.
4. Make official presentations with effective use of PPTs.
5. Engage in group discussions in a confident and professional manner.
6. Shed fear of questions from the audience and the interviewers.

**Course Outcomes:**

After studying this course, the student will be able to learn:

1. Understand the nuances of striking a great conversation in formal and informal situations.
2. Gain experience of facing an audience and speaking in public.
3. Design a winning presentation and present it with ease.

**OC Lab (2 hrs. per week)**

**UNIT-- I**

**Small talk and conversational techniques**

Tips on enhancing conversation skills.

Conversation starters, small talk questions, how to talk to strangers and practice activities on initiating informal conversations.

- 1) Talk about your favourite things.
- 2) Interview each other.

**UNIT-- II**

**Role Play/skit/one act play**

- 1) Role play assuming fictional characters and non-fictional characters.
- 2) One Act plays
- 3) Ad' Venture: Advertisement creation and enacting.

**UNIT-- III**

**Just a minute (JAM)**

One-minute speaking activity on topics of students' choice and Extempore.

#### **UNIT-- IV**

##### **Presentation Skills**

Introduction to structural talk. Techniques of making effective presentations.

- Five minute PowerPoint presentations.

#### **UNIT-- V**

##### **Group Discussions**

Tips on Dos and Don'ts of Group Discussion (GD). Discussion on evaluation pattern during GD.

- Practice sessions: GDs on different topics.

#### **UNIT-- VI**

##### **Facing questions: Mock Interviews**

Strategies of handling Question and Answer sessions after Presentations/seminars.

- Question Toss: Practice on asking and answering questions.

##### **Suggested Reading:**

- 1) “Effective Technical Communication” by M. Ashraf Rizvi, McGraw Hill.
- 2) “Skill Sutras” by JayashreeMohanraj, Prism Books Pvt. Ltd.
- 3) “Technical Communication: Principles and Practice” by Meenakshi Raman, OUP.
- 4) “Effective Communication” John Adair, Pan Macmillan Ltd.
- 5) “Body Language”, by Allan Pease, Sudha Publications.
- 6) “Business Communication: From Principles to Practice” MM Monippally, TataMcGraw Hill.

**SYLLABUS FOR B.TECH. I YEAR II SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
ENGINEERING CHEMISTRY LAB**

	<b>L</b>	<b>T</b>	<b>P/D</b>	<b>C</b>
<b>Code: 9HC64</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**Course Objectives:**

1. To reparation of Inorganic compounds.
2. To determine surface tension of a liquid.
3. To determine viscosity of lubricant.
4. To determine acid value of an oil.
5. To estimate hardness of water.
6. To analyze the amount of chloride content.
7. To determine cell constant and conductance of solutions.
8. To determine redox potential and emf of solutions.
9. To determine the rate constant of acid.
10. To synthesize a polymer (Thiakol rubber / Urea-Farmaldehyde resin).
11. To synthesize a drug- Aspirin.
12. To estimate of  $Mn^{+7}$  by Colorimetry method.

**Course Outcomes:**

After completion of the course, the student will be able to learn:

1. Preparation of Inorganic compounds.
2. Determination surface tension of a liquid.
3. Determination viscosity of lubricant.
4. Determination acid value of an oil.
5. Estimation hardness of water.
6. Analysis the amount of chloride content.
7. Determination of cell constant and conductance of solutions.
8. Determination of redox potential and emf of solutions.
9. Determination of the rate constant of acid.
10. Synthesis of a polymer (Thiakol rubber / Urea-Farmaldehyde resin).
11. Synthesis of a drug- Aspirin.
12. Estimation of  $Mn^{+7}$  by Colorimetry method.

## List of Experiments

1. Preparation of coordination complex NiDMG Complex.
2. Determination of surface tension.
3. Determination of viscosity.
4. Saponification/acid value of an oil.
5. Ion exchange column for removal of hardness of water / Estimation of Hardness of water by EDTA Method.
6. Determination of chloride content of water.
7. Determination of cell constant and conductance of solutions (HCl Vs NaOH / Mixture of acid Vs Strong base).
8. Potentiometry - determination of redox potential and emf ( $\text{FeSO}_4$  Vs  $\text{KMNO}_4$  / HCl Vs NaOH).
9. Determination of the rate constant of acid catalyzed hydrolysis of methylacetate.
10. Synthesis of a polymer- Thiokol rubber / Urea-Formaldehyde resin.
11. Synthesis of a drug- Aspirin.
12. Estimation of  $\text{Mn}^{+7}$  by Colorimetry method.

**SYLLABUS FOR B.TECH. I YEAR II SEM.**  
**COMPUTER SCIENCE AND ENGINEERING (AI & ML)**  
**DATA STRUCTURES USING C LAB**

	<b>L</b>	<b>T</b>	<b>P/D</b>	<b>C</b>
<b>Code: 9EC61</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**Course Objective:**

1. Understand the data structures: simple and complex and use them to write the programs for implementing searching, sorting, expression evaluations.
2. Understand the applications that use the particular data structure and its significance in the development of operating systems and the software's.
3. Understand the object-oriented programming concepts of C++.

**Course Outcomes:**

After completion of the course, the student will be able to learn:

1. Implement Stacks, Queues and circular queues.
2. Write programs using tree traversals. In-order, preorder and post-order.
3. Program searching, sorting and hashing operations.
4. Write programs on Binary trees
5. Implement classes and operator overloading.

**UNIT -- I**

1. Write a C program that implement stack and its operations using arrays
2. Write a C program that implement Queue and its operations using arrays.
3. Write a C program that implement Circular Queue and its operations using arrays.
4. Write a C program that uses Stack operations to perform the following
  - i) Converting infix expression into postfix expression
  - ii) Evaluating the postfix expression

**UNIT -- II**

1. Write a C program that uses functions to perform the following operations on singly linked list:
  - i) Creation
  - ii) Insertion
  - iii) Deletion
  - iv) Traversal
2. Write a C program using functions to perform the following operations on circular singly linked list:
  - i) Creation
  - ii) Insertion
  - iii) Deletion
  - iv) Traversal
3. Write a C program that uses functions to perform the following operations on doubly linked list:
  - i) Creation
  - ii) Insertion
  - iii) Deletion
  - iv) Traversal in both ways

4. Write a C program to implement operations on the following Data Structures Using Singly linked list:
  - i) Stack
  - ii) Queue

### **UNIT -- III**

1. Write a C program that uses functions to perform the following:
  - i. Creating a Binary Tree of integers.
  - ii. Traversing the above binary tree in pre order, in order and post order.

### **UNIT-- IV**

1. Write C programs that use both recursive and non- recursive functions to perform the following searching operations for a Key value in a given list of integers:
  - i) Linear Search
  - ii) Binary Search
2. Write C programs that implement the following sorting methods to sort a given list of integers in ascending order:
  - i) Bubble Sort
  - ii) Insertion Sort
  - iii) Selection Sort
3. Write C programs that implement the following sorting methods to sort a given list of integers in ascending order:
  - i) Quick sort
  - ii) Merge sort
  - iii) Heap Sort
4. Write a C Program to implement Separate Chaining using Hashing. Include Insertion, Deletion and Display of the Elements.

### **UNIT -- V**

1. Write a C++ program to read and display the details of student class with data members as name, RollNo. and 3 subject's marks.
2. Write a C++ program to implement all types of constructors.

### **UNIT -- VI**

1. Write a C++ program to implement operator overloading for addition of two complex numbers.

**SYLLABUS FOR B.TECH. I YEAR II SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
WORKSHOP/MANUFACTURING PROCESSES LAB**

<b>Code: 9BC61</b>	<b>L T P/D C</b>
	<b>0 1 3 2.5</b>

**Course Objectives:**

1. To know the different popular manufacturing process.
2. To gain a good basic working knowledge required for the production of various engineering products.
3. To provide hands on experience about use of different engineering materials, tools, equipment's and processes those are common in the engineering field.
4. To identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.

**Course Outcomes:**

After completion of the course, the student will be able to learn:

1. Use various types of conventional manufacturing Processes.
2. Manufacture components from wood, MS flat, GI Sheet etc. – hands on experience.
3. Manufacturing of components by machining like shafts, holes & threaded holes, surface finishing of components etc.
4. Produce small devices / products /appliances by assembling different components.

**LIST OF EXPERIMENTS**

S.No	Trades	List of Experiments
1	Fitting Shop	1. Preparation of T-Shape Work piece 2. Preparation of U-Shape Work piece which contains: Filing, Sawing, Drilling, Grinding.
2	Carpentry	3.Practice of Cross Half lap joint 4. Practice of Half lap Dovetail joint
3	Electrical & Electronics	5. One lamp one switch Practice 6. Stair case wiring: Practice
4	Welding ( Arc& Gas) & Soldering shop	Demonstration of Gas and Resistance welding 7. Practice of Lap and Butt joint using Arc welding



5	Casting	8.Preparation of mould by using split pattern 9. Mould preparation and pouring of molten metal.
6	Tin Smithy	10. Preparation of Rectangular Tray & Square box
7	Machine Shop	11. Demonstration of Turning, Drilling and grinding operations on Lathe, Drilling and grinding machines
8	Plastic molding & Glass Cutting	12 a) Demonstration of Injection Moulding b) Demonstration of Glass Cutting with hand tools
9	Domestic Appliances	13.Demonstration of assembly components of Fans, Mixers, Air blower, Iron box, Rice cooker, Emergency light
10	Lab project	14. Making various components and / or assembling the components which can be useful in domestic / engineering applications

**SYLLABUS FOR B.TECH. II YEAR I SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
OBJECT ORIENTED PROGRAMMING THROUGH JAVA**

**L T P/D C**

**2 1 0 3**

**Code: 9EC02**

**Course Objectives:**

1. Understand the concepts of Object oriented programming principles of Java.
2. Write the programs and execute using OOP Principles such as garbage collection, overloading methods, constructors, recursion, string handling, String Tokenizer, inheritance and its types, packages, multithreading and threads.

**Course Outcomes:**

After completion of the course, the student will be able to learn:

1. Understand and comprehend the fundamentals of JAVA, its Classes, and Objects and write simple programs using constructors.
2. Write programs using inheritance, interface and packages.
3. Implement programs using Packages, I/O Stream and collections.
4. Implement Exception handling and Multithreading.
5. Design programs using AWT, Swings and develop applications using event handling.
6. Develop applications using Applets and develop client server programs using networking concepts.

**UNIT -- I**

History of Java, Java buzzwords, data types, variables, simple java program, scope and life time of variables, operators, expressions, control statements, type conversion and costing, arrays,, classes and objects – concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, recursion, string handling, StringTokenizer.

Applications: Basic operations on the bank account of a customer.

**UNIT-- II**

**Inheritance** –Definition, single inheritance, benefits of inheritance, Member access rules, super class, polymorphism- method overriding, Dynamic method dispatch, using final with inheritance, abstract classes, Base class object.

**Interfaces:** definition, variables and methods in interfaces, differences between classes and interfaces, usage of implements and extends keyword, interfaces, uses of interfaces, packages

Applications: Extending the banking operations to the loan applicants.

### UNIT -- III

**Packages:** Definition, types of packages, Creating and importing a user defined package. Introduction to I/O programming: Data Input Stream, Data Output Stream, FileInputStream, File Output Stream, Buffered Reader.

**Collections:** interfaces, Implementation classes, and Algorithms (such as sorting and searching).

Applications: Searching for a string in the text. PNR status check, students' result sorting.

### UNIT -- IV

**Exception handling:** exception definition, benefits of exception handling, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes.

**Multi-Threading:** Thread definition, types of multitasking, uses of multitasking, thread life cycle, creating threads using Thread class and Runnable interface, synchronizing threads, daemon thread.

Applications: Illegal entry handling in the registration form. (Example: entering incorrect intermediate hall-ticket number in EAMCET Registration form).

### UNIT -- V

Advantages of GUI over CUI ,The AWT class hierarchy, Introduction to Swings, Swings Elements: JComponent, JFrame, user interface components- JLabels, JButton, JScrollbar, text components, check box, check box groups, choices, lists panels – scrollpane, menubar, graphics, layout, managers –boarder, grid, flow, card and grid bag.

**Event handling:** Delegation event model, closing a Frame, mouse and keyboard events, Adapter classes.

Applications: developing calculator, developing feedback form, developing bio data.

### UNIT -- VI

**Applets:** Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.

Applications: Developing of simple advertisements.

**Networking:** Basics of network programming, addresses, ports, sockets, simple client server program, multiple clients, sending file from server to client.

Applications: One to one Chat application.

**TEXT BOOKS:**

1. Java; the complete reference, 6th edition, Herbert Schildt, TMH.
2. Introduction to Java programming 6th edition, Y. Daniel Liang, Pearson education.

**REFERENCES:**

1. Core Java 2, Vol 1, Fundamentals, Cay. S. Horstmann and Gary Cornell, seventh Edition, Pearson Education.
2. Core Java 2, Vol 2, Advanced Features, Cay. S. Horstmann and Gary Cornell, Seventh Edition, Pearson Education.

**SYLLABUS FOR B.TECH. II YEAR I SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
PROBABILITY AND STATISTICS**

L	T	P/D	C
2	1	0	3

**Code: 9HC15**

**Prerequisites:** Mathematics Knowledge at Pre-University Level.

**Course Objectives:**

1. Concepts of the probability, types of random variables and probability distributions.
2. Sampling distributions and their properties, concepts on estimation.
3. Concepts on testing the hypothesis concerning to large samples.
4. Different kinds of tests related to small samples and tests concerned to small size samples and goodness of fit and independence of attributes using chi-square distribution.
5. Preliminaries of basic statistics also correlation.
6. Method of least squares and regression.

**Course Outcomes:**

After completion of the course, the student will be able to learn:

1. Solve the random variable problems and probability distributions.
2. Estimate the parameters and solve the problems using central limit theorem.
3. Test the hypothesis related to samples concerning to the means and proportions of large size samples.
4. Apply and solve the problems using t-test, Chi-square test also testing the hypothesis problems on small size samples, goodness of fit and independence of attributes.
5. Solve the problems on measures of central tendency, Correlation.
6. Classify and differentiate various regression models.

**UNIT -- I**

**Random Variables and Probability Distributions:** Conditional probability, Multiplication theorem, Baye's Theorem (without Proof). Random variables – Discrete and Continuous, Probability Mass and Density functions, Expectation and Variance.

**Probability Distributions:** Binomial, Poisson and Normal Distributions.

**UNIT -- II**

**Sampling Distributions and Estimation:** Populations and Samples, Sampling distribution of the Mean ( $\square$  - known and unknown), Sums and Differences, Central limit theorem.

**Estimation:** Point Estimation and Interval Estimation concerning Means for Large Samples.

### UNIT -- III

**Tests of Hypothesis for Large Samples:** Tests of Hypothesis, Type-I and Type-II Errors, Hypothesis testing concerning one mean and two means and test of hypothesis concerning to one Proportion and difference of proportions.

### UNIT -- IV

**Tests of Hypothesis for Small Samples:** Student t-test, Hypothesis testing concerning one mean and two Means, F-test and  $\chi^2$  test-Goodness of fit, Independence of Attributes.

### UNIT -- V

**Basic Statistics and Correlation:(10L)** Measures of Central tendency: Moments, skewness and kurtosis – Types of correlation, coefficient of correlation, Properties. Methods of finding the coefficient of correlation, Scatter diagram, direct method, Spearman's rank correlation, Karl Pearson's formula.

### UNIT -- VI

**Curve fitting and Regression:(10L)** Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Types of Regression, linear regression, multiple regressions.

#### Text Books:

1. Miller and Freund's, Probability and Statistics for Engineers, 8<sup>th</sup> Edition, Pearson Educations.
2. SCHAUM'S outlines: Probability and Statistics, Murray R. Spiegel, John Schiller, R. Alu Srinivasan, Mc Graw Hill publishers.
3. S C Gupta and V K Kapoor, Fundamentals of Mathematical statistics, Khanna publications.

#### Reference Books:

1. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11<sup>th</sup> Reprint, 2010.
2. Probability and Statistics, T.K.V. Iyengar, B. Krishna Gandhi, S. Ranganatham, M.V.S.S.N. Prasad, S. Chand Publications.
3. A.Ross, A First Course in Probability, 6<sup>th</sup> Ed., Pearson Education India, 2002.
4. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Probability & Statistics For Engineers & Scientists, 9<sup>th</sup> Ed. Pearson Publishers.

**SYLLABUS FOR B.TECH. II YEAR I SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
QUANTITATIVE APTITUDE and LOGICAL REASONING**

**Code: 9HC16**

**L T P/D C**

**Course Objective:**

**3 0 0 3**

To answer general problems in his everyday life within in short time and to improves the certain skills of a student such as numerical and logical ability, mental capacity and also in sharpening minds.

**Course Outcomes:**

After completion of the course, the student will be able to learn:

1. Number system, HCF and LCM, Averages, Ages and ratio and proportion.
2. Various important topics of quantative aptitude.
3. Mensuration and data interpretation topics.
4. Series Completion, analogy, classification and coding and decoding topics.
5. Various topics of logical reasoning.
6. Venn-diagrams, cubes and dice and also on clocks and calendar problems.

**UNIT -- I**

**Number System:** Test for Divisibility, Test of prime number, Division and Remainders – HCF and LCM of Numbers–Fractions and Decimals -Average-Problems on Ages- Problems on Numbers- Ratio and Proportion.

**UNIT -- II**

Percentage – Profit, Loss and Discount – Partnership and Share-Simple Interest - Compound Interest. Time and Work- Pipes and Cisterns-Time and Distance- Problems on Trains- Boats and Streams.

**UNIT -- III**

Allegation or Mixtures, Clocks &Calendar, Mensuration : Area of Plane Figures, Volume and Surface Area of Solid Figures.

Data Interpretation: Tabulation, Bar Graphs, Pie Charts, Line Graphs.

**UNIT -- IV**

**Series Completion:** Number Series, Alphabet Series, Alpha – Numeric Series.

**Analogy:** Completing the Analogous Pair, Simple Analogy, Choosing the Analogous pair, Double Analogy, Word Analogy, and Number Analogy.

**Classification:** Word Classification, Number Classification and Letter Classification.

**Coding & Decoding:** Letter Coding, Number Coding, Matrix Coding, Substitution, Deciphering Message Word Codes, Jumbled Coding. Crypt arithmetic-Inequalities-Input Output Tracing

#### **UNIT -- V**

Blood Relations– Direction sense test- Number, Ranking & Time Sequence Test – Mathematical Operations-Arithmetical Reasoning. Puzzle Test: Classification Type Questions, Seating Arrangements, Comparison Type Questions, Sequential Order of Things, Selection Based on Given Conditions, Family Based Puzzles, Jumbled Problems.

#### **UNIT -- VI**

Logical Venn Diagrams –Cubes and Dice – Analytical Reasoning-Assertions and Reason– Logical Deductions-Syllogism -Statement and Arguments-Statement and Conclusions- -Data Sufficiency.

#### **Text Books:**

1. Quantitative Aptitude by R.S.Agarwal
2. Verbal and Non Verbal Reasoning by R.S.Agarwal.



**SYLLABUS FOR B.TECH. II YEAR I SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
PYTHON PROGRAMMING**

	<b>L</b>	<b>T</b>	<b>P/D</b>	<b>C</b>
<b>Code: 9FC02</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>3</b>

**Course Objectives:**

1. Use Python interactively, execute a Python script at the shell prompt
2. Use Python types, expressions, and None, use string literals and string type
3. Use Python statements if...elseif..else, for, pass, continue, . . .
4. Understand the difference between expressions and statements,
5. Understand assignment semantics, write and call a simple function.,
6. Utilize high-level data types such as lists and dictionaries
7. Understand the difference between mutable and immutable types
8. Write a simple class and access methods and attributes, import and utilize a module, read from and write to a text file.

**Course Outcomes:**

After completion of the course, the student will be able to learn:

1. Select Python versions and mention their specifications.
2. Build programs using primitive data types.
3. Design applications that include functions, modules, packages along with respective exceptional handling mechanism.
4. Design applications using OO features of Python.
5. Write applications using Files.
6. Make use of NumPy/Tkinter/Plotpy modules in applicaitons.

**UNIT-- I**

**Introduction to Python:** History, Features, Modes of Execution, Setting up path, working with Python, Basic Syntax, Variable and Data Types, Operators. Conditional Statements (If, If- else, Nested if-else), Looping (for, While Nested loops), Control Statements(Break, Continue, Pass).

**Input-Output:** Printing on screen, Reading data from keyboard, Opening and closing file.

**UNIT -- II**

**Functions:** Defining a function, calling a function, Types of functions, Function Arguments, Anonymous functions, Global and local variables.

**String Manipulation:** Accessing Strings, Basic Operations, String slices, Function and Methods.

**Lists:** Accessing list, Operations, Working with lists Function and Methods.

**Tuple:** Accessing tuples, Operations, Working.

**Dictionaries:** Accessing values in dictionaries, working with dictionaries, Properties, Functions and Methods.

### **UNIT-- III**

**Modules:** Importing module, Math module, Random module, Packages.

**Exception Handling:** Exception, Exception Handling, Except clause, Try? Finally clause User Defined Exceptions

### **UNIT-- IV**

**Python- OOPs concept:** Class and object, Attributes, Inheritance, Overloading Overriding, Data hiding.

**Regular expressions:** Match function, Search function, Matching VS Searching, Modifiers Patterns.

### **UNIT -- V**

Introduction to Files, File Handling, Working with File Structure, Directories, Handling Directories.

### **UNIT -- VI**

Case Study with NumPy/PlotPy/SciPy/GUI Programming, Introduction, Tkinter programming, Tkinter widgets.

### **TEXT BOOK:**

1. [Apress]-Beginning Python. From Novice to Professional, 2nd ed. - [Hetland] (2008)

### **REFERENCE BOOKS:**

1. Introduction to Computation and Programming using Python, Revised and Expanded Edition, John V. Guttag, The MIT Press.
2. Programming Python, Fourth Edition by Mark Lutz, O'Reilly
3. Python Programming using problem solving approach, ReemaThareja, Oxford Higher Education.

**SYLLABUS FOR B.TECH. II YEAR I SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
DISCRETE MATHEMATICS**

L	T	P/D	C
2	1	0	3

**Code: 9F303**

**Prerequisites:** Mathematics- I and II

**Course Objectives:**

1. Define the syntax and semantics of propositional logic.
2. Translate statements from a natural language into its symbolic structures in logic.
3. Prove elementary properties of modular arithmetic and explain their applications in Computer Science, for example, in cryptography and hashing algorithms.
4. Apply the notion of relations on some finite structures, like strings and databases.
5. Analyze algorithms using the concept of functions and function complexity.
6. Apply graph theory models of data structures and state machines to solve problems of connectivity and constraint satisfaction, for example, scheduling.

**Course Outcomes:**

After completion of the course, the student will be able to learn:

1. Evaluate elementary mathematical arguments and identify fallacious reasoning (not just fallacious conclusions).
2. Reason about arguments represented in Predicate logic.
3. Perform operations on discrete structures such as sets, functions, relations, and sequences.
4. Solve discrete mathematics problems that involve: computing permutations and combinations of a set.
5. Analyze and deduce problems involving recurrence relations and generating functions.
6. Apply graph theory models of data structures and state machines to solve problems of connectivity and constraint satisfaction, for example, scheduling.

**UNIT – I**

**Propositional Logic:** Statement and notations, Connectives, Well formed Formulas, Truth Tables, Tautology, Equivalence, Implication, Rules of inference, Arguments, Proof by contradiction, Conditional Proof Normal forms, Automatic theorem proving.

**UNIT-- II**

**First order logic:** Predicates, Quantifiers, Free and Bound variables, Rules of inference, Consistency, Automatic Theorem Proving.

### UNIT – III

**Relations:** Properties of Binary Relations, Equivalence, transitive closure, Compatibility & Partial Ordering Relations, Hasse Diagrams, Lattice and its properties.

**Algebraic structures:** Algebraic systems, Examples and general properties, Semi groups and Monoids. Groups, Subgroups, Homomorphisms, Isomorphisms.

### UNIT -- IV

**Elementary Combinatorics:** Basics of counting, Combinations & Permutations with and without repetitions, Constrained repetitions. Binomial coefficients, Binomial and Multinomial theorems, Euler function, Derangements, Principle of inclusion and exclusion, Pigeon hole principle and its applications.

### UNIT -- V

**Recurrence relations:** Generating functions. Function of sequences, Calculating the coefficient of generating functions. Recurrence relations, Solving recurrence relations by substitution and generating functions. Characteristic roots. Solution of Inhomogeneous recurrence relations.

### UNIT -- VI

**Graph Theory:** Basic concepts, Representation of Graph, DFS, BFS, Spanning trees, Planar graphs, coloring, Isomorphism and subgraphs, Multi graphs and Euler Circuits, Hamiltonian graphs, Chromatic numbers, connectivity, cut vertices, cut edges, Matching and coverings, independent sets.

### TEXT BOOKS:

1. Discrete Mathematics for Computer Scientists & Mathematicians, J.L. Mott, A. Kandel, T.P. Baker, PHI.
2. Discrete mathematics with applications to computer science, J.P.Tremblay and R.Manohar, TMH
3. Elements of Discrete mathematics – A computer Oriented Approach- C L Liu, D P Mohapatra. Third Edition, Tata MacGraw Hill.

### REFERENCES BOOKS:

1. Discrete and Combinational Mathematics- An Applied Introduction-5<sup>th</sup> Edition – Ralph. P.Grimaldi.Pearson Education.
2. Discrete Mathematics and its Applications, Kenneth H. Rosen, Fifth Edition.TMH.
3. Discrete Mathematical structures Theory and application-Malik & Sen, Cengage.

**SYLLABUS FOR B.TECH. II YEAR I SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
UNIVERSAL HUMAN VALUES**

	<b>L</b>	<b>T</b>	<b>P/D</b>	<b>C</b>
<b>Code: 9HC03</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Objectives:**

1. Development of a holistic perspective based on self-exploration about themselves(human being), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- 3.Strengthening of self-reflection.
4. Development of commitment and courage to act.

**Course Outcomes:**

After completion of the course, the student will be able to learn:

1. This course also discusses their role in their family. It, very briefly, touches issues related to their role in the society and the nature, which needs to be discussed at length in one more semester for which the foundation course named as “H-102 Universal Human Values.
2. Understanding Harmony is designed which may be covered in their III or IV semester.
3. During the Induction Program, students would get an initial exposure to human values through Universal Human Values – I.
4. This exposure is to be augmented by this compulsory full semester foundation course.

**COURSE TOPICS:** The course has 28 lectures and 14 practice sessions in 6 modules

**Module 1:**

**Course Introduction**– Need, Basic Guidelines, Content and Process for Value Education

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I
2. Self-Exploration–what is it? – Its content and process; ‘Natural Acceptance’ and Experiential Validation- as the process for self-exploration.
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations.

4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority.
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario.
6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

### **Module 2:**

#### **Understanding Harmony in the Human Being– Harmony in Myself!**

7. Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’.
8. Understanding the needs of Self (‘I’) and ‘Body’ – happiness and physical facility.
9. Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer).
10. Understanding the characteristics and activities of ‘I’ and harmony in ‘I’.
11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail.
12. Programs to ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one’s own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

### **Module 3:**

#### **Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship**

13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship.
14. Understanding the meaning of Trust; Difference between intention and competence.
15. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship.
16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals.

17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.

#### **Module 4:**

**Understanding Harmony in the Nature and Existence**—Whole existence as Coexistence

18. Understanding the harmony in the Nature.

19. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature.

20. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space.

21. Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film “Home” can be used), pollution, depletion of resources and role of technology etc.

#### **Module 5:**

**Implications of the above Holistic Understanding-**

22. Natural acceptance of human values.

23. Definitiveness of Ethical Human Conduct.

24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order.

#### **Module 6:**

**Harmony on Professional Ethics-**

25. Competence in professional ethics:

a. Ability to utilize the professional competence for augmenting universal human order,

b. Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,

c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

26. Case studies of typical holistic technologies, management models and production systems

27. Strategy for transition from the present state to Universal Human Order:

1. At the level of individual: as socially and ecologically responsible engineers, technologists and managers
2. At the level of society: as mutually enriching institutions and organizations

28. Sum up. Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

**TEXT BOOK:**

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010 3.

**REFERENCE BOOKS :**

- 1 .JeevanVidya: EkParichaya, A Nagaraj, Jeevan VidyaPrakashan, Amarkantak, 1999.
- 2.Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004. 3.The Story of Stuff (Book).
- 4.The Story of My Experiments with Truth – by Mohandas Karamchand Gandhi
- 5.Small is Beautiful – E. F Schumacher.
- 6.Slow is Beautiful – Cecile Andrews
- 7.Economy of Permanence – J C Kumarappa
- 8.Bharat Mein Angreji Raj –PanditSunderlal
- 9.Rediscovering India – by Dharampal
- 10.Hind Swaraj or Indian Home Rule – by Mohandas K. Gandhi
- 11.India Wins Freedom –Maulana Abdul Kalam Azad
- 12.Vivekananda–Romain Rolland (English)
- 13.Gandhi–Romain Rolland (English)



**SYLLABUS FOR B.TECH. II YEAR I SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB**

**Code: 9EC62**

**L T P/D C**

**0 0 4 2**

**Course Objective:**

Understand, design and execute the programs involving concepts of Java and object-oriented programming principles.

**Course Outcomes:**

After completion of the course, the student will be able to learn:

1. Evaluate programs to generate Prime numbers, Roots of quadratic equation and Fibonacci series.
2. Implement small application such as banking system.
3. Compare programs on operator, function overloading and dynamic method dispatch.
4. Evaluate programs to implement interface and packages.
5. Explain and write programs to implement threads.
6. Illustrate programs to implement applets and event handling.
7. Illustrate an application to implement client and server scenario.

**LIST OF PROGRAMS**

1. A) Write a program to print prime numbers up to a given number.  
B) Write a program to print roots of a quadratic equation  $ax^2+bx+c=0$ .  
C) Write a program to print Fibonacci sequence up to a given number.
2. A) Define a class to represent a bank account and include the following members  
Instance variables:
  - (i) Name of depositor
  - (ii) Account No
  - (iii) Type of account
  - (iv) Balance amount in the account

**Instance Methods:**

To assign instance variables (Constructors-Zero argument and parameterized)

1. To deposit an amount
  2. To withdraw amount after checking the balance
  3. To display name and address
  4. Define Execute Account class in which define main method to test above class.
- B) In the above account class, maintain the total no. of account holders present in the bank and also define a method to display it. Change the main method appropriately.
  - C) In main method of Execute Account class, define an array to handle five accounts.
  - D) In Account class constructor, demonstrate the use of “this” keyword.
  - E) Modify the constructor to read data from keyboard.
  - F) Overload the method deposit() method (one with argument and another without argument)
  - G) In Account class, define set and get methods for each instance variable.

**Example:**

For account no variable, define the methods get Account No() and set Account No (int accno.) In each and every method of Account class, reading data from and writing data to instance variables should be done through these variables.

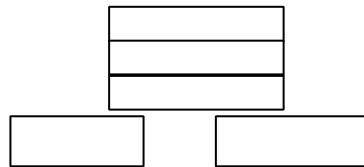
1. Define Resister class in which we define the following members: Instance variables: resistance Instance Methods: give Data():To assign data to the resistance variable display Data(): To display data in the resistance variable constructors
2. Define subclasses for the Resistor class called Series Circuit and Parallel Circuit in which define methods: calculate Series Resistance ( ) and calculate Parallel Resistance ( ) respectively. Both the methods should take two Resistor objects as arguments and return Resistor object as result. In main method, define another class called Resistor Execute to test the above class.
3. Modify the above two methods which should accept array of Resistor objects as argument and return Resistor object as result.
4.
  - A) Write a program to demonstrate method overridin.
  - B) Write a program to demonstrate the uses of “super” keyword (three uses)
  - C) Write a program to demonstrate dynamic method dispatch (i.e .Dynamic polymorphism).
5.
  - A) Write a program to check whether the given string is palindrome or not.
  - B) Write a program for sorting a given list of names in ascending order.
  - C) Write a program to count the no. of words in a given text.
6.
  - A) Define an interface “GeomtricShape” with methods area( ) and perimeter( ) (Both method’s return type and parameter list should be void and emptyrespectively. Define classes like Triangle, Rectangle and Circle implementing the “Geometric Shape” interface and also define “Execute Main” class in which include main method to test the above class
  - B) Define a package with name “sortapp” in which declare an interface “SortInterface” with method sort( ) whose return type and parameter list should be void and empty. Define “subsortapp” as subpackage of “sortapp” package in which define class “SortImpl” implementing “SortInterface” in which sort() method should print a message linear sort is used. Define a package “searching app” in which declare an interface “SearchInterface” with search( ) method whose return type and parameter list should be void and empty respectively. Define “searchingimpl” package in which define a “SearchImpl” class implementing “SearchInterface” defined in “searchingapp” package in which define a search( ) method which should print a message linear search isused.  
Define a class Execute Package with main method using the above packages(classes and its methods).

Use Array List class of Collections Framework to and use algorithms to search and sort the element of an array.
- 7) Modify the withdraw() method of Account class such that this method should throw “Insufficient Fund Exception” if the account holder tries to withdraw an amount

that leads to condition where current balance becomes less than minimum balance otherwise allow the account holder to withdraw and update the balance accordingly.

- 8) A) Define two threads such that one thread should print even numbers and another thread should print odd numbers.  
B) Modify the Account class to implement thread synchronization concept.  
C) Define two threads such that one thread should read a line of text from text file and another thread should write that line of text to another file. (Thread communication example).  
D) Write a program to implement thread priority.
- 9) Design the user screen as follows and handle the events appropriately.

Add Window  
First Number  
Second Number  
Result



- 10) Write a program to simulate a calculator
- 11) Write a Java program for handling mouse events and key events.
- 12) a) Write a program for handling window events.  
b) Develop an applet that displays a simple message.
- 13) Develop a client that sends data to the server and also develop a server that sends data to the client (two-way communication)
- 14) Develop a client/server application in which client read a file name from keyboard and send the file name to the server, and server will read the file name from client and send the file contents to the client.

**SYLLABUS FOR B.TECH. II YEAR I SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
PYTHON PROGRAMMING LAB AND IT WORKSHOP**

	<b>L</b>	<b>T</b>	<b>P/D</b>	<b>C</b>
<b>Code: 9LC61</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**Course Objective:**

1. Understand basics of Python programming, Decision Making and Functions in Python, Object Oriented Programming using Python.

**Course Outcomes:**

After completion of the course, the student will be able to learn:

1. Install and run the Python interpreter, create and execute Python programs.
2. Apply the best features of mathematics, engineering and natural sciences to program real life problems.
3. Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python, Express different Decision Making statements and Functions, Interpret Object oriented programming in Python.
4. Understand and summarize different File handling operations, explain how to design GUI Applications in Python.

**Week - 1 :**

1. Use a web browser to go to the Python website <http://python.org>. This page contains information about Python and links to Python-related pages, and it gives you the ability to search the Python documentation.
2. Start the Python interpreter and type `help()` to start the online help utility.
3. Start Python interpreter and use it as Calculator.

**Week - 2 :**

4. If you run a 10 kilometer race in 43 minutes 40 seconds, what is your average time per mile? What is your average speed in miles per hour? (Hint: there are 1.61 kilometers in a mile).
5. The volume of a sphere with radius  $r$  is  $5\pi r^3$ ? (Use Sphere volume formula)
6. Suppose the cover price of a book is \$24.95, but bookstores get a 40% discount. Shipping costs \$3 for the first copy and 75 cents for each additional copy. What is the total wholesale cost for 60 copies?

**Week - 3 :**

7. A function object is a value you can assign to a variable or pass as an argument. For example, `do_twice` is a function that takes a function object as an argument and calls it twice:

```
def do_twice(f):  
    f()  
    f()
```

Here's an example that uses `do_twice` to call a function named `print_spam` twice.

```
def print_spam():  
    print 'spam'
```

`do_twice(print_spam)`
  - a. Type this example into a script and test it.
  - b. Modify `do_twice` so that it takes two arguments, a function object and a value, and calls the function twice, passing the value as an argument.

- c. Write a more general version of `print_spam`, called `print_twice`, that takes a string as a parameter and prints it twice.
  - d. Use the modified version of `do_twice` to call `print_twice` twice, passing 'spam' as an argument.
8. Write a function that draws a grid like the following:

```
+-----+-----+
|         |         |
|         |         |
|         |         |
+-----+-----+
|         |         |
|         |         |
|         |         |
|         |         |
+-----+-----+
```

Hint: to print more than one value on a line, you can print a comma-separated sequence.

- 9. Write a function called `gcd` that takes parameters `a` and `b` and returns their greatest common divisor.
- 10. Write a function called `is_palindrome` that takes a string argument and returns `True` if it is a palindrome and `False` otherwise. Remember that you can use the Built-in function `len` to check the length of a string.

**Week - 4 :**

- 11. Write a function called `assorted` that takes a list as a parameter and returns `True` if the list is sorted in ascending order and `False` otherwise.
- 12. Write a function called `has_duplicates` that takes a list and returns `True` if there is any element that appears more than once. It should not modify the original list.
  - i. Write a function called `remove_duplicates` that takes a list and returns a new list with only the unique elements from the original. Hint: they don't have to be in the same order.
  - ii. The wordlist I provided, `words.txt`, doesn't contain single letter words. So you might want to add "I", "a", and the empty string.
  - iii. Write a python code to read a dictionary values from the user. Construct a function to invert its content. i.e., keys should be values and values should be keys.

**Week - 5 :**

- 13. If there are 23 students in your class, what are the chances that two of you have the

same birthday? You can estimate this probability by generating random samples of 23 birthdays and checking for matches.

Hint: you can generate random birthdays with the randint function in the random module.

14. How does a module source code file become a module object?
15. Why might you have to set your PYTHONPATH environment variable?
16. What is a namespace, and what does a module's namespace contain?
17. How do you make a module? Give an example of construction of a module using different geometrical shapes and operations on them as its functions.
18. What is the purpose of a `__init__.py` file in a module package directory? Explain with a suitable example.
19. Use the structure of exception handling all general purpose exceptions.

**Week – 6 :**

20. **a.** Write a function called `draw_rectangle` that takes a Canvas and a Rectangle as arguments and draws a representation of the Rectangle on the Canvas.  
**b.** Add an attribute named `color` to your Rectangle objects and modify `draw_rectangle` so that it uses the `color` attribute as the fill color.  
**c.** Write a function called `draw_point` that takes a Canvas and a Point as arguments and draws a representation of the Point on the Canvas.  
**d.** Define a new class called `Circle` with appropriate attributes and instantiate a few Circle objects. Write a function called `draw_circle` that draws circles on the canvas.
21. Write a Python program to demonstrate the usage of MRO in multiple levels of Inheritances.
22. Write a python code to read a phone number and email-id from the user and validate it for correctness.

**Week – 7 :**

23. Write a Python code to merge two given file contents into third file.
24. Write a Python code to open a given file and construct a function to check for given words present in it and display on found.

**Week – 8 :**

25. Import numpy, Plotpy and Scipy and explore their functionalities.
26. Write a GUI program to create a window wizard having two text labels, two text fields and two buttons as Submit and Reset.

**TEXT BOOK :**

1. [Apress]-Beginning Python. From Novice to Professional, 2nd ed. - [Hetland] (2008)

**REFERENCE BOOKS :**

1. Introduction to Computation and Programming using Python, Revised and Expanded Edition, John V. Guttag, The MIT Press.
2. Programming Python, Fourth Edition by Mark Lutz, O'Relly

3. Python Programming using problem solving approach, ReemaThareja, Oxford Higher Education.

## **IT WORKSHOP**

### **Course Objective:**

1. Understand basics of computer assembling, MS office tool .

### **Course Outcomes:**

After completion of the course, the student will be able to learn:

1. Apply knowledge for computer assembling and software installation and ability to solve the trouble shooting problems.
2. Apply the tools for preparation of PPT, Documentation and budget sheet etc.

### **Week – 1 :**

**Introduction to Computer:** Identify the peripherals of a computer, components/peripherals in a CPU & its functions. Introduction to the types of Operating System, Assembling and disassembling demonstration.

### **Week - 2 :**

Install computer with dual boot operating system (Windows, Linux with PowerPoint presentation). Comparison of types of OS in different platform.

### **Week – 3 :**

Introduction to S/W's, difference b/w hardware and software. Introduction to MS-Office and its importance.

### **Ms Word and Ms Power Point Presentation.**

### **Week – 4 :**

#### **Introduction to Excel**

**Features:** Accessing, Overview at toolbars, saving excel files, Gridlines, Format cells, Summation, Auto fill, formatting text.

Formula in excel – Average, Standard Deviation, Charts, Roaming & Inserting worksheets, Hyper linking, count function, lookup / Vlookup, sorting, Conditional formatting.

**SYLLABUS FOR B.TECH. II YEAR I SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB**

**Code: 9AC95**

<b>L</b>	<b>T</b>	<b>P/D</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**Course Objective:**

Understand the nature and scope of modern electronics, describe physical models of basic components, design and construct simple electronic circuits to accomplish a specific function, e.g., designing amplifiers and understand their capabilities and limitations and make decisions regarding their best utilization in a specific situation.

**Course Outcomes:**

After completion of the course, the student will be able to learn:

1. Understand the working of single-phase transformer under different conditions, the performance of three phase induction motor, different speed control methods of DC motor with and without loading with its performance.
2. Understand the applications of Thevenin's Theorem in circuit analysis.
3. Identify, Specify and test R, L, C Components (Colour Codes), Potentiometers, Switches, Coils, Relays.
4. Identify, Specify and test Active Devices, Diodes, BJTs, Low power JFETs.
5. Explain and demonstrate working of PN Junction and Zener diode.
6. Explain and demonstrate working Half and Full wave Rectifier without filters.
7. Demonstrate working of CE characteristics and its application as an amplifier.

**ELECTRICAL EXPERIMENTS**

1. Brake test on 3-phase induction motor (performance characteristics).
2. Speed control of DC shunt motor by
  - a) Armature Voltage Control .
  - b) Field flux control method.
3. Brake test on DC shunt motor.
4. Swinburne's test on DC shunt machine.
5. OCC characteristics of DC shunt generator.
6. Verification of superposition and Reciprocity Theorems.



**ELECTRONICS EXPERIMENTS**

1. PN Junction diode characteristics
  - A. Forward bias
  - B. Reverse bias.
2. Zener diode characteristics
3. Half wave Rectifier with and without filters.
4. Full wave Rectifier (Centre tapped and Bridge)with and without filters
5. Transistor CE characteristics (Input and Output)
6. Verification of Logic gates

**SYLLABUS FOR B.TECH. II YEAR II SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
COMPUTER ORGANIZATION AND ARCHITECTURE**

**Code: 9CC56**

**L T P/D C**

**Course Objective:**

**2 0 0 2**

Learn about basic structure of computer, different data representations and Instruction sets; 8086 architecture, addressing modes and instruction set also write efficient programs to interface devices with 8086 processor.

**Course Outcomes:**

After completion of the course, the student will be able to learn:

1. Perceive basic operational concept of computer and data processing.
2. Use data types with instruction set of specified architecture.
3. Justify different control unit design and algorithms for various operations.
4. Elaborate basic architecture of 8086 processor.
5. Write assembly language programming and debug to 8086.
6. Interface devices to 8086 processor.

**UNIT-- I**

**Basic Structure of Computer:** Computer Types, Functional units, Basic operational concepts, Bus structures, Software, Performance, multiprocessors and multi computers.

**Data Representation:** Fixed Point and Floating – Point Representation.

**UNIT-- II**

**Register Transfer Language and Micro-operations:** Register Transfer language. Arithmetic Micro-operations, logic micro-operations, shift micro operations, Arithmetic logic shift unit. Instruction codes. Computer instructions – Instruction cycle. Memory – Reference instructions. Input – Output and Interrupt; STACK organization; Instruction formats.

**UNIT -- III**

**Control Unit Design:** Control memory, Address sequencing, micro-program example, design of control unit-Hard wired control, Micro-programmed control.

**Computer Arithmetic Operations:** Addition and subtraction, multiplication Algorithms, Division Algorithms, Fixed point Arithmetic operations.

#### **UNIT -- IV**

Architecture of 8086 Microprocessor, Special functions of General purpose registers. 8086 flag register and function of 8086 Flags, Addressing modes of 8086, Instruction set of 8086.

#### **UNIT -- V**

Assembler directives, simple programs, procedures, and macros. Assembly language programs involving logical, Branch & Call instructions, sorting, evaluation of arithmetic expressions, string manipulation.

#### **UNIT --VI**

Pin diagram of 8086-Minimum mode and maximum mode of operation. Timing diagram. Memory interfacing to 8086 (Static RAM&EPROM).8255 PPI-Variou modes of operation and interfacing to 8086. Stepper motor Interface to 8086. Interrupt structure of 8086. Vector interrupt table. Interrupt service routines.

#### **TEXT BOOKS:**

1. Computer Systems Architecture – M.Moris Mano, IIIrd Edition, Pearson.
2. Microprocessors and interfacing – Douglas V.Hall, TMH, 2<sup>nd</sup> Edition, 1999.

#### **REFERENCE BOOKS:**

1. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson.
2. Microcomputer systems, The 8086/8088 Family Architecture, Programming and Design – Y.Liu and G.A. Gibson, PHI, 2<sup>nd</sup> Edition.
3. Advanced microprocessor and Peripherals – A.K.Ray and K.M.Bhurchandi, TMH, 2000.

**SYLLABUS FOR B.TECH. II YEAR II SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
DATABASE MANAGEMENT SYSTEMS**

	L	T	P/D	C
<b>Code: 9FC04</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Objectives:**

1. To understand the different issues involved in the design and implementation of a database system.
2. Study the physical and logical database designs, database modelling, relational, hierarchical, and network models and to understand and use data manipulation language to query, update, and manage a database.
3. Develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency and design and build a simple database system and demonstrate competence with the fundamental tasks involved with modelling, designing, and implementing a DBMS.

**Course Outcomes:**

After completion of the course, the student will be able to learn:

1. Comprehend importance, significance, models, Database languages, architecture and design of Data Base Systems.
2. Design Relational Models and apply Integrity Constraints, Querying fundamentals, Logical data base Design and Views of databases along with application of Relational Algebra.
3. Apply queries in SQL Query using Nested Queries Set, Comparison Operators, Aggregative Operators, Logical connectivity's with Joins statements and develop applications.
4. Eliminate data redundancy through normal forms.
5. Ensure ACID properties and Serializability in Transaction management and Database Recovery.
6. Use different External Storage Organization techniques and apply Indexing in databases to enhance system performance.

**UNIT -- I**

**Data Base Systems:** Data Vs Information, Data base System Applications, data base System VS file System – View of Data – Data Abstraction –Instances and Schemas – data Models – the ER Model – Relational Model – Other Models – Database Languages – DDL – DML – database Access for applications Programs – data base Users and Administrator – Transaction Management – data base System Structure – Storage Manager – the Query Processor.

**Data base design and ER diagrams:** Entities, Attributes and Entity sets – Relationships and Relationship sets – Additional features of ER Model – Concept Design with the ER Model – Data Modelling checklist. Application- ER diagram for a college

**UNIT -- II**

Introduction to the Relational Model – Integrity Constraint Over relations – Enforcing Integrity constraints – Querying relational data – Logical data base Design – Introduction to Views – Destroying /altering Tables and Views.

Relational Algebra – Selection and projection set operations – renaming – Joins – Division – Examples of Algebra overviews – Relational calculus – Tuple relational Calculus – Domain relational calculus. Application - Student database design.

#### **UNIT -- III**

Form of Basic SQL Query – Examples of Basic SQL Queries – Introduction to Nested Queries – Correlated Nested Queries Set – Comparison Operators – Aggregative Operators – NULL values – Comparison using Null values – Logical connectivity's – AND, OR and NOT – Impact on SQL Constructs – Outer Joins – Disallowing NULL values – Complex Integrity Constraints in SQL Triggers, Embedded SQL. Application - working with Aviation company database.

#### **UNIT -- IV**

Schema refinement – Problems Caused by redundancy – Decompositions – Problem related to decomposition – reasoning about FDS – FIRST, SECOND, THIRD Normal forms – BCNF – Lossless join Decomposition – Dependency preserving Decomposition – Multi valued Dependencies – FORTH Normal Form. Application - Faculty Evaluation Report.

#### **UNIT -- V**

Transaction Concept- Transaction State- Implementation of Atomicity and Durability – Concurrent – Executions – Serializability- Recoverability – Implementation of Isolation – Testing for serializability- Lock –Based Protocols – Timestamp Based Protocols- Validation- Based Protocols – Multiple Granularity, Recovery and Atomicity – Log – Based Recovery – Recovery with Concurrent Transactions – Buffer Management – Failure with loss of non-volatile storage. Application - Production Management System.

#### **UNIT -- VI**

Data on External Storage – File Organization and Indexing – Cluster Indexes, Primary and Secondary Indexes – Index data Structures – Hash Based Indexing – Tree base Indexing – Comparison of File Organizations – Indexed Sequential Access Methods (ISAM) – B+ Trees: A Dynamic Index Structure. Application – Creating B+ tree on Instructor File.

#### **TEXT BOOKS:**

1. Data base System Concepts, Silberschatz, Korth, McGraw hill, Vediton.
2. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill 3rdEdition.
3. Database Management Systems, Peter Rob, A.AnandaRao,Carlos Coronel ,CENGAGE Learning.

#### **REFERENCE BOOKS:**

1. Data base Systems design, Implementation, and Management, Peter Rob and Carlos Coronel 7thEdition.
2. Fundamentals of Database Systems, Elmasri Navrate Pearson Education

**SYLLABUS FOR B.TECH. II YEAR II SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
INTRODUCTION TO DATA SCIENCE**

**Code: 9EC16**

**L T P/D C**

**3 0 0 3**

**Course Objectives:**

1. To know the fundamental concepts of Data Science.
2. To explore tools and practices for working with Data Science.
3. To learn about Principle component analysis and understand about Predictive Analytics.

**Course Outcomes:**

After completion of the course, the student will be able to learn:

1. Learn about various data types, types of data sets a data quality.
2. Implementation of R fundamentals and perform factors and data frames.
3. Implementation of data structures iterative programming & function concepts using R.
4. Learn about data visualization techniques and apply suitable visualization techniques.
5. Learn about dimensionality reduction based on examples illustrations.
6. Perform predictive data analysis on variety of data along with appropriate statistical tests using R.

**UNIT-- I**

**Data Types & Collection:** Types of Data, Attributes and Measurement, Attribute, The Different Types of Attributes, Describing Attributes by the Number of Values, Asymmetric Attributes, Binary Attribute, Nominal Attributes, Ordinal Attributes, Numeric Attributes, Discrete versus Continuous Attributes, Types of Data Sets, General Characteristics of Data Sets, Record Data, Transaction or Market Basket Data, The Data Matrix, The Sparse Data Matrix, Graph Based Data, Ordered Data. Handling Non-Record Data, Data Quality, Measurement and Data Collection Issues, Precision, Bias and Accuracy.

**UNIT-- II**

**Basics of R:** Introduction, R-Environment Setup, Programming with R, Basic Data Types, Creating and Naming Vectors, Vector Arithmetic, Vector Sub setting.

**Matrices:** Creating and Naming Matrices, Matrix Sub setting, Arrays, Class.

**Introduction to Factors:** Factor Levels, Summarizing a Factor, Ordered Factors, Comparing Ordered Factors, Introduction to Data Frame, Sub setting of Data Frames, Extending Data Frames, Sorting Data Frames.

### UNIT-- III

**Lists:** Creating a Named List, Accessing List Elements, Manipulating List Elements, Merging Lists, Converting Lists to Vectors, Conditionals.

**Control Flow:** Relational Operators, Relational Operators and Vectors, Logical Operators and Vectors, Conditional Statements.

**Iterative Programming in R:** Introduction, While Loop, For Loop, Looping Over List.

**Functions in R:** Writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functions in R.

### UNIT-- IV

**Data Visualization:** Pixel-Oriented, Geometric Projection, Icon-Based, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

**Charts and Graphs:** Pie Chart, Chart Legend, Bar Chart, Box Plot, Histogram, Line Graph, Multiple Lines in Line Graph, Scatter Plot.

### UNIT-- V

**Dimensionality Reduction:** Eigen values and Eigenvectors of Symmetric Matrices, Computing Eigen values and Eigenvectors, The Matrix of Eigenvectors, Principal-Component Analysis, An Illustrative Example, Using Eigenvectors for Dimensionality Reduction, Singular-Value Decomposition (SVD), Interpretation of SVD, Dimensionality Reduction Using SVD.

### UNIT -- VI

**Predictive Analytics: Data Interfaces:** CSV Files: Syntax, Importing a CSV File.

**Statistical Applications:** Basic Statistical Operations, Linear Regression Analysis, Chi-Squared Goodness of Fit Test, Chi-Squared Test of Independence, Multiple regression.

### TEXT BOOKS :

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Introduction to Data Mining, Pearson Education Inc.
2. Han, Jiawei, Jian Pei, and Micheline Kamber, “Data mining: concepts and techniques”, 3 rd Edition, Elsevier, 2011.
3. Jure Leskovec, AnandRajaraman, Jeffrey D. Ullman, Mining of Massive Datasets, Cambridge University Press.
4. K G Srinivas ,G M Siddesh “Statistical programming in R”, Oxford Publications.

### REFERENCE BOOKS :

1. Brain S. Everitt, “A Handbook of Statistical Analysis Using R”, Second Edition, 4 LLC, 2014.
2. Dalgaard, Peter, “Introductory statistics with R”, Springer Science & Business Media, 2008.
3. Samir Madhavan, “Mastering Python for Data Science”, Packt, 2015.
4. Paul Teetor, “R Cookbook, O’Reilly, 2011.

**SYLLABUS FOR B.TECH. II YEAR II SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
DESIGN AND ANALYSIS OF ALGORITHMS**

	<b>L</b>	<b>T</b>	<b>P/D</b>	<b>C</b>
<b>Code: 9EC04</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>3</b>

**Prerequisite:** Data structures.

**Course Objectives:**

1. To provide a solid foundation in algorithm design and analysis, specifically, the student learning outcomes include: Basic knowledge of graph and matching algorithms.
2. Ability to understand and design algorithms using greedy strategy, divide and conquer approach, dynamic programming, backtracking and branch and bound.

**Course Outcomes:**

After completion of the course, the student will be able to learn:

1. Analyze worst-case running times of algorithms using asymptotic analysis.
2. Synthesize divide and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
3. Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analyze them.
4. Comprehend the concept of dynamic programming algorithms, their applications and analyze them.
5. Analyze the Backtracking and Branch and Bound algorithms and also identify the scenarios for its applicability.
6. Comprehend the concept of P and NP Problems and its usage in the applications.

**UNIT-- I**

**Introduction:** Algorithm, Pseudo code for expressing algorithms, Performance Analysis- Space complexity, Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation, Probabilistic analysis, Amortized analysis.

Applications: Designing optimal solution with respect to time for a problem.

**UNIT -- II**

**Divide and Conquer:** General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication.

Applications: PNR number Search, sorting the google search results.

**UNIT -- III**

**Greedy method:** General method, applications-Job sequencing with deadlines, fractional knapsack problem, Minimum cost spanning trees, Single source shortest path problem.



Applications: Allocation of funds/resources based on the priority in the computer systems.

#### UNIT-- IV

**Dynamic Programming:** General method, applications-Matrix chain multiplication, Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Travelling sales person problem, Reliability design.  
Applications: Routing Algorithms in the computer networking.

#### UNIT -- V

**Backtracking:** General method, applications-n-queen problem, sum of subsets problem, graph colouring, Hamiltonian cycles.  
**Branch and Bound:** General method, applications - Travelling sales person problem, 0/1 knapsack problem- LC Branch and Bound solution, FIFO Branch and Bound solution.  
Applications: Undo in MS-Word, Games.

#### UNIT—VI

**Introduction to NP-Hard and NP-Complete problems:** Basic concepts of non deterministic algorithms, Definitions of NP-Hard and NP-Complete classes, Modular Arithmetic.  
Applications: Performance evaluation in the dynamic systems.

#### TEXTBOOKS:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, SatrajSahni and Rajasekharam,Galgotia publications pvt.Ltd.
2. Algorithm Design: Foundations, Analysis and Internet examples, M.T.Goodrich and R.Tomassia,Johnwiley and sons.

**SYLLABUS FOR B.TECH. II YEAR II SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
BUSINESS ECONOMICS AND FINANCIAL ANALYSIS**

**Code: 9ZC01**

L	T	P/D	C
3	0	0	3

**Course Objectives:**

1. To understand the nuances of Business and its relation to economics.
2. To understand the production function and cost concepts.
3. To learn the basic market structures and their relevance to business.
4. To learn the fundamentals of financial accounting concepts.
5. To apply the fundamental concepts of financial accounting in preparation of financial statements.
6. To understand the financial ratios that are used to analyze the financial performance of the company.

**UNIT -- I**

**Introduction to Business Economics:** Definition, Nature and Scope of Business Economics- Demand Analysis: Demand Determinants, Law of Demand and its exceptions, Elasticity of Demand, Types of Elasticity of Demand and Demand Forecasting – Statistical and Non-Statistical techniques.

**UNIT -- II**

**Theory of Production and Cost Analysis:** Production Function – Isoquants and Isocosts, Internal and External Economies of Scale, Law of Returns Cost Analysis: Cost concepts, different types of costs, Break-even Analysis (BEA)- Determination of Break-Even Point (simple problems).

**UNIT -- III**

**Introduction to Markets**

**Market structures:** Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition, Pricing Methods and strategies.

**UNIT-- IV**

**Financial Accounting - I:** Accounting concepts and Conventions, Double-Entry system of Accounting, Accounting Cycle, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance.

**UNIT -- V**

**Financial Accounting – II:** Introduction to Final accounts, Revenue and Capital Expenditure, elements of financial statements, Preparation of Final Accounts with simple adjustments (simple problems).

**UNIT-- VI**

**Financial Analysis Through Ratios:** Concept of Ratio Analysis, Various Types of Ratios: Liquidity Ratios (short term solvency ratios), Leverage Ratios (long term solvency ratios), Turnover Ratios and Profitability Ratios(simple problems).

**TEXT BOOK:**

1. Aryasri: Managerial Economics and Financial Analysis, 2/e, TMH, 2005.

**REFERENCE BOOKS:**

1. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.
2. H. Craig Peterson & W. Cris Lewis, Managerial Economics, PHI, 4th Ed.
3. Suma Damodaran, Managerial Economics, Oxford University Press.

**SYLLABUS FOR B.TECH. II YEAR II SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
ENVIRONMENTAL SCIENCE**

<b>Code: 9HC05</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>

**Course Objectives:**

1. To understand structure and function of ecosystem
2. To learn classification and uses of natural resources
3. To learn about Understanding the impacts of developmental activities and mitigation measures.
4. To know the source, causes and preventive methods of pollution
5. To understand the importance of ecological balance for sustainable development.
6. To understand the environmental policies and regulations

**Course Outcomes:**

After completion of the course, the student will be able to learn:

1. Understand about ecosystem and energy flow among the organisms.
2. Know the resources available, use of them and overexploitation of the resources in the nature.
3. Learn the value, use and value of biodiversity.
4. Understand the causes and effect of pollution and implement measures in control of pollution.
5. Understand the sustainable development and implement green technology for sustainable development.
6. Learn and implement policy to protect the environment.

**UNIT-- I**

**Ecosystems:** Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Bio magnification, ecosystem value, services and carrying capacity.

**UNIT-- II**

**Natural Resources:** Classification of Resources: Living and Non-Living resources, water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources, Land Energy resources: growing energy needs, renewable and non renewable energy sources, use of alternate energy source.

**UNIT-- III**

**Biodiversity and Biotic Resources:** Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit.

Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation.

#### **UNIT-- IV**

**Environmental Pollution and Control Technologies:** Environmental Pollution: Classification of pollution, Air Pollution: Primary and secondary pollutants. Acid rain-Threshold limit values of chemicals present in environment, Global warming, Ozone layer depletion, Water pollution: Sources and types of pollution. Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil. Noise Pollution: Sources and Health hazards, standards, Solid waste: Municipal Solid Waste management, composition and characteristics of e-Waste and its management. Pollution control technologies: Sewage water Treatment, Kyoto protocol, and Montréal Protocol.

#### **UNIT-- V**

**Sustainable development and Green Technology:** Concept of sustainable development, threats to sustainability population and its explosion, Crazy consumerism, over- exploitation of resources, strategies for achieving sustainable development environmental education, conservation of resources, urban sprawl sustainable cities and sustainable communities, human health , role of IT in Environment, Environmental Ethics, Environmental Economic – Concept of Green Building, Clean Development Mechanism( CDM ).

#### **UNIT-- VI**

**Environmental Policy, Legislation & Environment Impact Assessment:** Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects.Strategies for risk assessment, Concepts of Environmental Management Plan (EMP).

#### **TEXT BOOK:**

1. Perspectives in Environmental Studies: Kaushik A. and Kaushik, C.P. New Age International (P) Ltd. (2008)

#### **REFERENCE BOOKS:**

1. Environmental Studies by ErachBharucha, 2005 University Press.
2. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
3. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
4. Environmental Science by Daniel B. Botkin& Edward A. Keller, Wiley INDIA edition.
5. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.

**SYLLABUS FOR B.TECH. II YEAR II SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
SOFT SKILLS LAB**

**Code: 9HC63**

**Course Objectives:**

	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1. Make self-assessment.	<b>0</b>	<b>1</b>	<b>2</b>	<b>2</b>
2. Know the importance of certain soft skills like time management and goalsetting.				
3. Enhance their team skills and design thinking capabilities for effective critical thinking and creativity.				
4. Know their emotional quotient which guides their thinking, behavior and helps them manage stress efficiently.				

**Course Outcomes:**

After completion of the course, the student will be able to learn:

1. Determine the significance of soft skills in the working environment.
2. Understand how to demonstrate empathy in a wide range of situations.
3. Effectively communicate through verbal/oral communication and improve the listening.
4. Become more effective individual through goal/target setting, self-motivation and practicing creative thinking.
5. Develop a positive and responsible attitude to their own well-being.

**UNIT-- I**

Introduction to soft skills, SWOT / SWOC Analysis, SWOT / SWOC Grid, Johari window

Activities: based on Soft skills, Self-Analysis, Questionnaire, SWOT Practice.

**UNIT-- II**

Emotional intelligence, Time management, Goal Setting.

Activities: big picture challenge, Goal setting charts.

**UNIT-- III**

Attitude, Professional etiquette & Grooming.

**UNIT-- IV**

Styles of Communication, Inter-personal Skills-Team work, Team building, Leadership Skills.

Activities: Social skills, Role Plays, Team building activities.

**UNIT-- V**

Problem Solving & Decision making, Critical & Creative thinking.

Activities: Problem solving situations, Games and puzzles, Case Studies and Group Discussions on decision making and problem solving, creativity.

**UNIT-- VI**

Values : Personal, Social & Cultural.

Activities: Role Plays.

**TEXT BOOK:**

1. SOFT SKILLS – Dr. K. Alex, S. Chand publications.

**REFERENCE BOOKS:**

1. SOFT SKILLS – Meenakshi Raman.
2. Step Ahead with Soft Skills - Oxford University Press.
3. Skill Sutras- Jayashree Mohanraj.
4. The Power of Soft Skills – Robert A. Johnson ; \* Soft Skills for Everyone – JeffButterfield.

**SYLLABUS FOR B.TECH. II YEAR II SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
R PROGRAMMING LAB AND DESIGN AND ANALYSIS OF ALGORITHMS LAB**

**Code: 9LC62**

<b>L</b>	<b>T</b>	<b>P/D</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**R PROGRAMMING LAB**

**Course Objectives:**

1. Learn concepts, techniques and tools they need to deal with various facets of data science practice, including data collection and integration.
2. Exploring data analysis, predictive modeling, descriptive modeling, data product creation, evaluation, and effective communication.
3. Understand the basic knowledge of algorithms and reasonable programming experience and some familiarity with basic linear algebra and basic probability and statistics.
4. Identify the importance of recommendation systems and data visualization techniques.

**Course Outcomes:**

After completion of the course, the student will be able to learn:

1. Understand basic terms what Statistical Inference means. Identify probability distributions commonly used as foundations for statistical modelling. Fit a model to data.
2. Discuss the significance of exploratory data analysis (EDA) in data science and to apply basic tools (plots, graphs, summary statistics) to carry out EDA.
3. Apply basic machine learning algorithms and to identify common approaches used for Feature Generation.
4. Analyze fundamental mathematical and algorithmic ingredients that constitute a Recommendation Engine and to Build their own recommendation system using existing components.

**LIST OF EXPERIMENTS**

1. R Environment setup: Installation of R and RStudio in Windows.
2. Write R commands for
  - i) Variable declaration and Retrieving the value of the stored variables,
  - ii) Write an R script with comments,



iii) Type of a variable using class() Function.

3. Write R command to

- i) illustrate summation, subtraction, multiplication, and division operations on vectors using vectors.
- ii) Enumerate multiplication and division operations between matrices and vectors in R console.

4. Write R command to

- i) illustrates the usage of Vector subsetting& Matrix subsetting.
- ii) Write a program to create an array of 3×3 matrixes with 3 rows and 3 columns.
- iii) Write a program to create a class, object, and function.

5. Write a command in R console

- i) to create a tshirt\_factor, which is ordered with levels 'S', 'M', and 'L'. Is it possible to identify from the examples discussed earlier, if blood type 'O' is greater or less than blood type 'A'?
- ii) Write the command in R console to create a new data frame containing the 'age' parameter from the existing data frame. Check if the result is a data frame or not. Also R commands for data frame functions cbind(), rbind(), sort().

6. Write R command for

- i) Create a list containing strings, numbers, vectors and logical values
- ii) To create a list containing a vector, a matrix, and a list. Also give names to the elements in the list and display the list also access the list elements
- iii) To add a new element at the end of the list and delete the element from the middle display the same
- iii) To create two lists, merge two lists. Convert the lists into vectors and perform addition on the two vectors. Display the resultant vector.

7. Write R command for

- i) logical operators—AND (&), OR (|) and NOT (!).
- ii) Conditional Statements.
- iii) Create four vectors namely patientid, age, diabetes, and status. Put these four vectors into a data frame patientdata and print the values using a for loop & While loop.
- iv) Create a user-defined function to compute the square of an integer in R.
- v) Create a user-defined function to compute the square of an integer in R.
- vi) Recursion function for a) factorial of a number b) find nth Fibonacci number.

8. Write R code for

- i) Illustrate Quick Sort.
- ii) Illustrate Binary Search Tree.

9. Write R command to

- i) illustrate Mathematical functions & I/O functions.
- ii) Illustrate Naming of functions and `sapply()`, `lapply()`, `tapply()` & `mapply()`.

10. Write R command for

- i) Pie chart & 3D Pie Chart, Bar Chart to demonstrate the percentage conveyance of various ways for traveling to office such as walking, car, bus, cycle, and train
- ii) Using a chart legend, show the percentage conveyance of various ways for traveling to office such as walking, car, bus, cycle, and train.

(a) Walking is assigned red color, car – blue color, bus – yellow color, cycle – green color, and train – white color; all these values are assigned through `cols` and `lbls` variables and the legend function.

(b) The fill parameter is used to assign colors to the legend.

(c) Legend is added to the top-right side of the chart, by assigning

- iii) Using box plots, Histogram, Line Graph, Multiple line graphs and scatter plot to demonstrate the relation between the cars speed and the distance taken to stop, Consider the parameters data and x Display the speed and dist parameter of Cars data set using x and data parameters

**TEXT BOOK:**

1. K G Srinivas, G M Siddesh, “Statistical programming in R”, Oxford Publications.

**DESIGN AND ANALYSIS OF ALGORITHMS LAB**

**Course Objectives:**

- 1.To write programs in java to solve problems using divide and conquer strategy.
- 2.To write programs in java to solve problems using backtracking strategy.
- 3.To write programs in java to solve problems using greedy and dynamic programming techniques.

**Course Outcomes:**

After completion of the course, the student will be able to learn:

1. Implement Merge sort algorithm for sorting a list of integers in ascending order, Dijkstra’s algorithm for the single source shortest path problem.
2. Implement Prim’s algorithm to generate minimum cost spanning tree.
3. Solve the job sequencing with deadlines problem using greedy algorithm.
4. Design the solution for the 0/1 knapsack problem using implement Dynamic Programming and implement.

5. Using Dynamic programming approach solve the Optimal Binary search Tree problem.
6. Design and implement n-queens problem using backtracking approach.

**LIST OF PROGRAMS FOR LAB**

1. Write a C program to implement Merge sort algorithm for sorting a list of integers in Ascending order.
2. Write a C program to implement Character sorting.
3. Write a C program to implement Dijkstra's algorithm for the single source shortest path problem.
4. Write a C program that implements Prim's algorithm to generate minimum cost Spanning tree.
5. Write a C program to implement greedy algorithm for job sequencing with deadlines.
6. Write a C program to implement Dynamic Programming algorithm for the 0/1 Knapsack problem.
7. Write a C program to implement Dynamic programming algorithm for the Optimal Binary search Tree problem.
8. Write a C program to implement backtracking algorithm for n-queens problems.

**SYLLABUS FOR B.TECH. II YEAR II SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
DATABASE MANAGEMENT SYSTEMS LAB**

**Code: 9FC63**

**L T P/D C**

**Course Objective:**

**0 0 3 1.5**

1. Design the optimal queries using structured and unstructured query languages like SQL and PL/SQL by making use of control structures, cursors, triggers and functions/procedures.

**Course Outcomes:**

After completion of the course, the student will be able to learn:

1. Create tables and apply constraints.
2. Write Queries using Aggregate functions, Conversion functions and use string Functions.
3. Explain and write PL/SQL programs using exceptions.
4. Develop programs using loops, exceptions and write Procedures.
5. Write Programs for stored functions, invoke functions in SQL Statement.
6. Describe and write programs using features of CURSORS and its variables.
7. Develop Programs implementing Triggers.

**LIST OF PROGRAMS**

1. Implement different statements in SQL.
2. Develop queries/ sub queries using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints.
3. Develop Queries using Aggregate functions, GROUP BY, HAVING and Creation and dropping of Views.
4. Develop Queries using Conversion functions (to\_char, to\_number and to\_date), string functions, date functions.
5. i) Creation of simple PL/SQL program which includes all the sections.  
ii) Insert data into table and use DCL commands in PL/SQL block.
6. Develop a program that includes the features of nested if, case.
7. Program development using loops.
8. Program development using Exceptions.
9. Programs development using procedures.
10. Program development using functions.

11. Program development using packages.
12. Develop programs using cursors.
13. Develop Programs using Triggers.

**TEXT BOOKS:**

- 1) ORACLE PL/SQL by example. Benjamin Rosenzweig, Elena Silvestrova, Pearson Education 3Edition.
- 2) ORACLE DATA BASE LOG PL/SQL Programming SCOTT URMAN, Tata McGraw Hill.
- 3) SQL and PL/SQL for Oracle 10g, Black Book, Dr. P. S.Deshpande.

**SYLLABUS FOR B.TECH. II YEAR II SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
COMPUTER ORGANIZATION LAB**

**Code: 9CC83**

<b>L</b>	<b>T</b>	<b>P/D</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**Course Objectives:**

1. Analyze and apply working of 8086.
2. Compare the various interface techniques. Analyze and apply the working of 8255, 8279 ICs and design and develop the programs.
3. Learning the Communication Standards.

**Course Outcomes:**

After completion of the course, the student will be able to learn:

1. Familiarize the architecture of 8086 processor, assembling language programming and interfacing with various modules.
2. Experiment with Arithmetic operations of binary number system.
3. Simulate any type of VLSI, embedded systems, industrial and real time applications by knowing the concepts of Microprocessor and Microcontrollers.

**PART – A**

**Introduction to MASM/TASM Assembler**

**Familiarization with 8086 Kit**

**Experiment I, II**

**Write ALP and execute the program to**

1. Add two 8-bit numbers
2. Add two 16-bit numbers
3. Add two 32-bit numbers
4. Subtract two 8-bit numbers
5. Subtract two 16-bit numbers
6. Subtract two 32-bit numbers
7. Multiply two 8-bit numbers
8. Multiply two 16-bit numbers
9. Perform 8-bit division
10. Perform 16-bit division
11. Find square of a number
12. Find cube of a number
13. Exchange two numbers
14. Find factorial of a given number

**Experiment III**

**Write ALP and execute the program to**

15. Add a given series of numbers
16. Find average of a given series of numbers
17. Find sum of squares of a given series of numbers
18. Find sum of cubes of a given series of numbers

#### **Experiment IV**

##### **Write ALP and execute the program to**

19. Find largest number from a given series of numbers
20. Find smallest number from a given series of numbers
21. Sort a series of given numbers in ascending order
22. Sort a series of given numbers in descending order

#### **Experiment V**

##### **Write ALP and execute the program to**

23. Display Fibonacci series
24. Move a string of data bytes from one location to another
25. Concatenate two strings
26. Reverse a given string

#### **Experiment V1**

##### **Write ALP and execute the program to**

27. Compare two strings
28. Find length of a given string
29. Find whether the given byte is in the string or not

### **PART-B**

#### **Write ALP and interface with 8086**

1. Interface a stepper motor
2. Generate a triangular wave, square wave and saw tooth waves, Interface keyboard

#### **TEXT BOOKS:**

1. Computer Systems Architecture – M.Moris Mano, IIIrd Edition, Pearson
2. Microprocessors and interfacing – Douglas V.Hall, TMH, 2<sup>nd</sup> Edition, 1999.

#### **REFERENCE BOOKS:**

1. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson
2. Microcomputer systems, The 8086/8088 Family Architecture, Programming and Design – Y.Liu and G.A. Gibson, PHI, 2<sup>nd</sup> Edition.
3. Advanced microprocessor and Peripherals – A.K.Ray and K.M.Bhurchandi, TMH, 2000.

**SYLLABUS FOR B.TECH. II YEAR II SEM.  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
TECHNICAL SEMINAR**

**Code: 9L484**

**L T P/D C**  
**0 1 0 1**

**Course Objective:**

Develop ability to be a public speaker. Learn the importance of delivering seminars for demonstrating oratory and develop interview facing skills.

**Course Outcomes:**

After completion of the course, the student will be able to learn:

1. Identify current general, political and technology related topics.
2. Arrange and present seminar in a effective manner
3. Collect, survey and organize content in presentable manner
4. Demonstrate oratory skills with the aid of Power Point Presentations
5. Exhibit interview facing skills and team leading qualities

**Procédure:**

1. Seminar in-charges shall highlight the significance of technical seminar in the first two sessions and enlighten the students on the utility of these seminars.
2. The slots, titles shall be decided upfront and seminar in charge shall take signatures.
3. The same sheet shall be affixed in the respective classrooms and seminar register.
4. If any student fails to present his/her seminar on the given slot, to genuine reasons, they may be asked to present in the subsequent slot/week.
5. Progress of the seminars need to be reviewed by the concerned HOD once in 15 days.
6. The evaluation for technical seminars has to be informed to students and displayed in the classrooms.
7. Report and presentation must contain topic, introduction, explanation, diagrams, tables, applications and conclusions.

There shall be a technical seminar evaluated for 100 marks each from I Year I Semester to II Year II Semester. The evaluation is purely internal and will be as follows:

<b>Sl.No</b>	<b>Description</b>	<b>Marks</b>
1	Literature survey, topic and content	10
2	Presentation including PPT	10
3	Seminar Notes	05



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4	Interaction with audience after presentation	05
5	Final Report 3 copies	10
6	Class room participation	05
7	Punctuality in giving seminar as per Scheduled time and date	10
8	Mid Semester Viva (on the seminar topics completed up to the end of 9 <sup>th</sup> week	15
9	End Semester Viva	40
	<b>Total</b>	<b>100 Marks</b>

Student must secure 40% i.e. 40 marks to be successful in sum total (Hundred Marks) in Technical Seminar.

**SYLLABUS FOR B. TECH. III YEAR I SEM**  
**COMPUTER SCIENCE AND ENGINEERING (AI & ML)**  
**BASICS OF ENTREPRENEURSHIP**  
**(OPEN ELECTIVE –I)**

**Code: 9ZC22**

**L T P C**  
**3 0 0 3**

**Prerequisite:** Economics, Accountancy and Management Science

**Course Objectives:**

The objective of the course is to make students understand the nature of Entrepreneurship, and its importance to business to the engineering students, which will allow them to get the required intuition and interest in starting their own start-up's.

**Course Outcomes:**

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

1. The students will acquire basic knowledge on Skills of Entrepreneurship.
2. The students will understand the techniques of selecting the customers through the process of customer segmentation and Targeting
3. The students understand business Models and their validity.
4. The students understand the basic cost structure, Revenue Streams and the pricing strategies.
5. The students will acquire knowledge about the project management and its techniques.
6. The students get exposure on marketing strategies and business regulations for the Start up.

**UNIT – I:**

**Introduction to Entrepreneurship & Self Discovery:** - Define Entrepreneurship, Entrepreneurship as a Career option, Find your Flow, Stock of Your Means, Characteristics, Qualities and Skills of Entrepreneurship, Effectuation, Principles of Effectuation, Life as an Entrepreneur, Stories of Successful Entrepreneurs.

**UNIT – II:**

**Opportunity & Customer Analysis:** - Identify your Entrepreneurial Style, Methods of finding and understanding Customer Problems, Run Problem Interview, Process of Design Thinking, Identify Potential Problems worth Solving, Customer Segmentation, Niche Marketing and Targeting, Craft your Values Proportions, Customer-driven Innovation.

**UNIT – III:**

**Business Model & Validation:** - Introduction to Business Models, Lean approach to Business Model Canvas, Blue and Red Ocean Strategies, the Problem-Solution Fit, Build your Solution Demo, Solution Interview Method, Identify Minimum Viable Product (MVP), Product-Market fit test.

**UNIT – IV:**

**Economics & Financial Analysis:** - Revenue Analysis, Identify different Revenue Streams and Costs Analysis – startup Cost, Fixed Cost and Variable Cost, Break Even Analysis, Profit Analysis, Introduction to Pricing, different Pricing Strategies, Sources of Finance, Bootstrapping and Initial Financing, Practice pitching to Investors and Corporate.

**UNIT – V:**

**Team Building & Project Management:** - Leadership Styles, Shared Leadership Model, Team Building in Venture, Roles and Responsibilities of team in venture, Explore collaboration tools and techniques, Brainstorming, Introduction to Project Management, Project Life Cycle, Create a Project Plan.

**UNIT – VI:**

**Marketing & Business Regulations:** - Positioning, Positioning Strategies, Branding, Branding Strategies, Selecting and Measuring Channels , Customer Acquisition, Selling Process, Selling Skills, Sales Plans. Business regulations – List of Required Registrations, Compliance Check List, Business Structures and Legal Entities.

**TEXTBOOKS:**

1. Robert D Hisrich, Michael P Peters, Dean A Shepherd, Entrepreneurship, Sixth Edition, New Delhi, 2006.
2. Thomas W. Zimmerer, Norman M. Scarborough, Essentials of Entrepreneurship And Small Business Management, Fourth Edition, Pearson, New Delhi, 2006

**REFERENCES:**

1. Alfred E. Osborne, Entrepreneur's Toolkit, Harvard Business Essentials, HBS Press, USA, 2005.
2. MadhurimaLall, ShikhaSahai, Entrepreneurship, Excel Books, First Edition, New Delhi, 2006.
3. S.S. Khanka, Entrepreneurial Development, S. Chand and Company Limited, New Delhi, 2007.
4. H. Nandan, Fundamentals of Entrepreneurship, Prentice Hall of India, First Edition, New Delhi, 2007.
5. S.R. Bhowmik, M. Bhowmik, Entrepreneurship-A tool for Economic Growth And A key to Business Success, New Age International Publishers, First Edition, (formerly Wiley Eastern Limited), New Delhi, 2007.
6. <https://www.wfglobal.org/>
7. <https://www.learnwise.org/#/IN/en/home/login>,

**SYLLABUS FOR B. TECH. III YEAR I SEM**  
**COMPUTER SCIENCE AND ENGINEERING (AI & ML)**  
**DESIGN LITERACY AND DESIGN THINKING**  
**(OPEN ELECTIVE –I)**

**L T P C**  
**3 0 0 3**

**Code: 9ZC08**

**Course Objectives:**

The objective of the course is to make students understand the fundamental concepts of design thinking, and to familiarize with product design process and to motivate the students to ideate new products and services.

**Course Outcomes:**

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

1. The students gain the knowledge on the inputs required for design thinking and also gain familiarity on concepts related to design thinking.
2. The students learn the techniques of idea generation
3. The students gain knowledge on different phases of design thinking
4. The students realize the product design process.
5. The students gain familiarity on design thinking for service design.
6. The students gain knowledge on various cases related to design thinking.

**UNIT I: Design Thinking** – Introduction to Design thinking, Principles of design thinking, Benefits of design thinking, Applications of Design thinking, Social Innovation, Impact of Design thinking, Design thinking tools and techniques. Innovation and Design thinking.

**UNIT II: Idea Generation:** New Idea generation methods - Principles of Idea Generation, Techniques, Creativity thinking techniques and tools, types of creative thinking, select ideas from ideation methods.

**UNIT III: Design Thinking Foundations:** The Design Double Diamond: Discover-Define-Develop-Deliver, User-centric design approaches: Importance of user-centricity for design, Empathisation, Empathy Maps, Data collection from users and for users, Data Validation Responsible Innovation and Ethical Design:

**UNIT IV: Product Design Process:** Identification of opportunities, Problem Statement, Product planning, Characteristics of Successful product Development, New product development process, Stanford design thinking iterative model

**UNIT V: Design Thinking for Service Design:** Attributes of a good service design, service design tools – blueprint, customer journey mapping Identifying the user needs in a service-driven economy; Process Flows and Customer Experience considerations for designing and improving services; 5 Whys; Service Delivery Pathways

**UNIT VI: Case Studies on Design thinking:** Case 1: Arcturus IV by John E. Arnold, Case – 2: How can we make AI to make things better for humans. Case – 3: User Centered Helmet

Design by Prof. B.K. Chakravarthy- Part 1 and Part 2; Case – 4: Challenges of Reaching a Million Users by Prof. Chetan Solanki and Prof Jayendran V.

**Essential Readings:**

1. Brown, T. (2008). Design thinking. *Harvard business review*, 86(6), 84.
2. “Innovation by Design”, Gerald H. (Gus) Gaynor, AMACOM {American Management Association}, NYC, 2002
3. Ansell, C., & Torfing, J. (2014). Collaboration and design: new tools for public innovation. In *Public innovation through collaboration and design* (pp. 19-36). Routledge.
4. Lewrick, M., & Link, P. (2015). Design thinking tools: Early insights accelerate marketers’ success. *Marketing Review St. Gallen*, 32(1), 40-51.

**References:**

1. Mæhlum, A. R. (2017). *Extending the TILES Toolkit-from Ideation to Prototyping* (Master's thesis, NTNU).
2. Norman, D. (2013). *The design of everyday things: Revised and expanded edition*. Basic books.
3. Design Thinking – A primer, Prof: Dr. BalaRamadurai, Indian Institute of Technology, Madras.

**Websites:**

1. [www.smashingmagazine .com](http://www.smashingmagazine.com)
2. [www.ID](http://www.ID)

**SYLLABUS FOR B. TECH. III YEAR I-SEM**  
**COMPUTER SCIENCE AND ENGINEERING (AI & ML)**  
**BANKING OPERATIONS AND INSURANCE**  
**(OPEN ELECTIVE –I)**

**L T P C**  
**3 0 0 3**

**Code: 9ZC05**

**Course Objectives:**

To make the students understand the concepts and principles of Indian Banking Business, Insurance Business and Capital market business products and services, which facilitate them to understand the nature of market.

**Course Outcomes:**

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

1. Describe the new dimensions and products served by the banking system in INDIA.
2. Explain the credit control system and create awareness on NPA's
3. Apply the knowledge of Insurance concepts in real life scenarios
4. Recognize the importance of regulatory and legal frame work of IRDA
5. Identify the risk management process and methods.
6. Calculate the diversity of risk and return.

**UNIT-I**

**Introduction to Banking Business:** Introduction to financial services - History of banking business in India, Structure of Indian banking system: Types of accounts, advances and deposits in a bank. KYC norms, New Dimensions and products- E-Banking: Mobile-Banking, Net Banking, Digital Banking, Negotiable Instruments: Cheque system.

**UNIT –II:**

**Banking Systems and Its Regulation: Banking Systems:** Branch Banking, Unit Banking, Correspondent Banking, Group Banking, Deposit Banking, Mixed Banking and Investment Banking - Banking Sector Reforms with special reference to Prudential Norms, Capital Adequacy Norms, Classification of Assets and NPA's, Functions of RBI, Role of RBI in regulating Indian Banking. Banking Ombudsman scheme.

**UNIT-III**

**Introduction to Insurance:** Introduction to insurance, Need and importance of Insurance, principles of Insurance, characteristics of insurance contract, branches of insurance and types of insurance: Life insurance and its products, General Insurance and its variants.

**UNIT –IV:**

**Insurance Business Environment:** Procedure for issuing an insurance policy –Nomination - Surrender Value - Policy Loans – Assignment - Revivals and Claim Settlement; Insurance as a tax mitigation tool, Role of IRDA in Insurance Regulation.

**UNIT-V**

**Financial Markets and Risk Management:** Introduction to Financial Markets: Money Market – Capital market; Introduction to Risk Management, meaning and classification of risks, Risk management process, Risk Management Approaches and Techniques.

**UNIT-VI**

**Derivatives as a Risk Management Tool:** Introduction to Financial Derivatives, Advantages of Derivatives - types of Derivative Contracts - Forwards, Futures, Options and Swaps - Differences among Forwards, Futures and Option Contracts.

**TEXT BOOKS:**

1. Varshney, P.N., Banking Law and Practice, Sultan Chand & Sons, New Delhi.
2. General Principles of Insurance Harding and Ewantly.

**REFERENCES:**

1. Mark S. Dorfman: Risk Management and Insurance, Pearson, 2009.
2. Scott E. Harringam Gregory R. Nichanus: Risk Management & Insurance, TMH, 2009.
3. Geroge E. Rejda: Principles of risk Management & Insurance, 9/e, pearson Education. 2009.
4. G. Koteswar: Risk Management Insurance and Derivatives, Himalaya, 2008.

**SYLLABUS FOR B. TECH. III YEAR I SEM**  
**COMPUTER SCIENCE AND ENGINEERING (AI & ML)**  
**INTRODUCTION TO ADDITIVE MANUFACTURING PROCESSES**  
**(OPEN ELECTIVE –I)**

**Code: 9BC51**

**L T P C**  
**3 0 0 3**

**Course Objectives:**

To teach students the fundamental concepts of Additive Manufacturing, techniques involved and their advantages and limitations and various applications of these technologies in relevant fields such as mechanical, Bio-medical, Aerospace, electronics etc.

**Course Outcomes:**

1. Understand the Additive manufacturing processes and their relationship with subtractive manufacturing.
2. Demonstrate comprehensive knowledge of the broad range of liquid based rapid prototype processes, devices, capabilities and materials that are available.
3. Apply the principles of casting in Additive manufacturing processes
4. Articulate the various tradeoffs of Additive manufacturing software's/data format that must be made in selecting advanced/additive manufacturing processes, devices and materials to suit particular product requirements.
5. Learn various applications of additive manufacturing, such as in architecture art, health care direct part production and mass customization.

**UNIT-I**

**Introduction:**

Development of AM, Fundamentals of AM, Classification of AMS, Advantages, Standards on AM, commonly used terms, AM process chain

**UNIT-II**

**Liquid-based Additive Manufacturing Systems:** Stereo lithography Apparatus (SLA), process, working principle, photopolymers, photo polymerization, Layering technology, laser and laser scanning, Applications, Advantages and Disadvantages, 3D bio printing.

**Solid-based Additive manufacturing Systems:**, Laminated Object Manufacturing (LOM): process, working principle, Applications, Advantages and Disadvantages, Fused Deposition Modeling (FDM): working principle, Applications, Advantages and Disadvantages.

**UNIT-III**

**Powder Based Additive Manufacturing Systems:** Selective laser sintering (SLS): working principle, Applications, Advantages and Disadvantages, Color Jet printing, working principle, Applications, Advantages and Disadvantages, **Build time calculations** – SLA, FDM, Problems.

**UNIT-IV**

**Additive manufacturing Data Formats:** STL Format, STL File Problems, Consequence of Building Valid and Invalid Tessellated Models, STL file Repairs: Generic Solution, Features



of various AM software's like Magics, Mimics, Solid View, View Expert, 3 D View, Velocity 2, Rhino, STL View 3 Data Expert and 3 D doctor.

**Design for AM** – Basic Principles and Practices.

#### **UNIT-V**

**Rapid Tooling:** Introduction to Rapid Tooling (RT), Conventional Tooling Vs RT, Need for RT. Rapid Tooling Classification, Spray Metal Deposition, Silicone rubber molds, , Casting-Sand Casting ,Investment Casting, evaporative Casting

**Reverse engineering** – What is RE, Why use RE, RE Generic process, Overview of RE-Software and Hardware, CMMs-applications and types

#### **UNIT-VI**

**Applications and examples:** Application - Material Relationship, Application in Design, Application in Engineering, Analysis and Planning, Aerospace Industry, Automotive Industry, Jewelry Industry, Coin Industry, Arts and Architecture. Medical and Bioengineering Applications: Planning and simulation of complex surgery, Customized Implants and Prosthesis, Design and Production of Medical Devices, Bionic ear, dentistry

#### **TEXTBOOKS:**

1. Chua C.K., Leong K.F. and LIM C.S, Rapid prototyping; Principles and Applications, World Scientific Publications , Third Edition, 2010.
2. Reverse Engineering: An Industrial Perspective, Springer- Verlag, 2008. ISBN: 978-1-84628-855-5.

#### **REFERENCES:**

1. Ian\_GibsonDavid\_Rosen, Brent\_Stucker, AdditiveManufacturingTechnologies3D Printing, Rapid Prototyping, and Direct Digital Manufacturing, Springer.
2. PaulF.Jacobs, Rapid Prototyping and Manufacturing ASME Press, 1996.

**SYLLABUS FOR B. TECH. III YEAR I SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
SOFTWARE TESTING METHODOLOGIES  
(PROFESSIONAL ELECTIVE-I)**

**Code: 9LC11**

**L T P C  
3 0 0 3**

**Course Objectives:**

To Understand the Basic concepts in Software testing, concepts of flow graphs, path testing and data flow testing, understand the concept of metrics and their types. Understand and implement various testing techniques and to make a thorough study on various testing tools. Set a strategy for testing environment and to learn the testing methodologies in detail.

**Course Outcomes:**

After completing this course, student shall be able to

1. Describe concepts of software testing.
2. Describe and apply the concepts Flow graphs, Path testing and Data Flow Testing.
3. Practice Software testing strategy and Environment with economics and apply Software Metrics useful in software development and maintenance.
4. Software Testing Methodology, finding defects hard to find, Verification and validation, Functional and structural, Workbench concept, Eight Consideration of software testing methodology, checklist. Describe Agile computing with agile testing.
5. Demonstrate Software Testing Techniques such as JADs, Pareto Analysis , Regression Tasting, Structured walkthroughs, Thread testing , Performance testing and White box testing.
6. Describe Graph matrices and applications, and practice and apply automated testing tools such load Runner, UFT and QTP.

**UNIT-I**

What is Testing, Characteristics of Test Engineers, Software Testing Life Cycle, Levels of Testing, Testing Approaches, Test Cases: Format for Writing Test Case, Test plan: Format to prepare Test plan, Purpose of testing, Dichotomies, Consequences of bugs.

**UNIT-II**

Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, application of path testing. Data Flow Testing: Basics of Data Flow Testing Logic Based Testing, Decision Tables.

**UNIT-III**

Software testing strategy and Environment, establishing testing policy, structured approach to testing, Test factors, Economics of SDLC testing.

Software Metrics: Software Quality, Metrics for Analysis Model, Metrics for Design Model, Metrics for source code, Metrics for testing, Metrics for maintenance.

**UNIT-IV**

Software Testing Methodology, Defects hard to find, Verification and validation, Functional and structural, Defects and Failures, testing that parallels the software Development process,

Workbench concept, Eight Consideration of software testing methodology, testing tactics checklist. Importance of Agility, Building an Agile Testing Process.

#### **UNIT-V**

Software Testing Techniques, Black-box, Boundary value, Branch coverage, Cause Effect graphing, CRUD, Database, Histogram, Gray box, Inspections, JADs, Pareto Analysis, Prototyping, Random Testing, Risk based testing, Regression Testing, Structured walkthroughs, Thread testing, Performance testing, Stress Testing, Accepting Testing, White box testing, Alpha and Beta Testing.

#### **UNIT-VI**

Graph matrices and application: Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm.  
Need for Automated testing tools, Taxonomy of Testing Tools, Exposure to Software Testing Tools: Load Runner, UFT and QTP.

#### **TEXT BOOKS:**

1. Software testing techniques – Boris Beizer, Dreamtech, Second Edition.(Unit 1,2,6)
2. Software testing tools – by Dr. K.V.K.K Prasad Dreamtech (Unit 1,6)
3. Effective Methods for Software Testing, 2<sup>nd</sup> Edition by William E.Perry, Wiley publications.(Unit 3,4)
4. Software Testing and continuous Quality Improvement, by William E.Lewis,Gunasekaran,2<sup>nd</sup> Edition Auerbach publications (Unit 5,Refer Internet)

#### **REFERENCES:**

1. Software Testing Techniques ,byBoriesBeizer, Second Edition,Dreamtech Press.
2. Testing and Quality Assurance for Component based software ,byGao,Tsao and Wu,Artech House Publishers.
3. Managing the Testing Process,by Rex Black,Wiley.

**SYLLABUS FOR B. TECH. III YEAR I SEM**  
**COMPUTER SCIENCE AND ENGINEERING (AI & ML)**  
**DATA VISUALIZATION TECHNIQUES**  
**(PROFESSIONAL ELECTIVE -I)**

**L T P C**  
**3 0 0 3**

**Code: 9LC06**

**Course Objectives:**

1. To understand various data visualization techniques.
2. To understand various Interaction Concepts and Techniques

**Course Outcomes:**

1. Visualize the objects in different dimensions.
2. Design and process the data for Virtualization.
3. Apply the visualization techniques in physical sciences, computer science, applied mathematics and medical science.
4. Apply the virtualization techniques for research projects. (K1,K3).

**UNIT – I**

**Introduction and Data Foundation:** Basics - Relationship between Visualization and Other Fields - The Visualization Process - Pseudo code Conventions - The Scatter plot. Data Foundation - Types of Data - Structure within and between Records - Data Pre-processing - Data Sets.

**UNIT – II**

**Foundations for Visualization:** Visualization stages - Semiology of Graphical Symbols - The Eight Visual Variables - Historical Perspective - Taxonomies - Experimental Semiotics based on Perception Gibson's Affordance theory – A Model of Perceptual Processing.

**UNIT –III**

**Visualization Techniques: Spatial Data:** One-Dimensional Data - Two-Dimensional Data – Three- Dimensional Data-Dynamic Data-Combining Techniques.

**Geospatial Data:** Visualizing Spatial Data - Visualization of Point Data -Visualization of Line Data - Visualization of Area Data - Other Issues in Geospatial Data Visualization

**UNIT – IV**

**Multivariate Data:** Point-Based Techniques - Line- Based Techniques - Region-Based Techniques - Combinations of Techniques – Trees Displaying Hierarchical Structures – Graphics and Networks- Displaying Arbitrary Graphs/Networks.

**UNIT – V**

**Interaction Concepts and Techniques: Text and Document Visualization:** Introduction - Levels of Text Representations - The Vector Space Model - Single Document Visualizations -Document Collection Visualizations-Extended Text Visualization **Interaction Concepts:** Interaction Operators- Interaction Operands and Spaces - A Unified Framework. **Interaction Techniques:** Screen Space - Object-Space-Data Space-Attribute Space-Data Structure Space-Visualization Structure-Animating Transformations –Interaction Control

**UNIT–VI**

**Research Directions in Virtualizations:** Steps in designing Visualizations – Problems in designing effective Visualizations- Issues of Data. Issues of Cognition, Perception, and Reasoning, Issues of System Design Evaluation, Hardware and Applications.

**TEXT BOOKS:**

1. Matthew Ward, Georges Grinstein and Daniel Keim, “Interactive Data Visualization Foundations, Techniques, Applications”,2010.
2. Colin Ware, “Information Visualization Perception for Design”, 2nd edition, Morgan Kaufmann Publishers,2004.

**REFERENCES:**

1. Robert Spence “Information visualization – Design for interaction”, Pearson Education, 2<sup>nd</sup> Edition,2007.
2. Alexandru C. Telea, “Data Visualization: Principles and Practice,” A. K. Peters Ltd,2008.

**SYLLABUS FOR B. TECH. III YEAR I SEM**  
**COMPUTER SCIENCE AND ENGINEERING (AI & ML)**  
**DESIGN THINKING**  
**(PROFESSIONAL ELECTIVE –I)**

**Code: 9LC13**

L	T	P	C
3	0	0	3

**Course Objective:**

1. To understand the fundamental concepts of design thinking.
2. To familiarize with product design process.
3. To ideate new products and services.

**Course Outcomes:**

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

1. Gain the knowledge on the inputs required for design thinking and also gain familiarity on concepts related to design thinking.
2. Understand the techniques of idea generation
3. Classify different phases of design thinking
4. Realize the product design process.
5. Understand design thinking for service design.
6. Gain knowledge on various case studies related to design thinking.

**UNIT – I**

**Design Thinking** – Introduction to Design thinking, Principles of design thinking, Benefits of design thinking, Applications of Design thinking, Social Innovation, Impact of Design thinking, Design thinking tools and techniques. Innovation and Design thinking.

**UNIT – II**

**Idea Generation:** New Idea generation methods - Principles of Idea Generation, Techniques, Creativity thinking techniques and tools, types of creative thinking, select ideas from ideation methods.

**UNIT – III**

**Design Thinking Foundations:** The Design Double Diamond: Discover-Define-Develop-Deliver, User-centric design approaches: Importance of user-centricity for design, Empathisation, Empathy Maps, Data collection from users and for users, Data Validation Responsible Innovation and Ethical Design:

**UNIT – IV**

**Product Design Process:** Identification of opportunities, Problem Statement, Product planning, Characteristics of Successful product Development, New product development process, Stanford design thinking iterative model

**UNIT – V**

**Design Thinking for Service Design:** Attributes of a good service design, service design tools – blueprint, customer journey mapping Identifying the user needs in a service-driven economy; Process Flows and Customer Experience considerations for designing and improving services; 5 Whys; Service Delivery Pathways

## **UNIT – VI**

**Case Studies on Design thinking:** Case 1: Arcturus IV by John E. Arnold, Case – 2: How can we make AI to make things better for humans. Case – 3: User Centered Helmet Design by Prof. B.K. Chakravarthy- Part 1 and Part 2; Case – 4: Challenges of Reaching a Million Users by Prof. Chetan Solanki and Prof Jayendran V.

### **TEXT BOOKS:**

1. Brown, T. (2008). Design thinking. Harvard business review, 86(6), 84.
2. "Innovation by Design", Gerald H. (Gus) Gaynor, AMACOM {American Management Association), NYC, 2002.
3. Ansell, C., & Torfing, J. (2014). Collaboration and design: new tools for public innovation. In Public innovation through collaboration and design (pp. 19-36). Routledge.
4. Lewrick, M., & Link, P. (2015). Design thinking tools: Early insights accelerate marketers' success. Marketing Review St. Gallen, 32(1), 40-51.

### **REFERENCES:**

1. Mæhlum, A. R. (2017). Extending the TILES Toolkit-from Ideation to Prototyping (Master's thesis, NTNU).
2. Norman, D. (2013). The design of everyday things: Revised and expanded edition. Basic books.
3. Design Thinking – A primer, Prof: Dr. Bala Ramadurai, Indian Institute of Technology, Madras.

**SYLLABUS FOR B. TECH. III YEAR I SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
HUMAN COMPUTER INTERACTION  
(PROFESSIONAL ELECTIVE-I)**

**L T P C  
3 0 0 3**

**Code: 9FC10**

**Course Objectives:**

1. To understand the importance of the design for any software that acts as an interface between Man and Machine
2. To make the students should also consider the characteristics of the humans while designing the Software /Hardware.
3. To teach the students to understand the characteristics required to build an effective GUI.
4. To understand the significance of the software tools and learn about different interaction devices.

**Course Outcomes:**

After completing this course, students should able to

1. Explain role of user Interface, its importance and Benefits of good design.
2. Describe the concept of direct manipulation, graphical system, web user role and Principles of user interface.
3. Describe Human interaction with computers, importance of human characteristics human consideration in Design and relate business functions.
4. Apply and explain Screen Designing formalities such as Screen planning, purpose, organizing screen elements, ordering of screen content, screen navigation, focus and emphasis and Technological considerations in interface design.
5. Explain Windows–Navigation schemes and screen based controls. Apply Components – text and messages, Icons and increases – Multimedia, colors, uses problems and choosing colors in real time application.
6. Develop applications with the aid of Software tools, interface Building Tools and use Interaction Devices.

**UNIT- I:**

Introduction: Importance of user Interface – definition, importance of good design, Benefits of good design –A brief history of Screen design.

**UNIT-II**

The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, Characteristics-Principles of user interface.

**UNIT-III**

Design process – Human interaction with computers, importance of human characteristics human consideration in Design, Human interaction speeds, understanding business functions.

**UNIT-IV**

Screen Designing: Design goals, Screen planning and purpose, organizing screen elements ordering of screen data and content – screen navigation and flow – Visually pleasing



composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.

#### **UNIT-V**

Windows – New and Navigation schemes selection of window, selection of devices based and screen based controls.

Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.

Case studies: windows GUI.

#### **UNIT-VI**

Software tools – Specification methods, interface – Building Tools.

Interaction Devices – Key board and function keys – pointing devices-speech recognition digitization and generation – image and video displays – Printers.

#### **TEXT BOOKS:**

1. The essential guide to user interface design, Wilbert OGalitz, Wiley Dreama Tech.
2. Designing the user interface.3<sup>rd</sup> Edition Ben Shneidermann, Pearson Education Asia.

#### **REFERENCES:**

1. Human – Computer Interaction .ALANDIX, JANETFINCAY,GREGORYD,ABOWD, RUSSELLBEALG,PEARSON.
2. Interaction Design PRECE, ROGERS, SHARPS. Wiley Dream tech.
3. User Interface Design, Soren Lauesen, Pearson Education.

**SYLLABUS FOR B. TECH. III YEAR I SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
DATA WAREHOUSING AND DATA MINING**

**L T P C**  
**2 1 0 3**

**Code: 9FC05**

**Prerequisite:** Database Management Systems

**Course Objectives:**

1. To understand the principles of Data Mining and methods improve the quality of data.
2. To be familiar with the Data warehouse architecture.
3. To understand applications of Association Rule Mining and algorithms to find them.
4. To perform classification and prediction of data.
5. To understand applications and algorithms for Clustering and to introduce advanced topics in Data Mining.

**Course Outcomes:**

At the end of this course the student will be able to.

1. Understand the functionality of the various data mining functions.
2. Apply pre-processing techniques on various datasets.
3. Build a Data warehouse system and perform business analysis with OLAP tools.
4. Characterize the kinds of patterns that can be discovered by association rule mining.
5. Compare and contrast between different classification and clustering algorithms.

**UNIT – I**

**Introduction:** Fundamentals of data mining, KDD process, Architectures of Data Mining Systems ,Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task primitives, Integration of a Data mining System with a Database or a Data warehouse systems, Major issues in Data Mining.

**UNIT – II**

**Data Preprocessing:** Needs for Preprocessing the Data, Descriptive Data Summarization, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

**UNIT – III**

**Data Warehouse and OLAP Technology for Data Mining:** Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, From Data Warehousing to Data Mining.

**UNIT – IV**

**Mining Frequent, Associations and Correlations:** Basic concepts, Frequent Itemset mining methods, Mining multilevel association rules from Transaction Databases, Mining Multidimensional association rules from Relational databases and Data Warehouses, From Association Mining to Correlation Analysis, Constraint-Based Association Mining.

**UNIT – V**

**Classification and Prediction:** Issues regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Classification by Back propagation, Support Vector Machines (SVMs), k-nearest neighbor classifier, Other Classification Methods. Prediction, Classifier Accuracy

**UNIT – VI**

**Cluster Analysis Introduction:** Types of Data in Cluster Analysis, Major Clustering methods, Partitioning Methods, Density-Based methods, Grid-Based methods, Model-Based Clustering methods, Outlier Analysis.

**Advanced Concepts:** Text Mining, Web Mining.

**TEXT BOOKS:**

1. Data mining: Concepts and Techniques, Jiawei Han and Micheline Kamber, 2nd Edition, Elsevier, 2006.
2. Data Mining Techniques – ARUN K PUJARI, University Press.

**REFERENCES:**

1. Data Mining Introductory and advanced topics –MARGARET H DUNHAM, PEARSON EDUCATION
2. Data Mining Techniques – ARUN K PUJARI, University Press.
3. Data Warehousing in the Real World – SAM ANAHORY & DENNIS MURRAY. Pearson Edn Asia.
4. Data Warehousing Fundamentals – PAULRAJ PONNAIAH WILEY STUDENT EDITION.
5. The Data Warehouse Lifecycle Toolkit – RALPH KIMBALL WILEY STUDENT EDITION
6. Introduction to Data Mining - First Edition, by Pang-Ning Tan, Michael Steinbach and Vipin Kumar, ISBN-13: 978-0321321367

**SYLLABUS FOR B. TECH. III YEAR I SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
SOFTWARE ENGINEERING**

**L T P C**  
**2 0 0 2**

**Code: 9EC03**

**Course Objectives:**

1. To understand the importance of software engineering lifecycle models in the development of software
2. To understand the various design principles in modeling a software
3. To develop a software which adheres to the standard benchmarks
4. To understand the object oriented principles and tools.
5. To undergo the technical know in the process of software testing
6. To understand the Process/product metrics, risk management, quality management.

**Course Outcomes:**

1. Students can able to identify software processes and software engineering practices to select and justify approaches for a given project and its constraints and distinguish lifecycles for developing software products.
2. Students can able to translate end-user requirements into system and software requirements, using e.g. UML, and structure the requirements in a Software Requirements Document (SRD).
3. Students understand the importance and principles of Unified Modeling Language, its building blocks and to relate UML paradigm for problem solving.
4. Students can define and design models for the requirements stated in the baseline document.
5. Students can able to understand and experience the testing process in improving the quality of the product by using software testing techniques/tools.

**UNIT I**

Introduction to Software Engineering: Software Development Life Cycle, The evolving role of software, Changing Nature of Software, Software myths.

A Generic view of Process: Software engineering- A layered technology, a Process framework. The Capability Maturity Model – Integrated (CMM-I)

**UNIT II**

Software Requirements: Functional and non-functional requirements, User requirements, System requirements, Interface specification, The software requirements document.

Requirements engineering process: Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management, RTM.

**UNIT III**

Process Models: The waterfall model, Incremental Process models, Evolutionary Process models, V model, Agile model, SCRUM

Introduction to Object\_Oriented Design: Importance of Modeling, Principles of Modeling, Conceptual model of the UML, High-Level Design(HLD) and Low-Level Design(LLD), Coupling and Cohesion

Basic Structural Modeling: Class Diagrams, Forward and Reverse Engineering.

#### **UNIT IV**

Basic Behavioral Modeling: Interaction diagrams, Use case Diagrams, Activity Diagrams, State chart diagrams.

Software Testing Introduction: What is Testing, Characteristics of Test Engineers, Software Testing Life Cycle, Levels of Testing, Test Cases: Format for Writing Test Case, Test plan: Format to prepare Test plan

#### **UNIT V**

Testing Strategies and Techniques: A strategic approach to software testing, test strategies for conventional software, Black-Box and White-Box testing, Validation testing, System testing, Gray box Testing, Boundary value Analysis, Equivalence Partition testing, Mutation Testing, Unit Testing, Integration Testing, Path testing, Regression Testing, Load testing, Stress Testing, Spike Testing, Accepting Testing, Alpha and Beta Testing.

Product and Process metrics: Software Quality, Metrics for Analysis Model, Metrics for Design Model, Metrics for source code, Metrics for testing, Metrics for maintenance, Software Measurement, Metrics for software quality.

#### **UNIT VI**

Risk Management: Reactive vs. Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMM Plan.

Quality Management: Quality concepts, Software quality assurance, Software Reviews, Formal technical reviews, Statistical Software quality Assurance, Software reliability, The ISO 9000 quality standards.

#### **TEXT BOOKS:**

1. Software Engineering, A Practitioner's Approach- Roger S. Pressman, 6th edition. McGrawHill International Edition.
2. Grady Booch, James Rumbaung, Ivar Jacobson: The Unified Modeling Language User Guide, Pearson Education.

#### **REFERENCES:**

1. Software Engineering- Sommerville, 7th edition, Pearson education.
2. Software Engineering- K.K. Agarwal & Yogesh Singh, New Age International Publishers
3. Software Engineering, an Engineering approach- James F. Peters, WitoldPedrycz, John Wiely.
4. Systems Analysis and Design- Shely Cashman Rosenblatt, Thomson Publications.
5. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill Companies
6. Meilir Page-Jones: Fundamentals of Object Oriented Design in UML, Pearson Education.
7. Pascal Roques: Modeling Software Systems Using UML2, WILEY-Dreamtech India Pvt. Ltd.
8. AtulKahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.
9. Mark Priestley: Practical Object-Oriented Design with UML, TATA McGrawHill
10. Craig Larman Applying UML and Patterns: An introduction to Object – Oriented Analysis and Design and Unified Process, Pearson Education.

**SYLLABUS FOR B. TECH. III YEAR I SEM**  
**COMPUTER SCIENCE AND ENGINEERING (AI & ML)**  
**INTRODUCTION TO ARTIFICIAL INTELLIGENCE**

**Code: 9LC01**

L	T	P	C
3	0	0	3

**Prerequisite:** Knowledge on Data Structures.

**Course Objectives:**

1. To learn the distinction between optimal reasoning vs. human like reasoning.
2. To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
3. To learn different knowledge representation techniques.
4. To understand the applications of AI, namely game playing, theorem proving, and machine learning.

**Course Outcomes:**

1. Learn the distinction between optimal reasoning vs. human like reasoning and formulate an efficient problem space for a problem expressed in natural language. Also select a search algorithm for a problem and estimate its time and space complexities.
2. Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.
3. Learn different knowledge representation techniques.
4. Understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
5. Comprehend the applications of Probabilistic Reasoning and Bayesian Networks, analyze Supervised Learning vs. Learning Decision Trees.

**UNIT-I**

**Introduction to AI-** Intelligent Agents, Problem-Solving Agents,  
**Searching for Solutions** - Breadth-First Search, Depth-First Search, Hill-climbing Search, Simulated Annealing Search, Local Search in Continuous Spaces.

**UNIT-II**

**Games-** Optimal Decisions in Games, Alpha-Beta Pruning, Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Knowledge-Based Agents.  
**Logic-**Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses.

**UNIT-III**

**First-Order Logic-**Syntax and Semantics of First-Order Logic, Using First Order Logic, Knowledge Engineering in First-Order Logic. Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification, Forward Chaining, Backward Chaining, Resolution.  
**Knowledge Representation:** Ontological Engineering, Categories and Objects, Events.

**UNIT-IV**

**Planning-**Definition of Classical Planning, Algorithms for Planning with State Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches,

Hierarchical Planning.

**UNIT-V**

**Probabilistic Reasoning:** Acting under Uncertainty, Basic Probability Notation Bayes' Rule and Its Use, Probabilistic Reasoning, Representing Knowledge in an Uncertain Domain.

**UNIT-VI**

**Bayesian Networks-** The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First-Order Probability.

**TEXT BOOKS:**

1. Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig, Pearson Education, Third Edition.

**REFERENCES:**

1. Artificial Intelligence, 3rd Edn., E. Richard K. Knight (TMH)
2. Artificial Intelligence, 3rd Edn., Patrick Henry Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education.

**SYLLABUS FOR B.TECH. III YEAR I SEM**  
**COMPUTER SCIENCE AND ENGINEERING (AI & ML)**  
**COMPUTER NETWORKS**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Code: 9EC05**

**Course Objectives:**

Understand primitives of computer networks, Learn flow control, error control and access control mechanisms. Learn routing and congestion control algorithms, internet protocols. Understand Transport layer entities such as DNS and HTTP.

**Course Outcomes:** At the end of this course the student will be able to

1. Identify the different types of network topologies and protocols useful for real time applications and transmission media.
2. Discuss design issues of data link layer and solve problems on Checksum and flow control.
3. Analyze MAC layer protocols and LAN technologies.
4. Obtain the skills of subnetting, routing mechanisms and congestion control.
5. Discuss the concepts, services and protocols of Transport and Application layers along with the network security

**UNIT I:**

**Introduction:** Uses of Computer Networks, Types of networks: WAN, LAN, MAN, Network Topologies, Reference models: OSI, TCP/IP.

**Physical Layer:** Transmission media: magnetic media, twisted pair, coaxial cable, fiber optics, wireless transmission.

**UNIT II:**

**Data link layer:** Design issues in data link layer: framing, flow control, error control, Error Detection and Correction: Parity, CRC checksum, Hamming code, Flow Control: Sliding Window Protocols, Applications: Data link layer protocols HDLC, PPP.

**UNIT III:**

**Medium Access sub layer:** Channel allocation problem, MAC Protocols: ALOHA, CSMA, CSMA/CD, MAC addresses, IEEE 802.X, Standard Ethernet, Wireless LANS. Bridges, Types of Bridges.

**UNIT IV:**

**Network Layer:** Design issues in Network Layer, Virtual circuit and Datagram subnets- Routing algorithm: Shortest path routing, Flooding, distance vector routing, Link state routing, Hierarchical routing, Broad casting, Multi casting, Routing for mobile hosts.

Internetworking: Concatenated Virtual Circuits, Connectionless internetworking, Tunneling, Internetwork routing, Fragmentation



**UNIT V:**

**Network layer in internet:** IPv4, IP addresses, Sub netting, Super netting, NAT. Internet control protocols: ICMP, ARP, RARP, DHCP.

Congestion Control: Principles of Congestion, Congestion Prevention Policies.

Congestion Control in datagram Subnet: Choke packet, load shedding, jitter control.

Quality of Service: Leaky Bucket algorithm and token bucket algorithm.

**UNIT VI:**

**Transport Layer:** Transport Services, Connection establishment, Connection release and TCP and UDP protocols.

**Application Layer:** Domain name system, FTP, HTTP, SMTP, WWW.

**TEXT BOOKS:**

1. Computer Networks — Andrew S Tanenbaum, 4th Edition. Pearson Education/PHI
2. Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.
3. Data Communication and Networks-Bhushan Trivedi-OXFORD Publications.

**REFERENCES:**

1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education
2. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson

**SYLLABUS FOR B.TECH. III YEAR I SEM**  
**COMPUTER SCIENCE AND ENGINEERING (AI & ML)**  
**OPERATING SYSTEMS**

**Code: 9EC06**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>2</b>	<b>1</b>	<b>0</b>	<b>3</b>

**Prerequisite: Computer Organization**

**Course Objectives:**

Learn basics of operating Systems. Understand the process management, Inter Process Communication and synchronization that take place in the operating system. Learn the principles of memory, I/O and file management in a secured environment.

**Course Outcomes:**

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

1. Understand the functional architecture of an Operating System with usage of system calls.
2. Analyze various process scheduling algorithms & pragmatics of scheduling algorithms used by various Operating Systems.
3. Solve issues related to process synchronization and Inter process Communication (IPC) in the Operating System.
4. Comprehend the concepts of Deadlock and illustrate the concepts of Memory Management.
5. Explain the concepts of File System with regard to Directory and Disk Management Algorithms, summarize the aspects of I/O Systems, Protection and Security.

**UNIT I: Introduction to Operating System:** Definition, Functions of Operating Systems, **Types of Operating Systems:** Batch Operating System, Multiprogramming Operating System, Multiprocessing Operating System, Multitasking Operating System, Network Operating System, Real Time Operating System, Time-Sharing Operating System and Distributed Operating System.

**Computer System Architecture:** Four Components of a Computer System, **Operating System Services, System Calls:** Definition, Types of System Calls, **Operating System Structure:** Simple Structure, Layered Approach, **Threads:** Definition, Need of threads, types of threads.

**UNIT II: Process Management:** Process concept: Definition of Process, Process State Diagram, PCB (Process Control Block), CPU Switch from process to process, Context Switching, Process Vs Thread.

**Process Scheduling:** Process Queues: Job Queue, Ready Queue, I/O/Device/Waiting Queue, Representation of Process Scheduling, **Types of Process Schedulers:** Long-term, Short-term and Medium-Term Scheduler.

**CPU Scheduling:** Preemptive Scheduling, Non-Preemptive Scheduling, Scheduling Criteria, **Scheduling Algorithms (Preemptive and Non-Preemptive with Arrival Time):** First Come First Serve (FCFS), Shortest-Job-First (SJF), Shortest Remaining Time First (SRTF), Priority Scheduling, Round Robin (RR), Multilevel Queue Scheduling, Multilevel Feedback Queue Scheduling.

**UNIT III: Process Synchronization** - The Critical Section Problem: Solution to Critical Section Problem (Software and Hardware), Synchronization Hardware, Classical Problems of Synchronization, Semaphores, Monitors.

**Inter Process Communication Mechanisms:** IPC between processes on a single computer system, IPC between processes on different systems, using pipes, FIFOs, message queues, shared memory.

**UNIT IV: Deadlocks:** Definition, Necessary Conditions for Deadlock, **Methods For Handling Deadlocks:** Deadlock Prevention, Avoidance(Bankers Algorithm), Detection and Deadlock recovery.

**Memory Management:** Logical versus Physical Address Space, Swapping, Contiguous memory allocation, Paging and Segmentation techniques, Segmentation with paging, **Virtual Memory:** Demand Paging, **Page-Replacement Algorithms:** FIFO, LRU and Optimal, Thrashing.

**UNIT V: File System:** Different types of files and their access methods, **Directory Structures:** Various file allocation methods - Contiguous, Linked with FAT and Indexed, **Disk Scheduling Algorithms:** FCFS, SSTF, SCAN, C-SCAN, LOOK, C-LOOK.

**UNIT VI: I/O Systems:** I/O Hardware: Polling, Interrupts and DMA, **Protection:** Goals of Protection, Principles of Protection, Access Matrix, Implementation of Access Matrix, Access Control List, Capability List, Program threats.

**TEXT BOOKS:**

1. Operating System Concepts by Silberchatz Galvin, 8<sup>th</sup> edition.
2. Modern Operating Systems by A. Tanenbaum, 1992, Prentice-Hall.
3. Operating Systems Internals and Design Principles by William Stallings, 4<sup>th</sup> edition, 2001, Prentice-Hall

**REFERENCE BOOKS:**

1. Operating System By Peterson , 1985, AW.
2. Operating System By Milankovic, 1990, TMH.
3. Operating System Incorporating With Unix& Windows By Colin Ritche, 1974, TMH.
4. Operating Systems By Mandrik& Donovan, TMH
5. Operating Systems ByDeitel, 1990, AWL.
6. Operating Systems – Advanced Concepts By MukeshSinghal , N.G. Shivaratri, 2003, T.M.H

**SYLLABUS FOR B. TECH. III YEAR I SEM**  
**COMPUTER SCIENCE AND ENGINEERING (AI & ML)**  
**SOFTWARE ENGINEERING LAB AND COMPUTER NETWORKS LAB**

**Code: 9LC63**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>1</b>

**Course Objectives:**

1. Understanding how a software design may be represented as a set of interacting objects that manage their own state and operations.
2. Helps the students to design the models in real market.
3. Learns various conceptual models relating to UML.
4. Over all understanding of the designing process in software engineering using UML concepts.
5. Understand packet tracer tools.
6. Understand Transport layer entities such as DNS and HTTP.

**Course Outcomes:** At the end of this course, the student will be able to

1. Students can able to identify software process and software engineering practices to select and justify approaches for a given project and its constraints and distinguish life cycles for developing software product.
2. Students understand the importance and principles of Unified Modeling Language, its building blocks and to relate UML paradigm for problem solving.
3. Students can define and design models for the requirements stated in the software project.
4. Students can able to design class, object and interactive diagrams and know their significance.
5. Students can able to design advanced behavioral and architectural modeling and work on case studies.
  - i. The student takes up the case studies mentioned and should perform the following lab activities
  - ii. Model it in different views i.e. Design view, Use case view, Implementation view, Deployment view.
  - iii. Generate the sample source code using Forward Engineering and generate sample model using Reverse Engineering.
  - iv. Generate the documentation of the project.
6. Discuss design issues of data link layer and solve problems on Checksum and flow control.
7. Analyze MAC layer protocols and LAN technologies.
8. Obtain the skills of packet tracer tools.

**SOFTWARE ENGINEERING LAB:**

**Case Studies**

- a. Library Management System
- b. Railway Reservation System
- c. Online Book Shopping System

**Week 1**

**1. Model the Usecase View**

- i) Usecase Diagrams
- ii) Generation of documentation

**Week 2**

**2. Model the Design View**

- i) Class Diagrams.
- ii) Forward and Reverse Engineering

**Week 3**

**3. Model the Design View**

- i) Object Diagrams.

**Week 4**

**4. Behavioral Modeling**

- i) Interaction Diagrams (Collaboration and Sequence Diagram)

**Week 5**

**5. Behavioral Modeling**

- i) Activity Diagrams

**Week 6**

**6. Implementation View**

- i) Component Diagrams

**Week 7**

**7. Deployment View**

- i) Deployment Diagrams

**LIST OF EXPERIMENTS (COMPUTER NETWORKS LAB):**

1. Implement the data link layer framing methods such as character, character-stuffing and bit stuffing.
2. Develop a simple data link layer that performs the flow control using the sliding window protocol.
3. Simulation of networking tools Cisco Packet Tracer and Wireshark.
4. Implement the network topologies using Cisco Packet Tracer tool
5. Implement the network devices like Hub, Router, etc.
6. Implement Home automation system using Cisco Packet Tracer tool.
7. Configuration of Web Server in cisco packet tracer tool.
8. Simulation of DNS, FTP, Web and Email server configuration using cisco packet tracer tool.

**TEXTBOOKS:**

1. Computer Networks, Andrew S Tanenbaum, David.j.Wetherall, 5<sup>th</sup>Edition. Pearson Education/PHI.

**REFERENCES:**

1. Lingala Thirupathi, D. Rambabu, Thejoram Naresh Reddy Boya, Gattoju Saritha-Computer Networks and Simulation, Walnut Publication, 2022.

**SYLLABUS FOR B.TECH. III YEAR I SEM**  
**COMPUTER SCIENCE AND ENGINEERING (AI & ML)**  
**ARTIFICIAL INTELLIGENCE LAB AND DATA MINING LAB**

**Code: 9LC64**

L	T	P	C
0	0	3	1

**Course Objectives:**

1. Become familiar with basic principles of AI toward problem solving, knowledge representation, and learning.
2. The course is intended to obtain hands-on experience using data mining software.
3. Intended to provide practical exposure of the concepts in data mining algorithms.

**Course Outcomes:**

1. Apply basic principles of AI in solutions that require problem solving, knowledge representation, and learning.
2. Apply pre-processing statistical methods for any given raw data.
3. Gain practical experience of constructing a data warehouse.
4. Implement various algorithms for data mining in order to discover interesting patterns from large amounts of data.
5. Apply OLAP operations on data cube construction.

**LIST OF EXPERIMENTS (ARTIFICIAL INTELLIGENCE):**

1. Write a program to implement FIND-S Algorithm for finding the most specific Hypothesis based on a given set of training data samples. Read the training data from a .CSV file
2. Write a program to implement k-Nearest Neighbour Algorithm to classify the IRIS data set. Print both correct and wrong predictions. Python ML library classes can be used for the problem.
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify new sample.
4. Build an artificial neural network by implementing the back propagation algorithm and test same using appropriate dataset.
5. Write a program to implement the naïve Bayesian classifier for sample training dataset stored as a .csv file. Compute the accuracy of the classifier considering test data set.
6. Implement an AI to implement BFS and DFS search.

**LIST OF EXPERIMENTS (DATA MINING):**

Experiments using Weka Tools

1. Implementation of Apriori Algorithm
2. Implementation of FP –Growth Algorithm
3. Implementation of Decision Tree Induction
4. Calculating Information Gain measures
5. Classification of data using Bayesian approach
6. Classification of data using K–nearest neighbour approach
7. Implementation of K–means algorithm

**TEXTBOOKS:**

- 1 Ian Goodfellow, Yoshua Bengio, Aaron Courville, “Deep Learning (Adaptive Computation and Machine Learning series)”, MIT Press, 2017
- 2 Data Mining – Concepts and Techniques - JIAWEI HAN & MICHELINE KAMBER, Elsevier.
- 3 Data Warehousing, Data Mining & OLAP- Alex Berson and Stephen J. Smith- Tata McGraw- Hill Edition, Tenth reprint 2007.

**REFERENCES:**

1. M. Tim Jones, —Artificial Intelligence: A Systems Approach(Computer Science), Jones and Bartlett Publishers, Inc.; First Edition, 2008
2. Nils J. Nilsson, —The Quest for Artificial Intelligence, Cambridge University Press, 2009.
3. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Anuj Karpatne, Introduction to Data Mining, Pearson Education.

**SYLLABUS FOR B. TECH. III YEAR I SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
SUMMER INDUSTRY INTERNSHIP-I**

**L T P C**  
**- - - 1**

**Code: 9L591**

**Prerequisite:** All Courses till this Semester

**Course Objectives:**

To enhance the knowledge on selecting a project, learn related tools and enhance programming and communication skills for employability.

**Course Outcomes:**

At the end of this course the student will be able to

1. Use the concepts learned in the courses, so far, in conceptualizing, designing and executing the modules of the projects.
2. Exhibit the interest in learning the modern tools and technologies through the bridge courses arranged in the college, beyond the curriculum, and hence developing the software.
3. Inculcate an enthusiasm to use the creative ideas to build the innovative projects and prototypes which are meeting the current needs of the market and society as a whole.
4. Improve their communicative skills and team skills.

A summer industry internship project shall be carried out by a group of students consisting of 2 to 4 in number during Fourth Semester summer vacation at industries. This work shall be carried out under the guidance of the faculty assigned as internal guide as well as external guide at industry where students are carrying out summer industry internship projects. Project shall consist of design, fabrication, software development or building of prototype or application app. This can be of interdisciplinary nature also.

There will be 100 marks in total with 30 marks of internal evaluation and 70 marks of external

The **Internal Evaluation** shall consist of:

1. Day to day work (internal guide 10M external guide : 5M) : 15 Marks
2. Report : 05 Marks
3. Demonstration / Presentation (Internal Presentation is evaluated by HOD, senior faculty and internal guide) : 10 Marks

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30 Marks

**End Examination** : 70 Marks.



**SYLLABUS FOR B. TECH. III YEAR II SEM**  
**COMPUTER SCIENCE AND ENGINEERING (AI & ML)**  
**CRYPTOGRAPHY AND NETWORK SECURITY**  
**(PROFESSIONAL ELECTIVE –II)**

**L T P C**  
**3 0 0 3**

**Code: 9EC09**

**Course Objectives:**

1. The students should learn all cryptographic algorithms, attacks on information passing through the network.
2. After completion of this course, they are in a position to implement several authentication and encryption algorithm. They understand the security protocols in different layers.

**Course Outcomes:** At the end of this course, the students will be able to

1. Understand the most common type of security attacks.
2. Understand the Encryption Principles, public key cryptography and algorithms.
3. Understand security protocols for protecting data on networks.
4. Be able to digitally sign emails and files.
5. Understand vulnerability assessments and the weakness of using passwords for authentication

**UNIT - I**

Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Internetwork security, Internet Standards and RFCs.

**UNIT - II**

Conventional Encryption Principles, Conventional encryption algorithms: DES, TDES, AES, cipher block modes of operation, location of encryption devices, key distribution, Approaches of Message Authentication, Secure Hash Functions: SHA1 and HMAC.

Public key cryptography principles, public key cryptography algorithms: RSA, DIFFIE HELL MAN, digital signatures, digital Certificates, Certificate Authority and key management

Kerberos, X.509 Directory Authentication Service.

**UNIT - III**

Email privacy: Pretty Good Privacy (PGP) and S/MIME.

**UNIT - IV**

IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

**UNIT – V**

Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET).

Intruders, Viruses and related threats.

**UNIT - VI**

Firewall Design principles, Trusted Systems. Intrusion Detection Systems.

**TEXT BOOKS:**

1. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.
2. Hack Proofing your network by Ryan Russell, Dan Kaminsky, Rain Forest Puppy, Joe Grand, David Ahmad, Hal Flynn IdoDubrawsky, Steve W.Manzuik and Ryan Permech, Wiley Dreamtech.

**REFERENCES:**

1. Fundamentals of Network Security by Eric Maiwald, Dreamtech Press.
2. Network Security - Private Communication in a Public World by Charlie Kaufman, Radia Perlman and Mike Speciner, Pearson/PHI.
3. Cryptography and network Security, Third edition, Stallings, PHI/Pearson.

**SYLLABUS FOR B. TECH. III YEAR II SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
SOFTWARE PROJECT MANAGEMENT  
(PROFESSIONAL ELECTIVE –II)**

**Code: 9FC13**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Prerequisites:** Software Engineering Concepts.

**Course Objectives:**

Software Project Management course aims to give the students an understanding of the building blocks of software projects and induces the essence of project management. The spectrum of topics covered in this subject including software lifecycle, software economics, artifacts, processes, workflows, architecture, planning etc help strengthen the fundamentals of the student enabling them to have a deeper understanding of software project management.

**Course Outcomes:**

At the end of this course the student will be able to

1. Explain primitives of Project Planning and evolution of software economics.
2. Describe software economics; reduce Software product size, improvement in software processes, improving team effectiveness, improving automation, Achieving quality.
3. Explain Life cycle phases and Artifacts of the process.
4. Describe Model based software architectures and Work Flows.
5. Apply Checkpoints for a process such as Major mile stones, Minor Milestones and apply work breakdown structures for a iterative process within cost and schedule. Describe Project Organizations and Responsibilities.
6. Describe Automation and Project Control and Process instrumentation and explain Future Software Project Management such as Modern Project Profiles and Next generation project management.

**UNIT-I**

**Concept of Management:** Management Definition, Role and Responsibilities of Management, Management in Software Industry

**Types of Software Organizations:** Start-up companies, Independent Software Companies, Multi-National Software Companies.

**Conventional Software Management:** The waterfall model, conventional software Management performance.

**Evolution of Software Economics:** Software Economics, pragmatic software cost estimation.

**UNIT-II**

**Improving Software Economics:** Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

**The old way and the new way:** The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

**UNI-III**

**Life cycle phases:** Engineering and production stages, inception, Elaboration, construction, transition phases.

**Artifacts of the process:** The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

#### **UNIT-IV**

**Model based software architectures:** A Management perspective and technical perspective.

**Work Flows of the process:** Software process workflows, Iteration workflows.

#### **UNIT-V**

**Checkpoints of the process:** Major mile stones, Minor Milestones, Periodic status assessments. **Iterative Process Planning:** Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning. **Project Organizations and Responsibilities:** Line-of-Business Organizations, Project Organizations, evolution of Organizations.

#### **UNIT-VI**

**Process Automation:** Automation Building blocks, The Project Environment.

**Project Control and Process instrumentation:** The seven core Metrics, Management indicators, quality indicators, life cycle expectations,

**Future Software Project Management:** Modern Project Profiles, Next generation Software economics, modern process transitions.

**Case study:** The command center processing and display system – Replacement (CCPDS-R)

#### **TEXTBOOKS:**

1. Software Project Management, Walker Royce: Pearson Education, 2005.

#### **REFERENCES:**

1. Management Concepts and Practices, Tim Hannagan, FT Prentice Hall, 5th Edition
2. Software Project Management, Bob Hughes and Mike Cotterell: Tata McGraw-Hill Edition.
3. Software Project Management, Joel Henry, Pearson Education.
4. Software Project Management in practice, Pankaj Jalote, Pearson Education.2005.

**SYLLABUS FOR B. TECH. III YEAR II SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
INFORMATION RETRIEVAL SYSTEMS  
(PROFESSIONAL ELECTIVE –II)**

**Code: 9FC08**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Objectives**

1. To learn the important concepts and algorithms in IRS
2. To understand the data / file structures that are necessary to design, and implement information retrieval (IR) systems.

**Course Outcomes :**

1. Ability to apply IR principles to locate relevant information large collections of data
2. Ability to design different document clustering algorithms
3. Implement retrieval systems for web search tasks.
4. Design an Information Retrieval System for web search tasks.

**UNIT - I**

**Introduction to Information Retrieval Systems:** Definition of Information Retrieval System, Objectives of Information Retrieval Systems, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses.

**UNIT - II**

**Information Retrieval System Capabilities:** Search Capabilities, Browse Capabilities, Miscellaneous.

**Capabilities Cataloguing and Indexing:** History and Objectives of Indexing, Indexing Process, Automatic Indexing, Information Extraction.

**UNIT - III**

**Data Structure:** Introduction to Data Structure, Stemming Algorithms, Inverted File Structure, N-Gram Data Structures, PAT Data Structure, Signature File Structure, Hypertext and XML Data Structures, Hidden Markov Models.

**UNIT - IV**

**Automatic Indexing:** Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages.

**Document and Term Clustering:** Introduction to Clustering, Thesaurus Generation, Item Clustering, Hierarchy of Clusters.

**UNIT - V**

**User Search Techniques:** Search Statements and Binding, Similarity Measures and Ranking, Relevance Feedback, Selective Dissemination of Information Search, Weighted Searches of Boolean Systems, Searching the INTERNET and Hypertext.

**Information Visualization:** Introduction to Information Visualization, Cognition and Perception, Information Visualization Technologies.

**UNIT - VI**

**Text Search Algorithms:** Introduction to Text Search Techniques, Software Text Search Algorithms, Hardware Text Search Systems

**Multimedia Information Retrieval:** Spoken Language Audio Retrieval, Non-Speech Audio Retrieval, Graph Retrieval, Imagery Retrieval, Video Retrieval.

**TEXT BOOKS :**

1. Information Storage and Retrieval Systems–Theory and Implementation, Second Edition, Gerald J.Kowalski, MarkT.Maybury, Springer.

**REFERENCES :**

1. Frakes, W.B. ,RicardoBaeza- Yates: Information Retrieval Data Structures and Algorithms ,PrenticeHall,1992.
2. Information Storage& Retrieval By Robert Korfhage–John Wiley&Sons.
3. Modern Information Retrieval By Yates and Neto Pearson Education.

**SYLLABUS FOR B. TECH. III YEAR II SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
INTRODUCTION TO INTERNET OF THINGS  
(PROFESSIONAL ELECTIVE –II)**

**Code: 9IC45**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Prerequisite:** Data Communications and Networks

**Course Objectives:**

1. To understand the fundamentals of internet of things.
2. To understand Raspberry PI platform.

**Course Outcomes:**

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

1. Getting familiar with terminology, technology and applications of IOT
2. Understand and explain IoT system management using M2M (machine to machine) with necessary protocols
3. Design and develop Python Scripting Language programs preferred for many IoT applications
4. Use Raspberry PI as a hardware platform for designing the IoT sensor interfacing
5. Implement web based services for IoT
6. Understand and analyze the case studies illustrating IoT Design

**UNIT-I:**

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 like Wireless Sensor Networks, Cloud Computing, Big data analytics, and Communication protocols, Embedded Systems, IoT Levels and Templates.

**UNIT-II:**

IoT and M2M Software defined networks, network function virtualization, difference between SDN and NFV for IoT; Basics of IoT System Management with NETCOZF-YANG (Block Diagrams).

**UNIT-III:**

Developing IoT, IoT Design Methodology – The 10 steps design methodology; Logical design using Python: Introduction to Python - Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, date/time operations, Python packages of interest for IoT.

**UNIT-IV:**

IoT Physical Devices and End points Raspberry PI – Introduction to Raspberry PI and its Interfaces (serial, SPI, I2C) Programming – Python programming with Raspberry PI – Controlling Input / output (Interfacing with LED and LDR).

**UNIT-V:**

IoT Physical Servers and Cloud Offerings Cloud concepts (IaaS, PaaS, SaaS), Introduction to Cloud Storage models and communication APIs – WAMP, Xively; Python web application framework with Django, Designing a RESTful web API.

**UNIT-VI:**

Case Studies Illustrating IoT Design Home Automation – Smart Lighting, Home intrusion detection, Cities – Smart parking, Environment – Weather monitoring system, Weather reporting bot, Air pollution monitoring, Forest fire detection, Agriculture – Smart irrigation, Productivity applications – IoT printer.

**TEXT BOOKS:**

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547.
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759.

**REFERENCES:**

1. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015
3. Editors Ovidiu Vermesan
2. Peter Friess, 'Internet of Things – From Research and Innovation to Market Deployment', River Publishers, 2014
3. N. Ida, Sensors, Actuators and Their Interfaces, SciTech Publishers, 2014.



**SYLLABUS FOR B. TECH. III YEAR II SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
BLOCKCHAIN TECHNOLOGIES  
(PROFESSIONAL ELECTIVE – III)**

**Code: 9JC05**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Prerequisite:** Information Security

**Course Objectives:**

To understand how block chain systems (mainly Bitcoin and Ethereum) work, to securely interact with them, Design, build, and deploy smart contracts and distributed applications, Integrate ideas from block chain technology into their own projects.

**Course Outcomes:**

At the end of this course the student will be able to

1. Understand the principles of HDFS and digital signature.
2. Explore the block chain Technology, Simplified Payment Verification protocol and its life cycle.
3. Analyze the Nakamoto consensus and differentiate proof-of-work and proof-of-stake consensus algorithms.
4. Understand the working of crypto currency, Bitcoin and Ethereum.
5. Explore Applications on legal issues of block chain.
6. Explore new trends in block chain technologies.

**UNIT-I**

**Basics:** Distributed Database, Two General Problem, Byzantine General problem and Fault Tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete. **Cryptography:** Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof.

**UNIT-II**

**Blockchain:** Introduction, Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Blockchain application, Soft & Hard Fork, Private and Public blockchain.

**UNIT-III**

Distributed Consensus: Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy utilization and alternate.

**UNIT-IV**

Cryptocurrency: History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin

**UNIT-V**

Cryptocurrency Regulation: Stakeholders, Roots of Bitcoin, Legal Aspects-Crypto currency Exchange, Black Market and Global Economy. Applications: Internet of Things, Medical Record Management System, Domain Name Service and future of Blockchain.

**UNIT-VI**

(Trends and Topics) - Zero Knowledge proofs and protocols in Blockchain - Succinct non interactive argument for Knowledge (SNARK) - pairing on Elliptic curves - Zcash.

**TEXT BOOKS:**

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).

**REFERENCES:**

1. Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies
2. Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System
3. DR. Gavin Wood, "ETHEREUM: A Secure Decentralized Transaction Ledger,"Yellow paper.2014.
4. Nicola Atzei, Massimo Bartoletti, and TizianaCimoli, A survey of attacks on Ethereum smart contracts

**SYLLABUS FOR B. TECH. III YEAR II SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
UNIFIED MODELING LANGUAGE  
(PROFESSIONAL ELECTIVE –III)**

**Code: 9LC16**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Objectives:**

1. To become familiar with all phases of object oriented analysis and design, master the main features of the UML.
2. Ability to analyze and solve challenging problems in various domains.
3. Learn the Object Design Principles and understand how to apply them towards implementation.

**Course Outcomes:**

1. Understand various stages and phases of software projects.
2. Select the basic elements of modeling such as Things, Relationships and Diagrams depending on the views of UML Architecture and SDLC.
3. Design class and object diagrams that represent static aspects of a software system.
4. Design component and deployment diagrams for software systems.
5. Design activity and state chart diagrams for software systems.

**UNIT - I**

**Introduction to UML:** Importance of Modeling, Principles of Modeling, Conceptual model of the UML, Architecture, Software Development Life Cycle.

**Basic Structural Modeling:** Classes, Relationships, Common Mechanisms and Diagrams.

**UNIT - II**

**Basic Structural Modeling:** Class Diagrams, Common Modeling Techniques for Class Diagrams. Forward and Reverse Engineering.

**Advanced Structural Modeling:** Advanced classes, Advanced Relationships, Interfaces, Types and Roles, Packages.

**UNIT - III**

**Object Diagrams:** Terms, concepts, Common Modeling techniques for Object Diagrams.

**Basic Behavioral Modeling:** Use cases, Use case Diagrams.

**UNIT - IV**

**Basic Behavioral Modeling:** Interactions, Interaction diagrams, Activity Diagrams.

**UNIT – V**

**Advanced Behavioral Modeling:** Events and Signals, State Machines, Processes and Threads, Time and Space, State Chart Diagrams.

**UNIT - VI**

**Architectural Modeling:** Components, Deployment, Component Diagrams and Deployment Diagrams.

**CASE STUDY:** Unified Library Application-Structural and Behavioral Modeling.

**TEXT BOOKS:**

1. Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modeling Language User Guide, Pearson Education.
2. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: UML 2 Toolkit, WILEY Dreamtech India Pvt. Ltd.
3. Ivar Jacobson, Grady Booch, James Rumbaugh: The Unified Software Development Process, Pearson Edition.

**REFERENCES:**

1. Meilir Page-Jones: Fundamentals of Object-Oriented Design in UML, Pearson Education.
2. Pascal Roques: Modeling Software Systems Using UML2, WILEY Dreamtech India Pvt. Ltd.
3. AtulKahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.
4. Mark Priestley: Practical Object-Oriented Design with UML, TATA McGraw Hill.

**SYLLABUS FOR B. TECH. III YEAR II SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
AUGMENTED REALITY AND VIRTUAL REALITY  
(PROFESSIONAL ELECTIVE –III)**

**Code: 9LC08**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Pre-Requisites:** Data Structures

**Course Objectives:**

This course provides students with an opportunity to explore the research issues in Augmented Reality and Virtual Reality (AR &VR). It also makes the students know the basic concepts and framework of virtual reality.

**Course Outcomes:** After completion of course, students will be able to

1. Understand the fundamentals of Virtual Reality.
2. Analyze multiple Models of Input and Output Interface in Virtual Reality like Gloves, Video-based Input, 3D Menus & 3DScanner etc.
3. Illustrate the fundamentals or advanced topics of Computer Graphics.
4. Analyze the Interactive Techniques on VR in respect of Body Track, Hand Gesture, 3D Manus, and Object Grasp.
5. Understand the development tools of VR.
6. Explore the Conceptual idea on Augmented Reality and relate the illustrations.

**UNIT-I**

Introduction of Virtual Reality: Fundamental Concept and Components of Virtual Reality. Primary Features and Present Development on Virtual Reality.

**UNIT-II**

Multiple Models of Input and Output Interface in Virtual Reality: Input -- Tracker, Sensor, Digital Glove, Movement Capture, Video-based Input, 3D Menus & 3DScanner etc. Output-- Visual /Auditory Haptic Devices.

**UNIT-III**

Visual Computation in Virtual Reality: Fundamentals of Computer Graphics. Software and Hardware Technology on Stereoscopic Display. Advanced Techniques in CG: Management of Large Scale Environments & Real Time Rendering.

**UNIT -IV**

Interactive Techniques in Virtual Reality: Body Track, Hand Gesture, 3D Manus, And Object Grasp.

**UNIT-V**

Development Tools and Frameworks in Virtual Reality: Frameworks of Software Development Tools in VR. X3D Standard; Vega, MultiGen, Virtools etc. Application of VR in Digital Entertainment: VR Technology in Film & TV Production. VR Technology in Physical Exercises and Games. Demonstration of Digital Entertainment by VR.

**UNIT-VI**

Augmented and Mixed Reality, Taxonomy, technology and features of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality, wireless displays in educational augmented reality applications, mobile projection interfaces, marker-less tracking for augmented reality, enhancing interactivity in AR environments, evaluating AR systems.

**TEXTBOOKS:**

- 1) Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition. Wiley-IEEE Press, 2003/2006.
- 2) Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.

**REFERENCES:**

- 1) Alan Craig, William Sherman and Jeffrey Will, Developing Virtual Reality Applications, Foundations of Effective Design, Morgan Kaufmann, 2009.

**SYLLABUS FOR B. TECH. III YEAR II SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
IMAGE PROCESSING  
(PROFESSIONAL ELECTIVE –III)**

**Code: 9FC09**

**L T P C  
3 0 0 3**

**Course Objectives:**

Make decisions from image data, online inspection and face recognition.

**Course Outcomes:**

At the end of this course the student will be able to

1. Analyze general terminology of image processing.
2. Examine various types of images, intensity transformations and spatial filtering.
3. Develop Fourier transform for image processing in frequency domain.
4. Evaluate the methodologies for image segmentation, restoration etc.
5. Implement image process and analysis algorithms.
6. Apply image processing algorithms in practical applications.

**UNIT – I**

**Introduction:** Examples of fields that use digital image processing, fundamental steps in digital image processing, components of image processing system. Digital Image Fundamentals: A simple image formation model, image sampling and quantization, basic relationships between pixels.

**UNIT – II**

**Image Enhancement** in the spatial domain: Basic gray-level transformation, histogram processing, enhancement using arithmetic and logic operators, basic spatial filtering, smoothing and sharpening spatial filters, combining the spatial enhancement methods

**UNIT – III**

**Image Restoration:** A model of the image degradation/restoration process, noise models, restoration in the presence of noise—only spatial filtering, Weiner filtering, constrained least squares filtering, geometric transforms; Introduction to the Fourier transform and the frequency domain, estimating the degradation function

**UNIT– IV**

**Color Image Processing:** Color fundamentals, color models, pseudo color image processing, basics of full–color image processing, color transforms, smoothing and sharpening, color segmentation.

**UNIT – V**

**Image Compression and Morphology:** Fundamentals, image compression models, error-free compression, lossy predictive coding, image compression standards, Morphological Image Processing: Preliminaries, dilation, erosion, open and closing, hit or miss transformation

**UNIT – VI**

**Image Segmentation and Recognition:** Detection of discontinuous, edge linking and boundary detection, thresholding, region-based segmentation, Patterns and patterns classes, recognition based on decision-theoretic methods, matching, optimum statistical classifiers

**TEXT BOOKS:**

1. Digital Image Processing, Rafeal C.Gonzalez, Richard E.Woods, Third Edition, Pearson Education/PHI.

**REFERENCES:**

1. Image Processing, Analysis, and Machine Vision, Milan Sonka, Vaclav Hlavac and Roger Boyle, Second Edition, Thomson Learning.
2. Introduction to Digital Image Processing with Matlab, Alasdair McAndrew, Thomson Course Technology
3. Computer Vision and Image Processing, Adrian Low, Second Edition, B.S.Publications
4. Digital Image Processing, William K. Prat, Wily Third Edition
5. Digital Image Processing and Analysis, B. Chanda, D. Datta Majumder, Prentice Hall of India, 2003.



**SYLLABUS FOR B. TECH. III YEAR II SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
MACHINE LEARNING**

**Code: 9LC03**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Prerequisite: Introduction to Data Science**

**Course Objectives:**

1. To introduce students to the basic concepts and techniques of Machine Learning.
2. To have a thorough understanding of the Supervised and Unsupervised learning techniques.
3. To study the various probability based learning techniques.
4. To understand graphical models of machine learning algorithms.

**Course Outcomes:**

At the end of this course, the student is able to

1. Understand the fundamental concepts of ML and Designing a Learning System.
2. Understand the basic concepts of linear models, tree and Probabilistic Models.
3. Understand various Dimensionality Reduction Techniques and Apply Various Evolutionary Algorithms with models.
4. Understand the Graphical models and Analytical Learning.

**UNIT-I**

**INTRODUCTION:** Learning– Types of Machine Learning – Supervised Learning – The Brain and the Neuron – Linear Discriminants: Definitions of Perceptron, Linear separability, Linear Regression.

Design a Learning System– Perspectives and Issues in Machine Learning – Concept Learning Task – Concept Learning as Search – Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination Algorithm.

**UNIT-II**

**LINEAR MODELS:**

Multi-layer Perceptron– Going Forwards – Going Backwards: Back Propagation Error – Multi-layer Perceptron in Practice – Examples of using the MLP – Overview – Deriving Back-Propagation – Radial Basis Functions and Splines – Concepts – RBF Network – Interpolations and Basis Functions – Support Vector Machines.

**UNIT-III**

**TREE AND PROBABILISTIC MODELS:**

Learning with Trees– Decision Trees – Constructing Decision Trees – Classification and Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to Combine Classifiers – Basic Statistics – Gaussian Mixture Models – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms.

**UNIT-IV**

**DIMENSIONALITY REDUCTION AND EVOLUTIONARY MODELS:**

Dimensionality Reduction– Linear Discriminant Analysis – Principal Component Analysis – Factor Analysis – Independent Component Analysis – Locally Linear Embedding – Isomap – Least Squares Optimization – Evolutionary Learning – Genetic algorithms – Genetic

Offspring: - Genetic Operators – Using Genetic Algorithms – Reinforcement Learning – Overview – Getting Lost Example.

#### **UNIT-V**

##### **GRAPHICAL MODELS:**

Markov Chain Monte Carlo Methods– Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden Markov Models – Tracking Methods.

#### **UNIT – VI**

##### **ANALYTICAL LEARNING**

Learning with perfect domain theory– Explanation based Learning – Inductive analytical approach to learning – KBANN algorithm.

##### **TEXT BOOKS:**

1. Stephen Marsland, —Machine Learning – An Algorithmic Perspective, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
2. Tom M Mitchell, —Machine Learning, First Edition, McGraw Hill Education, 2013.

##### **REFERENCES:**

1. Peter Flach, —Machine Learning: The Art and Science of Algorithms that Make Sense of Data, First Edition, Cambridge University Press, 2012.
2. Jason Bell, —Machine learning – Hands on for Developers and Technical Professionals, First Edition, Wiley, 2014.
3. Ethem Alpaydin, —Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press, 2014.

**SYLLABUS FOR B.TECH. III YEAR II SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
COMPILER DESIGN**

**Code: 9LC04**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>2</b>	<b>1</b>	<b>0</b>	<b>3</b>

**Course Objectives:**

1. Learn principles of Finite state machine, finite automation models, and transition diagrams.
2. Understand regular languages and expressions for writing grammars.
3. Understand context free grammars useful in designing compilers.
4. Study the design and working of a compiler.
5. Study the role of grammars in compiler design.
6. Learn the various parsing techniques for design of compilers.

**Course Outcomes:** At the end of this course the student will be able to

1. Design the finite automata different Languages
2. Construct finite Automata for a given regular expression, and derive strings with suitable examples. Conceptualize context free grammars and normal forms.
3. Design the push down automata and Turing Machine for complex languages.
4. Understand LEX tool and relate parsing techniques,
5. Demonstrate and solve problems on SLR, CLR, LALR, operator precedence parser, LR (O), LR(1), LR(K) grammar and use YACC tool.
6. Understand Semantic Analysis concepts to design compiler: and describe Intermediate code generation such as 3-address code form.

**UNIT-I**

Strings, Alphabet, Language, Operations, finite automaton model, acceptance of strings, and languages, deterministic finite automaton and non-deterministic finite automaton, Equivalence between NFA to DFA conversion.

**UNIT-II**

**Regular Languages,** Regular sets, regular expressions, Constructing finite Automata for a given regular expression, Conversion of Finite Automata to Regular expressions. Closure properties of regular sets (proofs not required).

**Context Free Grammars:** Context free grammar, derivation trees, Right most and leftmost derivation of strings, Ambiguity in context free grammars, Minimization of Context Free Grammars, Chomsky normal form, Greiback normal form.

**UNIT-III**

Push down automata: definition, model, acceptance of CFL, Introduction to DCFL and DPDA. **Turing Machine:** Turing Machine, definition, model, design of TM, recursively enumerable languages. Chomsky hierarchy of languages

**UNIT- IV**

Overview of compiler – Environment, pass, phase, phases of compiler, LEX tool.

Top Down Parsing: Top down parsing technique, Recursive decent parsing with back tracking, Ambiguous grammar, Elimination of left recursion, Left factoring, Predictive parsing, LL (1).

**UNIT-V**

Bottom up parsing: shift reduce parser SLR, CLR, LALR, operator precedence parser, LR (O), LR(1), LR(K) grammar, YACC tool.

**UNIT-VI**

Semantic Analysis: Syntax directed translation, S- Attributed, L Attributed definition, Type checker, Intermediate code generation: 3-address code form, DAG. Code optimization: Optimization, loop optimization, peep-hole optimization, Symbol table format.

**TEXTBOOKS:**

1. Introduction to Automata Theory Languages and Computation. Hopcroft H.E. and Ullman J. D. Pearson Education.
2. Introduction to Theory of Computation, Sipser 2nd edition Thomson.
3. Compilers Principles, Techniques and Tools Aho, Ullman, Ravisethi, Pearson Education.

**REFERENCES:**

1. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
2. Introduction to languages and the Theory of Computation ,John C Martin, TMH.
3. Elements of Theory of Computation?, Lewis H.P. & Papadimition C.H. Pearson /PHI.
4. Theory of Computer Science Automata languages and computation -Mishra and Chandrashekar, 2nd edition, PHI Course Requirements.
5. Modern Compiler Construction in C , Andrew W.Appel Cambridge University Press.
6. Compiler Construction, LOUDEN, Thomson.

**SYLLABUS FOR B.TECH. III YEAR II SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
INTELLECTUAL PROPERTY RIGHTS**

L	T	P	C
2	0	0	-

**Code: 9IC04**

**Course Objective:**

This course is intended to impart awareness on intellectual property rights and various regulatory issues related to IPR

**Course Outcomes:**

At the end of this course the student will be able to

1. Demonstrate a breadth of knowledge in Intellectual property
2. Overview of Patents, Searching, filling and drafting of Patents
3. Overview of copyright & GI .
4. Overview of Trade Mark & Trade Secret,
5. Overview of Integrated Circuit and Industrial Design.
6. Knowledge about different national and international: Conventions and Treaties, Governing the IPRs.

**UNIT I:**

**Introduction to IPR:** Discovery, Invention, Creativity, Innovation, History & Significance of IPR, Overview of IPR -Patent, Copyright, Trade Mark, Trade Secret , GI, Industrial Design & Integrated Circuit, Non-patentable criteria

**UNIT II:**

**Patents:** Patents- Patentability Criteria, Types of Patents-Process, Product & Utility Models, Software Patenting and protection, Patent infringement- Case studies- Apple Vs Samsung, Enfish LLC Vs Microsoft, Overview of Patent search-Types of Searching, Public & Private Searching Databases, Basics of Patent Filing & Drafting, Indian Patents Law

**UNIT III:**

**Copyrights and Geographical Indications:** Types of Copyrights, Procedure for filing, copyright infringement, Copyright Law, Geographical Indications – TirupatiL addu, Darjeeling Tea, Basmati rice

**UNIT IV:**

**Trademark and Trade secrets:** Trade Marks –Commercial importance, protection, registration, Case Studies- Sabena and Subena, Castrol Vs Pentagon, Trade Secrets- Case Studies-Kentucky Fried Chicken (KFC), Coca-Cola

**UNIT V:**

**Protection of Industrial Designs & Integrated Circuits:** Industrial Designs – Scope, protection, filing, infringement; Integrated Circuits & Layout design, Semiconductors, Unfair competition, Designs Act.

**UNIT VI:**

**International Conventions & Treaties:** Overview of WTO, GATT, TRIPS, WIPO, Berne Convention, Rome convention, Paris Convention, Patent Cooperation Treaty (PCT), Madrid Protocol, Budapest Treaty, Hague agreement .

**TEXT BOOKS:**

1. Deborah E. Bouchoux, Intellectual Property for Paralegals – The law of Trademarks, Copyrights, Patents & Trade secrets, 3<sup>rd</sup> Edition, Cengage learning, 2012
2. N.S. Gopalakrishnan& T.G. Agitha, Principles of Intellectual Property, Eastern Book Company, Lucknow, 2009.

**REFERENCES:**

1. M. M. S. Karki , Intellectual Property Rights: Basic Concepts, Atlantic Publishers, 2009
2. Neeraj Pandey & Khushdeep Dharni, Intellectual Property Rights, Phi Learning Pvt. Ltd
3. Ajit Parulekar and Sarita D' Souza, Indian Patents Law – Legal & Business Implications; Macmillan India ltd, 2006.
4. B. L. Wadehra. Law Relating to Patents, Trade Marks, Copyright, Designs & Geographical Indications; Universal law Publishing Pvt. Ltd., India 2000.
5. P. Narayanan; Law of Copyright and Industrial Designs; Eastern law House, Delhi, 2010.

**SYLLABUS FOR B. TECH. III YEAR II SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
WEB TECHNOLOGIES**

**Code: 9FC06**

L	T	P	C
2	1	0	3

**Prerequisite:**

1. Data Communications and Computer Networks Concepts.
2. Object Oriented Programming through Java.

**Course Objectives:**

1. To understand the basics of Web Designing using HTML and CSS
2. Perform the client-side scripting with JavaScript.
3. Understand the different data stores XML, and JSON with full-stack web application development using Angular and study with Server-side programming using Java Servlets and PHP.

**Course Outcomes:**

At the end of this course the student will be able to

1. Demonstrate the use of HTML tags. Apply Styles using CSS and Bootstrap.
2. Develop scripts using XML and validate using parsers.
3. Appraise the Expressions, Filters, Directives, Controller, and Modules of Angular.
4. Design responsive web applications.
5. Comprehend the uses of Web servers and design the server-side scripts using Servlets.
6. Design and develop server-side scripts and components using PHP.

**UNIT-I**

**Client-Side Web Development.**

HTML 4 - List, Tables, Images, Forms, Div. (with all attributes and sub-elements)

Cascading Style sheets 3 - Selectors (Basic, Combinatory, Attribute, Pseudo-class, Pseudo Element) using properties (font, background),

Bootstrap basics

**JavaScript** - Introduction, variables, objects (Boolean, Number, String, Date, Math, Regular expression, Array), Function, Event handlers (mouse, keyboard, window), Using CSS with JavaScript. Introduction to **Typescript**.

**UNIT-II**

**Data Store**

XML: DTD, XML Schemas, Using XML Processors: DOM Parser and SAX Parser. (Text Book 1)

**JSON:** Introduction, JSON vs XML, Data Types, Parsing JSON, stringify(), Objects, Array, JSON HTML, JSONP

**UNIT-III**

**Application Development Using Angular: (Part –I)**

Basics: MVC-The Angular way, Features of Angular, Model-View-Controller, My First Angular app.

Expressions: Angular Expressions, Angular vs JavaScript.

**Filters:** Built-In Filters, Using Angular Filters, Creating Custom Filters.

**Directives:** Introduction to Directives, Directive Lifecycle, Binding controls to data, Matching directives, Using Angular built-in directives, creating a custom directive.

**Controllers:** Role of a Controller, Controllers & Modules, Attaching Properties and functions to scope, Nested Controllers, Using Filters in Controllers, Controllers in External Files.

**Modules:** Introduction to Angular Modules, Bootstrapping Angular.

#### **UNIT-IV**

##### **Application Development Using Angular: (Part- II)**

**Forms:** Working with Angular Forms, Model Binding, Forms Events, Updating Models with a Twist, Form Controller, Validating Angular Forms, \$error object.

**Scope:** Scope Lifecycle, Scope Inheritance, Scope & Controllers, Root scope, Scope Broadcasting, Two-way data binding, Scope Inheritance, Scope & Directives, \$apply and \$watch, Scope Events.

**Dependency Injection & Services:** Dependency Injection, Creating Services, Factory, Service & Provider, Using Dependency Injection, Using Angular built-in services.

**Single Page Application (SPA):** SPA and its Pros and Cons, Passing Parameters, Changing location, installing the Route module, Configure routes, Resolving promises, Creating Single Page Apps.

#### **UNIT-V**

##### **Web Hosting**

Introduction to Servlets, Lifecycle of a Servlet, Servlet API: javax.servlet package, javax.servlet.http package, Reading Servlet Context Parameters, Reading Initialization parameters, Request Dispatcher Handling HTTP Requests & Responses, Session Tracking.

#### **UNIT-VI**

##### **Server Scripting Language: PHP**

Declaring variables, data types, array, string, operators, Expression, control statement, function, Reading data from form controls like text boxes, radio buttons, lists, etc.

Handling file upload, connecting to the database with CRUD operation (Mysql as reference), Handling sessions and cookies. File handling in PHP.

#### **TEXTBOOKS:**

1. Web Programming: Building Internet Applications, 3rd Edition, Chris Bates, Wiley Publications.
2. Angular - The Complete Guide [2021 Edition], Maximilian Schwarzmuller, Packt Publishing.
3. Head First Servlets and JSP, 2nd Edition by Kathy Sierra, Bryan Basham, Bert Bates, O'Reilly Media, Inc.

#### **REFERENCES:**

1. Programming the World Wide Web, Robert W. Sebesta.
2. Building Web Applications with TypeScript, Angular and React, Sahil Malik, Ivo Gabe de Wolff, Gabriel Isenberg, Packt Publishing.



**SYLLABUS FOR B. TECH. III YEAR II SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
MACHINE LEARNING LAB AND COMPILER DESIGN LAB**

**Code: 9LC65**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**Course Objectives:**

1. To experiment various machine learning algorithms.
2. To experiment on the basic techniques of compiler construction and tools that can be used to perform syntax-directed translation of a high-level programming language into an executable code.

**Course Outcomes:**

1. Apply common Machine Learning algorithms in practice and implementing their own.
2. Perform experiments in Machine Learning using real-world data.
3. Implementation of DFA for a given Languages/ Regular Expression.

**LIST OF EXPERIMENTS (MACHINE LEARNING):**

1. The probability that it is Friday and that a student is absent is 3 %. Since there are 5 schooldays in a week, the probability that it is Friday is 20 %. What is the probability that a student is absent given that today is Friday? Apply Baye’s rule in python to get the result.(Ans:15%)
2. Extract the data from database using python
3. Implement k-nearest neighbours classification using python
4. Giventhefollowingdata,whichspecifyclassificationsfor nine combinations of VAR1 and VAR2 predict a classification for a case where VAR1=0.906 and VAR2=0.606, using the result of k-means clustering with 3means(i.e.,3 centroids)

VAR1	VAR2	CLAS
1		S
1.713	1.586	0
0.180	1.786	1
0.353	1.240	1
0.940	1.566	0
1.486	0.759	1
1.266	1.106	0
1.540	0.419	1
0.459	1.799	1
0.773	0.186	1

5. Implement linear regression using python.
6. Implement Naïve Bayes theorem to classify the English text.
7. Implement an algorithm to demonstrate the significance of genetic algorithm.
8. Implement the finite words classification system using Back-propagation algorithm.

**LIST OF EXPERIMENTS (COMPILER DESIGN):**

- 1) Implement DFA accepting the language containing even binary numbers.
- 2) Implement DFA that accept all the strings of a's and b's 3<sup>rd</sup> symbol from is RHS always a
- 3) Implement DFA accepting the language of strings not ending with 00 over the input (0,1)
- 4) Implement the DFA that accepts all the string of a's and b's where number of a 's is divisible by 3 and number of b's is divisible by2.
- 5) Write lex program to implement lexical analyzer functionality.
- 6) Write a lex program to count the number of words and number of lines in a given file or program.
- 7) Write a 'C' program to implement lexical analyzer using c program.
- 8) write recursive descent parser for the grammar  $E \rightarrow E+T$   $E \rightarrow T$   $T \rightarrow T * F$   $T \rightarrow F$   
 $F \rightarrow (E)/id$ .
- 9) write recursive descent parser for the grammar  $S \rightarrow (L)$   $S \rightarrow a$   $L \rightarrow L,S$   $L \rightarrow S$
- 10) Write a C program to calculate first function for the grammar  
 $E \rightarrow E+T$   $E \rightarrow T$   $T \rightarrow T * F$   $T \rightarrow F$   $F \rightarrow (E)/id$
- 11) Write a YACC program to implement top down parser for the given grammar.

Write a YACC program to evaluate algebraic expression.

**TEXTBOOKS:**

1. Stephen Marsland, —Machine Learning – An Algorithmic Perspective, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
2. Introduction to Theory of Computation, Sipser 2nd edition Thomson.

**REFERENCES:**

1. Tom M Mitchell, —Machine Learning, First Edition, McGraw Hill Education, 2013.
2. Peter Flach, —Machine Learning: The Art and Science of Algorithms that Make Sense of Data, First Edition, Cambridge University Press, 2012.
3. Jason Bell, —Machine learning – Hands on for Developers and Technical Professionalsl, First Edition, Wiley, 2014.
4. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
5. Introduction to languages and the Theory of Computation ,John C Martin, TMH.

**SYLLABUS FOR B. TECH. III YEAR II SEMESTER  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
WEB TECHNOLOGIES LAB**

**Code: 9FC66**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**Prerequisite:** Object Oriented Programming through Java Lab

**Course Objectives:**

1. To implement programs using HTML tags, Java scripts along with Event Handling.
2. To implement scripts using XML, DOM parser, and SAX parser for project development.
3. To implement the MVC architecture applications.

**Course Outcomes:**

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

1. Demonstrate the use of HTML tags and be able to design web pages. Develop dynamic programs involving Java scripts, popup windows in JavaScript along Event Handling.
2. Develop scripts using XML and XSLT and read XML documents using parsers, DOM parser, and SAX parser. Develop JSON files and access them via HTML pages.
3. Implement Angular with Expressions, Filters, Directives, Controller, and Modules.
4. Develop a Single Page Application with implementation of Scope and Form.
5. Implement Java servlets using Apache Tomcat Server for User authentications
6. Develop an application in PHP with Database connectivity.

**LIST OF EXPERIMENTS**

**Week-1:**

1. Create a web page with advanced layouts and positioning with CSS and HTML.
2. Design a website with different methods of embedding CSS in a web page.
3. Create a static web page which displays your personal details. (Hint: CSS3 and HTML5)
4. Create a web page through which the user can enter his / her details to become an authenticated user of that page.

**Week-2:**

1. Create a web page that shows different methods of embedding JavaScript with validation.
2. Create a web page with rollover menus. Rollover menus should be created using JavaScript.
3. Create a simple calculator, which can perform the basic arithmetic operations.

**Week-3:**

1. Write an XML file which will display the Book information which includes the following:
  - 1) Title of the book
  - 2) Author Name
  - 3) ISBN number

- 4) Publisher name                      5) Edition                      6) Price
2. Write a Document Type Definition (DTD) or XML Schema Definition (XSD) to validate the above XML file.

**Week-4:**

1. Prepare a JSON file with Student information and display the content in HTML Table format.

**Week-5:**

1. Prepare a program that displays the name that we feed in the ng-init directive.
2. AngularJS expression can contain arithmetic operators which will produce the result based on the type of operands
3. Program for AngularJS expression can contain variables declared via ng-init directive.
4. Return the names that contain the letter "i".
5. Type a letter in the input field, and the list will shrink/grow depending on the match.
6. By using ng-click directive on the table headers, we can run a function that changes the sorting order of the array.
7. Creating a custom myFormat filter will format every other character to uppercase.

**Week-6:**

1. Program to implement any 5 directives from ng-app, ng-init, ng-model, ng-controller, ng-bind, ng-repeat, ng-show, ng-readonly, ng-disabled, ng-if, ng-click.
2. Demonstrates by attaching properties to the \$scope object inside a controller and then displaying property value in HTML.
3. Program to handle click events of a button.
4. Program to implement complex and nested controllers
5. Create a module using controllers

**Week-7:**

6. Prepare a angular Student information form
7. Prepare a program to implement Scope & Directives, \$apply and \$watch

**Week-8:**

1. Write a program for Single Page Application (SPA) using angular.

**Week-9:**

1. Install APACHE TOMCAT web server and while installation, assign port number 8181. Make sure that this port is available i.e., no other process is using this port.
2. Write a servlet program to print welcome messages on the browser.
3. Develop a web application to pass the parameters from the HTML page and display them using servlet.

**Week-10:**

1. Develop a web application using servlet to perform Session Tracking with hidden form fields, cookies and url-rewriting and http sessions. (Files to developed- Html, Java, Web.xml)

2. Write a servlet using the RequestDispatcher class and Develop a web application using servlet to perform the user Authentication:

A. Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and pwd4 respectively. Write a servlet for doing the following:

1. Create a Cookie and add these four user id's and passwords to this Cookie.
2. Read the user id and passwords entered in the Login form (week1) and authenticate with the values (user id and passwords) available in the cookies.

If he is a valid user(i.e., user-name and password match) you should welcome him by name(user-name) else you should display “ You are not an authenticated user “.

Use init-parameters to do this. Store the user-names and passwords in the webinf.xml and access them in the servlet by using the getInitParameters() method.

B. Authenticate the user when he submits the login form using the username and password from the database.

#### **Week-11:**

1. Write a PHP to test the database connection
2. Write a PHP to create a Table.

#### **Week-12:**

1. Write a PHP to insert values form HTML to database (registration Page)
2. Write a PHP to insert values to a Database.
3. Write a PHP to select values from a database table.
4. Write a PHP to update existing records of a database table.
5. Write a PHP to validate user login

#### **TEXTBOOKS:**

1. Web Programming: Building Internet Applications, 3rd Edition, Chris Bates, Wiley Publications.
2. Angular - The Complete Guide [2021 Edition], Maximilian Schwarzmuller, Packt Publishing.

#### **REFERENCES:**

1. Programming the World Wide Web, Robert W. Sebesta.
2. Building Web Applications with TypeScript, Angular and React, Sahil Malik, Ivo Gabe de Wolff, Gabriel Isenberg, Packt Publishing.

**SYLLABUS FOR B. TECH. III YEAR II SEM  
COMPUTER SCIENCE AND ENGINEERING (AI AND ML)  
COMPREHENSIVE VIVA VOCE**

**L T P C**  
**- - - 1**

**Code: 9L680**

**Prerequisite:** All core Courses till this Semester

**Course Objectives:**

Prepare students in basics and advanced relevant courses to revise and face technical interviews for enhancing employability.

**Course Outcomes:**

At the end of this course the student will be:

1. Assessed the knowledge of the students in the Core and Elective subjects that they have studied till the completion of that academic year.

Comprehensive Viva Voce will be conducted in third year second Semester for 100 marks. Out of 100 marks 30 marks are evaluated internally and 70 marks for external evaluation.

**Internal:**

Comprehensive Viva Voce is conducted twice in a Semester and evaluated for 30 marks each and average will be considered for internal.

Internal Examination : 30 Marks  
End Examination : 70 Marks.

External Evaluation of the project (viva-voce) shall be conducted by a committee appointed by the Chief Superintendent. The end examination will be carried out by a committee consisting of an external examiner, head of the department, and subject experts.

**SYLLABUS FOR B. TECH. IV YEAR I SEM**  
**COMPUTER SCIENCE AND ENGINEERING (AI & ML)**  
**PRINCIPLES OF OPERATIONS RESEARCH**  
**(OPEN ELECTIVE –II)**

**Code: 9BC52**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Prerequisite:** Linear Algebra and Calculus, Differential Calculus and Numerical Methods

**Course Objectives:**

The course aims at building capabilities in the students for analyzing different situations in the industrial/ business scenario involving limited resources and finding the optimal solution within constraints.

**Course Outcomes:**

1. Formulate and solve mathematical model (linear programming problem) for a physical situation like production, distribution of goods and economics.
2. Recognize and Solve the problem of transportation involving a large number of shipping routes with least transportation cost and generate optimal assignment strategy for different situations
3. Use Johnson's rule to create the optimal sequencing schedule for a sequencing problem and make decisions about replacing an item using replacement policy
4. Analyze the performance measures of Queing system and Calculate the EOQ for minimizing the total inventory cost
5. Apply simulation techniques for solving various types of problems and general idea development about Markov chains

**UNIT – I:**

**INTRODUCTION:** Definition, Characteristics and Phases and Types of models, applications.

**LINEAR PROGRAMMING PROBLEM-** Formulation – Graphical solution, Simplex method-Types of variables, Unique and Multiple optimal solution, Redundancy & Degeneracy in LPP, Unbounded solution, Artificial variables techniques - Big-M method with feasible and infeasible solutions, Two-phase method, Primal to Dual formation with Duality Principle.

**UNIT – II:**

**TRANSPORTATION PROBLEM** – Formulation – methods of finding initial solution (NW corner, VAM, Least cost Method) Optimal solution (Stepping stone Method, MODI method) Special cases in TP: unbalanced, Degeneracy, Restriction and maximization case.

**ASSIGNMENT PROBLEM** – Formulation – Optimal solution (Hungarian Method) - Variants of Assignment Problem-Unbalanced, Restriction, Maximization, Airlines layover case, Traveling Salesman problem.

**UNIT – III:**

**SEQUENCING** – Introduction – Terminology, Assumptions, Johnson's procedure-Processing n jobs through two machines – Processing n jobs through three machines – Processing two jobs through 'm' machines (Gantt Chart).

**REPLACEMENT:** Introduction – Types of failure, Replacement of items that deteriorate with time – when money value is not counted and counted – Replacement of items that fail completely, Group replacement.

**UNIT – IV:**

**THEORY OF GAMES:** Introduction and Terminologies, Criterion and optimal strategy – Solution of games with saddle points: Mixed Strategies-Rectangular games without saddle points, Dominance principle, Average Relational Dominance,  $m \times 2$  &  $2 \times n$  games - Graphical method and Sub Game Method, Matrix Method, Application of LPP in game theory.

**UNIT – V:**

**WAITING LINES:** Introduction, Terminology, Structure of a queue, calling population characteristics-size, behavior, pattern of arrivals, Kendall-Lee notation, Queuing Models: Single Channel: Poisson arrivals: exponential service times: with finite and infinite population, Multichannel: Poisson arrivals: exponential service times with infinite population  
**INVENTORY :** Introduction, Inventory costs, Concept of EOQ, Single item Deterministic models with and without shortages, Single item inventory models with one price break and multiple price breaks, Stochastic models – Instantaneous demand and no set up cost.

**UNIT – VI:**

**SIMULATION:** Definition – Types of simulation – phases of simulation– applications of simulation – Inventory and Queuing problems – Advantages and Disadvantages  
Markov chains: Introduction to Markov chains, Analysis Assumptions, Input output probabilities, Applications (Only basic understanding)

**TEXT BOOKS:**

1. Operations research / Hira & Gupta
2. Operation Research /J.K.Sharma/Macmillan Publishers.

**REFERENCES:**

1. Quantitative Techniques in Management: N D Vohra, TMH



**SYLLABUS FOR IV B.TECH. I SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
ADVANCED ENTREPRENEURSHIP  
(OPEN ELECTIVE –II)**

**Code: 9ZC23**

**L T P C  
3 0 0 3**

**Prerequisite:** Basics of Entrepreneurship

**Course Objectives :**

The course is designed to impart the necessary managerial skills and tactics required for an emerging Entrepreneur for the Engineering students to enhance their prospects as an Entrepreneur.

**Course Outcomes :**

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

1. Gain knowledge on the stages of Startup and the turbulence environment it undergoes and the stages related to growth of the Startup.
2. Exposed to the various business models and critically evaluating the effectiveness of the business models and products
3. Understand the method of business traction, create roles and build their A- team
4. Understand the various channels of revenue building and exploration of new revenue avenues.
5. Understand the need of sales planning and people plan and also financial modeling
6. Exposed to the legal implications affecting the company's prospects and identifying right mentors and advisors to support startups

**UNIT – I**

**Fundamentals of Entrepreneurship & Refining Business Model and Product:**

Fundamentals and key concepts of entrepreneurship, refining the business model, products and services, pivoting, types of business models, business model evolution, generating new business models, analyzing the business model, adding new customer segment, product manager, significance and role of product manager.

**UNIT – II**

**Business Planning & Exploring Revenue:** Business plan, sales plan, hiring sale team, people plan, financial planning, financial forecasting, create a procurement plan, negotiating role play, understanding primary revenue sources, exploring customer lifecycle for growth customers, exploring and identify secondary sources of revenue,

**UNIT- III**

**Funding the Growth & Building the A-Team:** Overview of funding, funding options for an entrepreneur, explore the right funding options, create funding plan, pitch deck, introduction to building A-Team, pitching to attract the talent, setting your team, defining roles, hiring the A-Team members.

**UNIT- IV**

**Brand and Channel Strategy & Leveraging Technologies:** Introduction to branding, drawn the venture's golden circle, positioning and positioning statements, creating brand

name, logo, social media handle, identify right channels, leaping ahead with technology, digital marketing for startups, plan a social media campaign, digital collaboration, store documents online, other technology platforms, make tech plan, platform wish list.

#### **UNIT –V**

**Measuring Progress and Legal Matters:** Metrics for customer acquisition (CAC, CLV, and ARPU), metrics for customer retention and satisfaction, find CAC, CLV and ARPU, key financial metrics, communicate metrics, new revenue stream through key financial metrics, re-forecasting of financial plan, identify professional help for legal and compliance requirements, searching of trademark and brand name and company name.

#### **UNIT –VI**

**Seeking Support and Final Project:** Mentors help to create successful startups, identify mentors and advisors, importance of mentors and advisors, scout the board of directors, overview on final project, capstone project presentation, contents of capstone project.

#### **TEXT BOOKS:**

1. Entrepreneurship Rajeev Roy, oxford,2012.
2. Entrepreneurship Development Khanka, S.Chand 2012.

#### **REFERENCES:**

1. Small Scale industries and Entrepreneurship Vasanth Desai “Himalya publishing 2012.
2. Robert Hisrich et al “enterpreneruship TMH 2012.
3. Entrepreneurship Development Khanka, ,S.Chand 2012.
4. Entrepreneurship Development B.Janikairam and M Rizwana.
5. E-resource: - [www.learnwise.org](http://www.learnwise.org) .

**SYLLABUS FOR IV B.TECH. I SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
PROJECT AND RISK MANAGEMENT  
(OPEN ELECTIVE –II)**

**Code: 9ZC19**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Prerequisite:** Basics of Entrepreneurship.

**Course Objectives:**

Make students understand the nature of Entrepreneurship, its importance and to create an awareness regarding the systematic planning and implementation of projects; highlight the components of structured finance and establish a framework of CMBS with respect to Servicing Agreements

**Course Outcomes:**

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

1. Students will understand the nature of Entrepreneurship and its importance.
2. Will gain knowledge regarding project, its life cycle and organization.
3. Will gain knowledge relating to project formulation.
4. Comprehend the components of structured finance
5. Establish a framework of CMBS
6. Students will gain knowledge relating to the CRE Servicing

**UNIT-I**

**CONCEPTS OF ENTREPRENEURSHIP:** Definition of Entrepreneurship, Evolution of Entrepreneurship, Classification of Entrepreneurs, Characteristics of Entrepreneur, Selection of Product and the means required for starting an enterprise, Financing and Financial incentives available, Success rate of entrepreneurs – a case study.

**UNIT-II**

**BASICS OF PROJECT MANAGEMENT:** Concept and characteristics of a project - types of projects - Objectives of project management - Project Organizational structure - Project life cycle - Challenges and problems of project management - Qualities & functions of a project manager.

**UNIT-III**

**PROJECT FORMULATION AND IMPLEMENTATION:** Generation of Project Ideas; Monitoring the environment; Preliminary Screening of Projects; Feasibility study; Project Selection. Detailed Project Report: Market, Technical, Financial and Economic aspects. Prerequisites for Successful Project Implementation; Control of in-progress Projects (Gantt chart, PERT, CPM); Project Risk Management Process, Post-audit; Abandonment Analysis

**UNIT-IV**

**INTRODUCTION TO STRUCTURED FINANCE:** Term Loans, Bonds/Debentures, Types of debentures, Issue of debt instruments. Structured Finance: Evolution, Securitization process, characteristics, and structured finance products (ABS, CDO, MBS, CDS)

### **UNIT-V**

**COMMERCIAL MORTGAGAGE LOAN BASICS:** Definition and characteristics of CMBS, CMBS Vs other Mortgage Backed Securities, CMBS three level perspective: property level, loan level, bond level; Life cycle of commercial real estate loans – Loan cycle, Key players in loan cycle; Property types and characteristics, property performance.

### **UNIT-VI**

**BASICS OF CRE SERVICING:** Introduction to servicing, Role of the Servicer, Servicing approaches, Influence of technology, Ethics in commercial servicing, Servicing – sources of income, Overview of servicing agreements, Pooling & Servicing agreement, Sub servicing agreement.

### **TEXT BOOKS:**

1. H. Nandan, Fundamentals of Entrepreneurship, Prentice Hall of India, First Edition, New Delhi, 2007.
2. Jeffrey K. Pinto “Project Management”, 2<sup>nd</sup> edition, Pearson.

### **REFERENCES:**

1. DhandapaniAlagiri “Structured Finance – Concepts & Perspectives”, ICFAI University press.
2. Projects by Prasanna Chandra, McGraw-Hill Publishing Co. Ltd
3. Project Management: Systems approach to Planning Scheduling and Controlling, H. Kerzner.
4. The Complete Real Estate Documents by Mazyar M. Hedayat, John J. Oleary
5. The Fundamentals of Listing and Selling Commercial Real Estate - By Keim K. Loren (Author).

**SYLLABUS FOR IV B.TECH. I SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
CO – CREATION AND PRODUCT DESIGN**

**(OPEN ELECTIVE –II)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Code: 9ZC09**

**Course Objectives:**

The objective of the course is to make students understand the fundamental concepts of design thinking, and to familiarize with product design process and to motivate the students to ideate new products and services.

**Course Outcomes:**

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

**CO1:** Outline the significance of Human Centered Design from customer perspective. (L2)

**CO2:** Examine the scope of emerging technologies in the field of product design. (L4)

**CO3:** Designing the product prototypes and developing the testing solutions. (L6)

**CO4:** Determine the relevance of reverse engineering and ergonomics at work place. (L5)

**CO5:** Application of the knowledge into practice with regard to IPR's. (L3)

**Unit – I: HUMAN CENTERED DESIGN:** Understanding user and Customer perspectives, Identify insights and opportunities, Interviewing, User Experience design. Frame your design challenge. Empathy tools and techniques.

**UNIT II: IDEATION PROCESS:** Articulation of Problem Statement, Visualizing Ideas, Communicating ideas and compelling story telling, Brainstorming, Divergent thinking in exploring solutions, 3- box thinking, 3-box framework and Box-3 ideation.

**UNIT III: EMERGING TECHNOLOGIES AND DESIGN:** Emerging technologies, utilization and growth, Automation through Industry 4.0, IOT for Network and Intelligent world, efficient and effective manufacturing aided by Robotics, Custom manufacturing by Additive / 3D printing, Augmented reality for product and process.

**UNIT IV: PROTOTYPING:** Introduction to Prototype, types of prototype, prototyping strategies, Design consideration in the five stages of the product life cycle. Prototype building by different engineering disciplines. Testing Solution and taking the solution to the users. Create a pitch for your design.

**UNIT V: REVERSE ENGINEERING IN PRODUCT DEVELOPMENT:** Reversing engineering methods, identifying the bad features in a product, reduction in size and weight, usage of new materials, importance of ergonomics in product development, environmental considerations in design, and safety considerations in design.

**UNIT VI: INTELLECTUAL PROPERTY RIGHTS:** Introduction to IPR, Patents – Types of Patents, elements of patentability, Patents registration Procedure, Patent office and Appellate Board, Rights and Duties of Patentee, Restoration of Lapsed patents.

**Essential Readings:**

1. Philip Kosky, Robert T. Balmer, William D. Keat, George Wise, “Exploring Engineering: An Introduction to Engineering and Design”, 4th edition, Elsevier, 2016.
2. David Ralzman, “History of Modern Design”, 2nd edition, Laurence King Publishing Ltd., 2010 3. An AVA Book, “Design Thinking”, AVA Publishing, 2010.
3. Ingle, B. R. (2013). *Design thinking for entrepreneurs and small businesses: Putting the power of design to work*. Apress.
4. Norman, D. A. (2016). *Living with complexity*. MIT press.
5. Chapman, J. (2017). *Routledge handbook of sustainable product design*. Taylor & Francis.
6. Nithyananda, K.V. (2019), IPR, protection and Management, India, Cengage learning India.

**References:**

1. G. Pahl, W.Beitz, J. Feldhusen, KH Grote, “Engineering Design: A Systematic Approach”, 3rd edition, Springer, 2007. 2. Tom Kelley, Jonathan Littman, “Ten Faces in Innovation”, Currency Books, 2006.
2. Kumar, V. (2012). *101 design methods: A structured approach for driving innovation in your organization*. John Wiley & Sons.
3. Chapman, J. (2012). *Designers Visionaries and Other Stories: A Collection of Sustainable Design Essays*. Taylor & Francis.
4. Garrett, J. J. (2010). *The elements of user experience: user-centered design for the web and beyond*. Pearson Education.
5. Neeraj, P. &Khusdeep, D (2014), IPR, India, IN: PHI Learning.

**SYLLABUS FOR B. TECH. IV YEAR I SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
SCRIPTING LANGUAGES  
(PROFESSIONAL ELECTIVE –IV)**

**Code: 9FC77**

L	T	P	C
3	0	0	3

**Prerequisites:**

Computer Programming and Data Structures, Object Oriented Programming Concepts.

**Course Objectives:**

1. This course introduces the script programming paradigm.
2. Introduces scripting languages such as Perl, Ruby and TCL.

**Course Outcomes:**

1. Identify the differences between typical scripting languages and typical system and application programming languages.
2. Gain knowledge of the strengths and weakness of Perl, TCL and Ruby; and select an appropriate language for solving a given problem.
3. Acquire programming skills in scripting languages.

**UNIT - I**

**Introduction:** Ruby, Rails, The structure and Execution of Ruby Programs, Package management with RUBY GEMS, Ruby and web: Writing CGI scripts, cookies, Choice of Web servers, SOAP and web services.

Ruby Tk–Simple Tk Application, widgets, Binding events, Canvas, scrolling

**UNIT - II**

**Extending Ruby:** Ruby Objects in C, the Jukebox extension, Memory allocation, Ruby Type System, Embedding Ruby to Other Languages, Embedding a Ruby Interpreter.

**UNIT - III**

**Introduction to PERL and Scripting:**Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, UsesforScriptingLanguages, WebScripting, and the universe of ScriptingLanguages.

PERL-Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

**UNIT - IV**

**Advanced perl:** Finer points of looping, pack and unpack, file system, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.

**UNIT - V**

TCL Structure, syntax, Variables and Data in TCL, Control Flow ,Data Structures, input/output ,procedures, strings, patterns, files, Advance TCL- eval, source, exec and up level commands, Namespaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bolts Internet Programming, Security Issues, CInterface.

**UNIT - VI**

**Tk:** Tk-Visual Tool Kits, Fundamental Concepts of Tk, Tk by example, Events and Binding, Perl-Tk.

**TEXT BOOKS:**

1. The World of Scripting Languages, David Barron, Wiley Publications.
2. Ruby Programming language by David Flanagan and Yukihiro Matsumoto O'Reilly.
3. "Programming Ruby" The Pragmatic Programmers guide by Dabve Thomas Second Edition.

**REFERENCES:**

1. Open Source Web Development with LAMP using Linux Apache, MySQL, Perl and PHP, J. Lee and B. Ware (Addison Wesley) Pearson Education.
2. Perl by Example, E. Quigley, Pearson Education.
3. Programming Perl, Larry Wall, T. Christiansen and J. Orwant, O'Reilly, SPD.
4. Tcl and the Tk Tool kit, Ousterhout, Pearson Education.
5. Perl Power, J. P. Flynt, Cengage Learning.



**SYLLABUS FOR B. TECH. IV YEAR I SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
AGILE SOFTWARE DEVELOPMENT  
(PROFESSIONAL ELECTIVE –IV)**

**Code: 9FC16**

L	T	P	C
3	0	0	3

**Prerequisite:** Software Engineering

**Course Objectives:**

To understand how an iterative, incremental development process leads to faster delivery of more useful software.

**Course Outcomes:**

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

1. To understand the essence of agile development methods
2. To apply the principles and practices of extreme programming in real world problems.
3. To incorporate proper coding standards and guidelines in an agile process.
4. To optimize an agile process by exploring the possible risks and threats in the software process
5. To improve the process by eliminating waste
6. To design an agile process for a business application and deal with appropriate tradeoff.

**UNIT-I**

Why Agile? Understanding Success, Beyond Deadlines, The Importance of Organizational Success, Enter Agility, How to Be Agile? Agile Methods, Don't Make Your Own Method, The Road to Mastery, Find a Mentor

**UNIT-II**

Understanding XP: The XP Lifecycle, The XP Team, XP Concepts, Adopting XP: Is XP Right for Us? Assess Your Agility

**UNIT-III**

Practicing XP: Thinking: Pair Programming, Energized Work, Informative Workspace, Root-Cause Analysis, Retrospectives, collaborating: Trust, Sit Together, Real Customer Involvement, Ubiquitous Language, Stand-Up Meetings, Coding Standards, Iteration Demo, Reporting, releasing: "Done", No Bugs, Version Control, Ten-Minute Build, Continuous Integration, Collective Code Ownership, Documentation.

**UNIT-IV**

Planning: Vision, Release Planning, The Planning Game, Risk Management, Iteration Planning, Slack, Stories, Estimating. Developing: Incremental requirements, Customer Tests, Test-Driven Development, Refactoring, Simple Design, Incremental Design and Architecture, Spike Solutions, Performance Optimization, Exploratory Testing

**UNIT-V**

Mastering Agility Values and Principles: Commonalities, About Values, Principles, and Practices, Further Reading, Improve the Process: Understand Your Project, Tune and Adapt, Break the Rules, Rely on People: Build Effective Relationships, Let the Right People Do the

Right Things, Build the Process for the People, Eliminate Waste: Work in Small, Reversible Steps, Fail Fast, Maximize Work Not Done, Pursue Throughput

**UNIT-VI**

Deliver Value: Exploit Your Agility, Only Releasable Code Has Value, Deliver Business Results, Deliver Frequently, Seek Technical Excellence: Software Doesn't Exist, Design Is for Understanding, Design Tradeoffs, Quality with a Name, Great Design, Universal Design Principles, Principles in Practice, Pursue Mastery

**TEXT BOOKS:**

1. James Shore and Shane Warden, "The Art of Agile Development", O'REILLY, 2007.

**REFERENCES:**

1. Robert C. Martin, "Agile Software Development, Principles, Patterns, and Practices", PHI, 2002.
2. Angel Medinilla, "Agile Management: Leadership in an Agile Environment", Springer, 2012.
3. BhuvanUnhelkar, "The Art of Agile Practice: A Composite Approach for Projects and Organizations", CRC Press.
4. Jim Highsmith, "Agile Project Management", Pearson education, 2004.
5. Elisabeth Hendrickson, "Agile Testing" Quality Tree Software Inc. 2008.

**SYLLABUS FOR B. TECH. IV YEAR I SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
DEVOPS  
(PROFESSIONAL ELECTIVE –IV)**

**Code: 9LC17**

**L T P C  
3 0 0 3**

**Course Objectives:**

1. Describe the agile relationship between development and IT operations.
2. Understand the skill sets and high-functioning teams involved in DevOps and related methods to reach a continuous delivery capability.
3. Implement automated system update and DevOps lifecycle.

**Course Outcomes:**

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

1. Identify components of Devops environment.
2. Describe Software development models and architectures of DevOps.
3. Apply different project management, integration, testing and code deployment tool.
4. Investigate different DevOps Software development models.
5. Assess various Devops practices.
6. Collaborate and adopt Devops in real-time projects.

**UNIT – I**

**Introduction:** Introduction, Agile development model, DevOps, and ITIL. DevOps process and Continuous Delivery, Release management, Scrum, Kanban, delivery pipeline, bottlenecks, examples

**UNIT – II**

**Software development models and DevOps:** DevOps Lifecycle for Business Agility, DevOps, and Continuous Testing.

DevOps influence on Architecture: Introducing software architecture, The monolithic scenario, Architecture rules of thumb, The separation of concerns, Handling database migrations, Microservices, and the data tier, DevOps, architecture, and resilience.

**UNIT – III**

**Introduction to project management:** The need for source code control, The history of source code management, Roles and code, source code management system and migrations, Shared authentication, Hosted Git servers, Different Git server implementations, Docker intermission, Gerrit, The pull request model, GitLab.

**UNIT – IV**

**Integrating the system:** Build systems, Jenkins build server, Managing build dependencies, Jenkins plugins, and file system layout, The host server, Build slaves, Software on the host, Triggers, Job chaining and build pipelines, Build servers and infrastructure as code, Building by dependency order, Build phases, Alternative build servers, Collating quality measures.

**UNIT– V**

**Testing Tools and automation:** Various types of testing, Automation of testing Pros and cons,

Selenium - Introduction, Selenium features, JavaScript testing, Testing backend integration points, Test-driven development, REPL-driven development

**UNIT – VI**

**Deployment of the system:** Deployment systems, Virtualization stacks, code execution at the client, Puppet master and agents, Ansible, Deployment tools: Chef, Salt Stack and Docker.

**TEXT BOOKS:**

1. Joakim Verona. Practical Devops, Second Edition. Ingram short title; 2nd edition (2018). ISBN-10: 1788392574.
2. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications. ISBN: 9788126579952.

**REFERENCES:**

1. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley; ISBN-10.

**SYLLABUS FOR B. TECH. IV YEAR I SEM**  
**COMPUTER SCIENCE AND ENGINEERING (AI & ML)**  
**ETHICAL HACKING**  
**(PROFESSIONAL ELECTIVE –IV)**

**Code: 9JC04**

**Prerequisite:** Knowledge in information security, Web application

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**Course Objectives:**

1. Introduce the methodologies and framework of ethical hacking for enhancing the security.
2. The course includes-Impacts of Hacking; Types of Hackers; Information Security Models; Information Security Program; Business Perspective; Planning a Controlled Attack.

**Course Outcomes:**

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

1. Gain the knowledge of the use and availability of tools to support an ethical hack.
2. Interpret the results of a controlled attack.
3. Explain the role of inherent and imposed limitations and metrics for planning of a test.
4. Comprehend the dangers associated with penetration testing.

**UNIT- I**

Introduction: Hacking Impacts, The Hacker Framework: Planning the test, Sound Operations, Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Final Analysis, Deliverable, Integration

Information Security Models: Computer Security, Network Security, Service Security, Application Security, Security Architecture

**UNIT - II**

Information Security Program: The Process of Information Security, Component Parts of Information Security Program, Risk Analysis and Ethical Hacking

The Business Perspective: Business Objectives, Security Policy, Previous Test Results, Business Challenges

**UNIT - III**

Planning for a Controlled Attack: Inherent Limitations, Imposed Limitations, timing is Everything, Attack Type, Source Point, Required Knowledge, Multi-Phased Attacks, Teaming and Attack Structure, Engagement Planner, The Right Security Consultant, The Tester, Logistics, Intermediates, Law Enforcement

**UNIT - IV**

Preparing for a Hack: Technical Preparation, Managing the Engagement

Reconnaissance: Social Engineering, Physical Security, Internet Reconnaissance

**UNIT - V**

Enumeration: Enumeration Techniques, Soft Objective, Looking Around or Attack, Elements of Enumeration, Preparing for the Next Phase

Exploitation: Intutive Testing, Evasion, Threads and Groups, Operating Systems, Password Crackers, RootKits, applications, Wardialing, Network, Services and Areas of Concern

**UNIT - VI**

Deliverable: The Deliverable, The Document, Overall Structure, Aligning Findings, Presentation Integration: Integrating the Results, Integration Summary, Mitigation, Defense Planning, Incident Management, Security Policy, Conclusion.

**TEXT BOOK:**

1. James S. Tiller, “The Ethical Hack: A Framework for Business Value Penetration Testing”, Auerbach Publications, CRC Press.

**REFERENCES:**

1. EC-Council, “Ethical Hacking and Countermeasures Attack Phases”, Cengage Learning.
2. Michael Simpson, Kent Backman, James Corley, “Hands-On Ethical Hacking and Network Defense”, Cengage Learning.

**SYLLABUS FOR B. TECH. IV YEAR I SEM**  
**COMPUTER SCIENCE AND ENGINEERING (AI & ML)**  
**CLOUD COMPUTING**  
**(PROFESSIONAL ELECTIVE – V)**

**Code: 9FC17**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Objectives:**

Understand the basic characteristics of cloud computing and technologies that support to implement cloud computing. Analyze the basic cloud computing models that are used to implement cloud technology and available cloud resources in the market. Analyzing the security issues in cloud computing environment and understanding different case studies in cloud computing and IOT platform.

**Course Outcomes :**

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

1. Summarize the characteristics of cloud and differentiate the cloud service and deployment models and to explore vendor specific services
2. Analyze different architectures for cloud applications, Create and run Amazon ec2 instance through python programs, assess the performance of cloud services and summarize the innovative applications of IOT on cloud.
3. Design architecture of an Apps such as map reduce, image processing app etc on cloud and understand various security aspects in cloud.

**UNIT-I**

Introduction to Cloud Computing : Introduction ,characteristics ,Cloud Models and examples, Applications of Cloud Services .Cloud Concepts and Technologies .

**UNIT-II**

Cloud Services and Platforms : Compute Services, Storage Services, Database Services, Application Services, Content Delivery Services, Analytics Services, Deployment and Management Services, Identity and Access Management Services, Open Source Private cloud Software.

**UNIT-III**

Cloud Application Design: Design Considerations for Cloud Application, Reference Architectures for Cloud Applications, Cloud Application Design Methodologies , Data Storage Approaches. Python for Cloud: Python for Amazon Web Services, Map Reduce

**UNIT – IV**

**book 2.** Cloud and the Internet of Things: Performance of Distributed Systems and the Cloud- Enabling Technologies for the Internet of Things- Innovative Applications of the Internet of Things- Online Social and Professional Networking

**UNIT-V**

Cloud Application Development in Python: Design Approaches, Image Processing App, Document Storage App, Map Reduce App, Social Media Analytics App.

**UNIT-VI**

Cloud Security: Introduction, Cloud Security Architecture (CSA), Authentication, Authorization, Identity Access Management (IAM), Data Security, Key Management, Auditing.

Cloud for Industry, Healthcare and Education.

**TEXT BOOKS:**

1. Cloud Computing –A Hands on Approach ,Arshdeep,VijayMediseti,University Press.
2. Distributed and Cloud Computing,1stEdition,From Parallel Processing to the Internet of Things,Authors: Kai Hwang Jack Dongarra Geoffrey Fox(Unit4)
3. Cloud Computing: Raj Kumar Buyya,JamesBroberg,AndrzejGOscinski,Wiley.

**REFERENCES:**

1. Cloud Computing: Dr.KumarSaurab Wiley India 2011 .
2. Code in the cloud computing: K Chandrasekharan CRC Press.
3. Cloud Computng: John W. Rittinghouse ,JamesRansome,CRC press.
4. Virtualization Security: Dave Shackelford2013,SYBEX a Willy Brand.
5. Cloud Computing and Software Service: Ahson, iiyas.2011.
6. Cloud Computing Bible: Sosinsky 2012 Wiley India.



**SYLLABUS FOR B. TECH. IV YEAR I SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
BUSINESS INTELLIGENCE  
(PROFESSIONAL ELECTIVE –V)**

**Code: 9EC19**

**L T P C  
3 0 0 3**

**Course Objectives:**

1. Introduce the Business intelligence concepts, techniques and models.
2. Understand the modeling process behind business analytics.
3. To analyze different data analysis tools and techniques.

**Course Outcomes:**

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

1. Understand the importance of business intelligence and its applications in today's world.
2. Illustrate the different form of analytics such as business analytics, predictive analytics.
3. Compare in detail the various aspects of business intelligence.
4. Understand the technological components of operational intelligence.
5. Analyze and understand the broad concepts in prescriptive analytics with Decision Tables.
6. Apply business intelligence process for web mining and web analytics.

**UNIT-I**

Introduction to Business Intelligence, Business Intelligence, Mobile Business Intelligence, Real-time Business Intelligence

**UNIT-II**

Analytics: A Comprehensive Study, Business Analytics, Analytics, Software Analytics, Embedded Analytics, Learning Analytics, Predictive Analytics, Prescriptive Analytics, Social Media Analytics, Behavioral Analytics

**UNIT-III**

Essential Aspects of Business Intelligence, Context Analysis, Business Performance Management, Business Process Discovery, Information System, Organizational Intelligence, Data Visualization, Data Profiling, Data Cleansing, Process Mining, Competitive Intelligence

**UNIT-IV**

Operational Intelligence: Technological Components, Operational Intelligence, Business Activity Monitoring, Complex Event Processing, Business Process Management, Metadata, Root Cause Analysis

**UNIT-V**

Prescriptive Analytics:

Certainty, Uncertainty, and Risk- Decision Modeling with Spreadsheets - Mathematical Programming Optimization - Decision Analysis with Decision Tables and Decision Trees - Problem-Solving Search Methods - Problem-Solving Search Methods

**UNIT-VI**

Web Analytics and Web Mining: Web Mining Overview - Web Content and Web Structure Mining - Search Engines - Search Engine Optimization - Web Analytics Technologies, metrics - Web Analytics Maturity Model and Web Analytics Tools

**TEXT BOOKS:**

1. Drew Bentley, Business Intelligence and Analytics, Published by Library Press.
2. Efraim Turban, Ramesh Sharda, Dursun Delen, “Business Intelligence and Analytics”, 10th Edition, Pearson, 2015.

**REFERENCES:**

1. S. Christian Albright, Wayne L. Winston, Business Analytics: Data Analysis & Decision Making, 6th Edition, CENGAGE INDIA, 2017.
2. Dinabandhu Bag, Business Analytics, Routledge, 1st edition, 2016 .
3. Rick Sherman, Business Intelligence Guidebook: From Data Integration to Analytics, Morgan Kaufmann, 1st edition 2014.
4. Introduction to business Intelligence and data warehousing, IBM, PHI.

**SYLLABUS FOR B. TECH. IV YEAR I SEM**  
**COMPUTER SCIENCE AND ENGINEERING (AI & ML)**  
**QUANTUM COMPUTING**  
**(PROFESSIONAL ELECTIVE – V)**

**Code: 9LC21**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Objectives:**

1. To introduce the fundamentals of quantum computing
2. The problem-solving approach using finite dimensional mathematics

**Course Outcomes:**

1. Understand basics of quantum computing
2. Understand physical implementation of Qubit
3. Understand Quantum algorithms and their implementation
4. Understand the Impact of Quantum Computing on Cryptography

**UNIT – I**

Introduction to Essential Linear Algebra: Some Basic Algebra, Matrix Math, Vectors and Vector Spaces, Set Theory. Complex Numbers: Definition of Complex Numbers, Algebra of Complex Numbers, Complex Numbers Graphically, Vector Representations of Complex Numbers, Pauli Matrices, Transcendental Numbers.

**UNIT – II**

Basic Physics for Quantum Computing: The Journey to Quantum, Quantum Physics Essentials, Basic Atomic Structure, Hilbert Spaces, Uncertainty, Quantum States, Entanglement.

**UNIT-III**

Basic Quantum Theory: Further with Quantum Mechanics, Quantum Decoherence, Quantum Electrodynamics, Quantum Chromodynamics, Feynman Diagram Quantum Entanglement and QKD, Quantum Entanglement, Interpretation, QKE.

**UNIT – IV**

Quantum Architecture: Further with Qubits, Quantum Gates, More with Gates, Quantum Circuits, The D-Wave Quantum Architecture. Quantum Hardware: Qubits, How Many Qubits Are Needed? Addressing Decoherence, Topological Quantum Computing, Quantum Essentials.

**UNIT – V**

Quantum Algorithms: What Is an Algorithm? Deutsch's Algorithm, Deutsch-Jozsa Algorithm, Bernstein-Vazirani Algorithm, Simon's Algorithm, Shor's Algorithm, Grover's Algorithm.

**UNIT – VI**

Current Asymmetric Algorithms: RSA, Diffie-Hellman, Elliptic Curve. The Impact of Quantum Computing on Cryptography: Asymmetric Cryptography, Specific Algorithms, Specific Applications.

**TEXT BOOKS:**

1. Nielsen M. A., Quantum Computation and Quantum Information, Cambridge University Press.
2. Dr. Chuck Easttom, Quantum Computing Fundamentals, Pearson.

**REFERENCES:**

1. Quantum Computing for Computer Scientists by Noson S. Yanofsky and Mirco A. Mannucci.
2. Principles of Quantum Computation and Information, Volume II: Basic Tools and Special Topics By Benenti G., Casati G. and Strini G., World Scientific Publishing Co Pte Ltd.

**SYLLABUS FOR B. TECH. IV YEAR I SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
PARALLEL AND DISTRIBUTED COMPUTING  
(PROFESSIONAL ELECTIVE – V)**

**Code: 9LC22**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Objectives:**

1. To learn core idea behind parallel and distributed computing.
2. To explore the methodologies adopted for parallel and distributed environments.
3. To understand the networking aspects of parallel and distributed computing.
4. To provide an overview of the computational aspects of parallel and distributed computing.
5. To learn parallel and distributed computing models.

**Course Outcomes:**

1. Explore the methodologies adopted for parallel and distributed environments.
2. Analyze the networking aspects of Distributed and Parallel Computing.
3. Explore the different performance issues and tasks in parallel and distributed computing.
4. Tools usage for parallel and distributed computing.
5. Understanding high performance computing techniques.

**UNIT-I**

Parallel and Distributed Computing—Introduction- Benefits and Needs-Parallel and Distributed Systems- Programming Environment- Theoretical Foundations.

**UNIT-II**

Parallel Algorithms— Introduction-Parallel Models and Algorithms- Sorting - Matrix Multiplication- Convex Hull- Pointer Based Data Structures.

**UNIT-III**

Synchronization-Process Parallel Languages-Architecture of Parallel and Distributed Systems-Consistency and Replication-Security-Parallel Operating Systems.

**UNIT-IV**

Management of Resources in Parallel Systems- Tools for Parallel Computing- Parallel Database Systems and Multimedia Object Servers.

**UNIT-V**

Networking Aspects of Distributed and Parallel Computing- Process- Parallel and Distributed Scientific Computing.

**UNIT-VI**

High-Performance Computing in Molecular Sciences-Communication Multimedia Applications for Parallel and Distributed Systems-Distributed File Systems.

**TEXTBOOKS:**

1. Jacek Błażewicz, et. al., “Handbook on parallel and distributed processing”, Springer Science & Business Media, 2013.
2. Andrew S. Tanenbaum, and Maarten Van Steen, “Distributed Systems: Principles and Paradigms”.Prentice-Hall,2007.

**REFERENCES:**

- 1.George F.Coulouris, Jean Dollimore, and Tim Kindberg, “Distributed systems: concepts and design”, Pearson Education, 2005.
2. Gregor Kosec and Roman Trobec, “Parallel Scientific Computing: Theory, Algorithms, and Applications of MeshBased and Meshless Methods”, Springer, 2015.

**SYLLABUS FOR B. TECH. IV YEAR I SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
ADVANCED ARTIFICIAL INTELLIGENCE AND DEEP LEARNING**

**Code: 9LC02**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Prerequisite:** Machine Learning

**Course Objectives:**

1. To understand the different types of AI agents
2. Know various AI search algorithms (uninformed, informed, heuristic, constraint satisfaction, genetic algorithms)
3. To understand the fundamentals of knowledge representation (logic-based, frame-based, semantic nets), inference and theorem proving
4. Demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information
5. Ability to apply knowledge representation, reasoning, and machine learning techniques to real-world problems
6. Ability to apply concepts of convolutional networks in day to day applications.

**Course Outcomes:**

After completion of this course, student will be able to

1. Identify different types of agents and their relationships with the environment.
2. Demonstrate the application of agents handling applications dealing with conflict resolution.
3. Represent knowledge in logical level and also be able to convert it to a form suitable for implementation.
4. Derive inferences applying rules of First Order Logic.
5. Formulate an approach for applications involving complete and incomplete Planning.
6. Choose the appropriate learning strategy needed for solving a given problem.

**UNIT-I**

**Introduction:** AI problems, Intelligent agents: Agents and Environments, Rationality, Nature of environments, Structure of agents, Problem solving agents, Problem formulation – Planning Application – Classical Planning problem.

**UNIT-II**

**Searching and Game Theory:** Searching for solutions, searching with partial information (Heuristic search), Greedy best first search, A\* search Constraint Satisfaction problem -Game Playing: Adversarial search: Games, Minimax algorithm, Optimal decisions in multiplayer games, Alpha-Beta pruning, Evaluation functions. **Case studies:** Tic-tac-toe game.

**UNIT-III**

**Knowledge Representation and Reasoning:** Logical Agents, Knowledge Based Agents, Wumpus world, Propositional logic, Resolution patterns in propositional Logic, First order logic, Inference in first order logic, propositional vs. First order inference, Unification and Lifting, forward chaining, Backward chaining, Resolution.

#### **UNIT-IV**

**Uncertain Knowledge and Reasoning:** Bayes Rule, Concepts of Time and Uncertainty, Utility Functions, Value of Information, Value iteration, Policy iteration, Partially Observable MDP.

#### **UNIT-V**

##### **Basics of Deep Learning:**

Deep learning architectures: Convolutional Neural Networks : Neurons in Human Vision-The Shortcomings of Feature Selection - Full Description of the Convolutional Layer - Max Pooling-Full Architectural Description of Convolution Networks - Closing the Loop on MNIST with Convolutional Networks- -Building a Convolutional Network for CIFAR-10 - Visualizing Learning in Convolutional Networks- Leveraging Convolutional Filters to Replicate Artistic Styles-Learning Convolutional Filters for Other Problem Domains- Training algorithms.

#### **UNIT VI**

##### **Deep Reinforcement Learning:**

Deep Reinforcement Learning Masters Atari Games - Reinforcement Learning-Markov Decision Processes (MDP)-Explore Versus Exploit - Pole-Cart with Policy Gradients-Q-Learning and Deep Q-Networks-Improving and Moving Beyond DQN.

#### **TEXT BOOKS:**

1. S. Russell and P. Norvig, Artificial Intelligence: A Modern Approach, Prentice Hall, Third Edition, 2009.
2. Artificial Intelligence, 3<sup>rd</sup> Edition, Patrick Henry Winston, Pearson Education, 1992.
3. Nikhil Buduma, Nicholas Locascio, “Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms”, O’Reilly Media, 2017.
4. Ian Goodfellow, YoshuaBengio, Aaron Courville, “Deep Learning (Adaptive Computation and Machine Learning series”, MIT Press, 2017.

#### **REFERENCES:**

1. M. Tim Jones, —Artificial Intelligence: A Systems Approach(Computer Science), Jones and Bartlett Publishers, Inc.; First Edition, 2008
2. Nils J. Nilsson, —The Quest for Artificial Intelligence, Cambridge University Press, 2009.
3. William F. Clocksin and Christopher S. Mellish, Programming in Prolog: Using the ISO Standard, Fifth Edition, Springer, 2003.
4. Gerhard Weiss, —Multi Agent Systems, Second Edition, MIT Press, 2013.
5. David L. Poole and Alan K. Mackworth, —Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, 2010.
6. Bratko, —Prolog: Programming for Artificial Intelligence, Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.



**SYLLABUS FOR B. TECH. IV YEAR I SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
NATURAL LANGUAGE PROCESSING**

**Code: 9LC18**

**L T P C  
3 0 0 3**

**Prerequisites:** Data Structures, Finite Automata and Probability Theory

**Course Objectives:**

1. Introduce to some of the problems and solutions of NLP and their relation to linguistics and statistics.
2. Understand and carryout proper experimental methodology for training and evaluating empirical NLP systems.

**Course Outcomes:**

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

1. Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
2. Understand and carryout proper experimental methodology for training and evaluating empirical NLP systems.
3. Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
4. Able to design, implement, and analyze NLP algorithms.
5. Able to design different language modeling Techniques.

**UNIT-I**

**Finding the Structure of Words:** Words and Their Components, Issues and Challenges, Morphological Models.

**Finding the Structure of Documents:** Introduction, Methods, Complexity of the Approaches, Performances of the Approaches.

**UNI-II**

**Syntax Analysis:** Parsing Natural Language, Tree banks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual Issues

**UNIT-III**

**Semantic Parsing:** Introduction, Semantic Interpretation, System Paradigms, Word Sense Systems, Software.

**UNIT-IV**

Predicate-Argument Structure, Meaning Representation Systems, Software.

**UNIT-V**

**Discourse Processing:** Cohension, Reference Resolution, Discourse Cohension and Structure.

**UNI-VI**

**Language Modeling:** Introduction, N-Gram Models, Language Model Evaluation,

Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Cross lingual Language Modeling.

**TEXT BOOKS:**

1. Multilingual Natural Language Processing Applications: From Theory to Practice–Daniel M.Bikel and Imed Zitouni, Pearson Publication.
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S.Tiwary.

**REFERENCES:**

1. Speech and Natural Language Processing-Daniel Jurafsky&James H Martin, Pearson Publications.
2. Charniak, E.: Statistical Language Learning. The MIT Press.
3. Jelinek, F.: Statistical Methods for Speech Recognition. The MIT Press.
4. Lutz and Ascher - "Learning Python", O'Reilly.

**SYLLABUS FOR B. TECH. IV YEAR I SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
BIG DATA ANALYTICS**

**Code: 9FC15**

**Prerequisites:** Machine Learning

L	T	P	C
3	0	0	3

**Course Objectives:**

1. To explore the fundamental concepts of big data analytics.
2. To understand storage and parallel processing of Big Data using Hadoop
3. To introduce programming tools like HIVE, SQOOP, HBASE in Hadoop ecosystem.
4. To understand the applications using Apache Spark RDD Concepts.
5. To know high level API like Data Frames and Spark SQL
6. To teach the fundamental techniques and principles in achieving big data analytics with stream processing.

**Course Outcomes:**

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

1. Comprehend the fundamentals of big data analytics and understand how Hadoop solves the big data problem in real life.
2. Interpret the challenges with big data and elaborate the knowledge about the technological developments in big data environment.
3. Demonstrate the difference between NOSQL and SQL databases.
4. Discuss the Hadoop distributed file system (HDFS) framework and anatomy of Hadoop map-reduce.
5. Design the algorithms to process big data using Apache Spark Low Level API.
6. Apply Hadoop Data Analysis to social Media Analytics and Opinion Mining on Tweets.

**UNIT– I**

Introduction to Big Data: Big Data Analytics, Characteristics of Big Data – The Four Vs, importance of Big Data, Different Use cases, Data-Structured, Semi-Structured, Un-Structured

Introduction to Hadoop and its use in solving big data problems. Comparison Hadoop with RDBMS, Brief history of Hadoop, Apache Hadoop Eco System, Components of Hadoop, The Hadoop Distributed File System (HDFS):, Architecture and design of HDFS in detail, Working with HDFS (Commands)

**UNIT-II**

Anatomy of Hadoop map-reduce (Input Splits, map phase, shuffle, sort, combiner, reduce phase) (theory)

Hive:Introduction to Hive, data types and file formats, HiveQL data definition(Creating Databases and Tables),HiveQL for Data loading, HiveQL data manipulation, Logical joins, Window functions, Optimization, Table partitioning, Bucketing, Indexing, Join Strategies.

**UNIT-III**

SQOOP: Introduction to SQOOP, SQOOP imports : From Database to HDFS/Hive, SQOOP exports: From HDFS/Hive to Database, Incremental imports

NoSQL & HBase: Overview, HBase architecture, CRUD operations

#### **UNIT-IV**

SPARK Basics: History of Spark, Spark Architecture, Spark Shell, Working with RDDs in Spark: RDD Basics, Creating RDDs in Spark. RDD Operations. Passing Functions to Spark, Transformations and Actions in Spark, Spark RDD Persistence

Working with Key/Value Pairs: Pair RDDs, Transformations on Pair RDDs, Actions Available on Pair RDDs

#### **UNIT-V**

Structured API: DataFrames, SQL : Overview of Structured Spark Types, Schemas, Columns and Expressions, DataFrame Transformations, Working with different types of data,

Aggregations- Aggregation Functions, Grouping, User-Defined Aggregation Functions, Joins- Inner Joins, Outer Joins, Processing CSV Files, JSON Files, Text Files and Parquet Files, Spark SQL

#### **UNIT-VI**

Spark streaming: Stream Processing Fundamentals, Structured Streaming Basics - Core Concepts, Structured Streaming in Action, Transformations on Streams, Input and Output (Kafka)

Case study: Twitter Stream processing application

#### **TEXT BOOKS:**

1. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012
2. SPARK: The Definitive Guide, Bill Chambers & Matei Zaharia, O'Reilley, 2018 Edition

#### **REFERENCES:**

1. "Hadoop Operations", O'Reilley, Eric Sammer, 2012.
2. "Programming Hive", O'Reilley, E. Capriolo, D. Wampler, and J. Rutherglen, 2012.
3. "HBase: The Definitive Guide", O'Reilley, Lars George, 2011.
4. Big Data, Big Analytics: Emerging, Michael Minnelli, Michelle Chambers, and Ambiga Dhiraj.

**SYLLABUS FOR B. TECH. IV YEAR I SEMESTER  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
DEEP LEARNING LAB AND BIG DATA ANALYTICS LAB**

**Code: 9LC66**

**L T P C  
0 0 3 1.5**

**Course Objectives:**

1. The basic ideas and principles in data center design; cloud management techniques and cloud software deployment considerations;
2. To Build The Foundation Of Deep Learning.
3. To Understand How To Build The Neural Network.
4. To enable students to develop successful machine learning concepts.
5. To provide the students with the knowledge of Big data Analytics principles and techniques.
6. To give an exposure of the frontiers of Big data Analytics.

**Course Outcomes:**

Upon the Successful Completion of the Course, the Students would be able to:

1. Discuss system, network and storage virtualization and outline their role in enabling the cloud computing system model.
2. Learn The Fundamental Principles Of Deep Learning.
3. Identify The Deep Learning Algorithms For Various Types of Learning Tasks in various domains.
4. Implement Deep Learning Algorithms and Solve Real-world problems.
5. Use Excel as an Analytical tool and visualization tool.
6. Program using HADOOP and Map Reduce.
7. Perform data analytics using ML in R.
8. Use Cassandra to perform social media analytics.

**LIST OF EXPERIMENTS (DEEP LEARNING LAB)**

1. Setting up the Spyder IDE Environment and Executing a Python Program.
2. Installing Keras, Tensor flow and Pytorch libraries and making use of them.
3. Applying the Convolution Neural Network on computer vision problems.
4. Image classification on MNIST dataset (CNN model with Fully connected layer).
5. Applying the Deep Learning Models in the field of Natural Language Processing.
6. Train a sentiment analysis model on IMDB dataset, use RNN layers with LSTM/GRU notes.
7. Applying the Auto encoder algorithms for encoding the real-world data.
8. Applying Generative Adversial Networks for Image generation and unsupervised tasks.

### **LIST OF EXPERIMENTS (BIG DATA ANALYTICS LAB)**

1. Implement a simple map-reduce job that builds an inverted index on the set of input documents (Hadoop)
2. Process big data in HBase
3. Store and retrieve data in Pig
4. Perform Social media analysis using cassandra
5. Buyer event analytics using Cassandra on suitable product sales data.
6. Using Power Pivot (Excel) Perform the following on any dataset
  - i. Big Data Analytics
  - ii. Big Data Charting
7. Use R-Project to carry out statistical analysis of big data
8. Use R-Project for data visualization of social media data

#### **TEXT BOKS:**

1. Deep Learning by Ian Good fellow, Yoshua Bengio and Aaron Courville, MIT Press.
2. The Elements of Statistical Learning by T. Hastie, R.Tibshirani, and J.Friedman, Springer.
3. Probabilistic Graphical Models. Koller, and N.Friedman, MIT Press.
4. Big Data Analytics, SeemaAcharya, Subhashini Chellappan, Wiley 2015.
5. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business, Michael Minelli, Michehe Chambers, 1st Edition, AmbigaDhiraj, Wiely CIO Series, 2013.
6. Hadoop: The Definitive Guide, Tom White, 3rd Edition, O'Reilly Media, 2012.
7. Big Data Analytics: Disruptive Technologies for Changing the Game, Arvind Sathi, 1st Edition, IBM Corporation, 2012.

#### **REFERENCES:**

1. Bishop,C.M.,Pattern Recognition and Machine Learning, Springer.
2. Yegnanarayana,B., Artificial Neural Networks PHI Learning Pvt. Ltd.
3. Golub, G.H.,and Van Loan C.F., Matrix Computations, JHU Press.
4. Big Data and Business Analytics, Jay Liebowitz, Auerbach Publications, CRC press (2013)
5. Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop, Tom Plunkett, Mark Hornick, McGraw-Hill/Osborne Media (2013), Oracle press.
6. Professional Hadoop Solutions, Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, Wiley, ISBN: 9788126551071, 2015.
7. Understanding Big data, Chris Eaton, Dirk deroos et al., McGraw Hill, 2012.

**SYLLABUS FOR B. TECH. IV YEAR I SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
PE-IV (SCRIPTING LANGUAGES) LAB**

**Code: 9LC67**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**Prerequisites:** Any high-level programming language (C, C++).

**Course Objectives:**

- 1 Describe the agile relationship between development and IT operations.
- 2 Understand the skill sets and high-functioning teams involved in
- 3 DevOps and related methods to reach a continuous delivery capability
- 4 Implement automated system update and DevOps lifecycle

**Course Outcomes:**

- 1 Identify components of Devops environment
- 2 Apply different project management, integration, testing and code deployment tool
- 3 Investigate different DevOps Software development models

**LIST OF EXPERIMENTS (SCRIPTING LANGUAGES)**

1. Write a Ruby script to create a new string which is n copies of a given string where n is a nonnegative integer.
2. Write a Ruby script which accept the radius of a circle from the user and compute the parameter and area.
3. Write a Ruby script which accept the user's first and last name and print them in reverse order with a space between them.
4. Write a Ruby script to accept a filename from the user print the extension of that
5. Write a Ruby script to find the greatest of three numbers.
6. Write a Ruby script to print odd numbers from 10 to 1.
7. Write a Ruby script to check two integers and return true if one of them is 20 otherwise return their sum.
8. Write a Ruby script to check two temperatures and return true if one is less than 0 and the other is greater than 100.
9. Write a Ruby script to print the elements of a given array.
10. Write a Ruby program to retrieve the total marks where subject name and marks of a student stored in a hash.
11. Write a TCL script to find the factorial of a number.
12. Write a TCL script that multiplies the numbers from 1 to 10.
13. Write a TCL script for Sorting a list using a comparison function.
14. Write a TCL script to (i)create a list (ii )append elements to the list (iii) traverse the list (iv) concatenate the list.
15. Write a TCL script to comparing the file modified times.
16. Write a TCL script to Copy a file and translate to native format.
17. a) Write a Perl script to find the largest number among three numbers.  
b) Write a Perl script to print the multiplication tables from 1-10 using subroutines.
18. Write a Perl program to implement the following list of manipulating functions.  
a)Shift  
b)Unshift  
c)Push.

19. a) Write a Perl script to substitute a word, with another word in a string.
- b) Write a Perl script to validate IP address and email address.
20. Write a Perl script to print the file in reverse order using command line arguments.

**TEXT BOOKS:**

1. The World of Scripting Languages, David Barron, Wiley Publications.
2. Ruby Programming language by David Flanagan and Yukihiro Matsumoto O'Reilly.
3. "Programming Ruby" The Pragmatic Programmer's guide by Dabve Thomas Second edition.
1. Beginning Linux Programming, 4th Edition, N.Matthew, R.Stones, Wrox, Wiley India Edition, rp-2008.

**REFERENCES:**

1. Open Source Web Development with LAMP using Linux Apache, MySQL, Perl and PHP, J.Lee and B. Ware (Addison Wesley) Pearson Education.
2. Perl by Example, E. Quigley, Pearson Education.
3. Linux System Programming, Robert Love, O'Reilly, SPD.



**SYLLABUS FOR B. TECH. IV YEAR I SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
PE-IV (AGILE SOFTWARE DEVELOPMENT) LAB**

**L T P C**  
**0 0 3 1.5**

**Code: 9LC67**

**Course Objectives:**

1. Describe the agile relationship between development and IT operations.
2. Understand the skill sets and high-functioning teams involved in
3. DevOps and related methods to reach a continuous delivery capability
4. Implement automated system update and DevOps lifecycle

**Course Outcomes:**

1. Identify components of Devops environment
2. Apply different project management, integration, testing and code deployment tool
3. Investigate different DevOps Software development models

**LIST OF EXPERIMENTS (AGILE SOFTWARE DEVELOPMENT):**

1. Subscription to AWS, Management console, EC2 essentials & Build EC2 instances, Different IP sassing to EC2 instance, Elastic IP address.(Amazon Web Services)
1. CreationofUbuntuEC2instance,connect(openputtysession),practiceLinuxcommandsand terminate, SSH-authentication setup between different servers, Security groups, Key pairs (Public key, Private keys).(Amazon Web Services)
2. Installing Git, Sign up process for Git, Sub version controls/Git working with local repositories, remote repositories, Software configuration management (SCM) using Git, Managing project from Git.(Git/GitHub)
3. Installation of Git server,Git commands, Cloning fetch/pull, Merging in Git, Branching strategies of Git.(**Git/GitHub**)
4. Continuous integration continuous deployment tools, Jenkins installation, User profile and management in Jenkins, Builds setup and pipeline of jobs in Jenkins. (**Jenkins Frame Work**)
5. Jenkins master &slave node configuration, Jenkins work space management, Securing Jenkins-authentication, Authorization, Confidentiality, Creating users.(**JenkinsFrameWork**)
6. Jenkins plugins- Installing Jenkins plugins, SCM plugin, Build and test, Artifacts, Integration with Git, Create a docker Image. (Jenkins FrameWork)
7. Docker terminologies, Installation of Docker, Docker image creation and Docker hands-on, Docker container creation/start/stop/destroy. (Docker)
8. Installing Ansible on Linux (Aws-Ec2 server) and SSH-authentication setup, Understanding modules, Ansible playbooks, Playbooks creation and execution. (Ansible)
9. Writing and executing different types of playbooks, Playbook with direct static tasks, Playbook with dynamic variable pass, Play book with roles.(**Ansible**)

**TEXT BOOKS:**

1. Andrew Stellman and Jennifer Greene, Learning Agile,1<sup>st</sup> ed. Mumbai:Shroff-O'Reilly,2018.
2. Beginning Linux Programming, 4th Edition, N.Matthew, R.Stones, Wrox, Wiley India Edition, rp-2008.

ii.

**REFERENCES:**

1. Andrew Stellman and Jennifer Greene, Learning Agile,1<sup>st</sup> ed. Mumbai:Shroff-O'Reilly,2018.
2. Pierluigi Riti, Pro Devops with Google Cloud Platform with Docker, Jenkin sand Kubernetes,1<sup>st</sup> ed., NewYork:Apress,2018.
3. James shore and Shanewarden, The art of Agile development,1<sup>st</sup> ed.,Mumbai:Shroff-O'Reilly,2018.

**SYLLABUS FOR B. TECH. IV YEAR I SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
PE-IV (DEVOPS) LAB**

**Code: 9LC67**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**Course Objectives:**

1. Describe the agile relationship between development and IT operations.
2. Understand the skill sets and high-functioning teams involved in
3. DevOps and related methods to reach a continuous delivery capability
4. Implement automated system update and DevOps lifecycle

**Course Outcomes:**

1. Identify components of Devops environment
2. Apply different project management, integration, testing and code deployment tool
3. Investigate different DevOps Software development models

**LIST OF EXPERIMENTS (DEVOPS)**

1. Write code for a simple user registration form for an event.
2. Explore Git and GitHub commands.
3. Practice Source code management on GitHub. Experiment with the source code written in exercise 1.
4. Jenkins installation and setup, explore the environment.
5. Demonstrate continuous integration and development using Jenkins.
6. Explore Docker commands for content management.
7. Develop a simple containerized application using Docker.
8. Integrate Kubernetes and Docker
9. Automate the process of running containerized application developed in exercise. 7 using Kubernetes.
10. Install and Explore Selenium for automated testing.
11. Write a simple program in JavaScript and perform testing using Selenium.
12. Develop test cases for the above containerized application using selenium.

**TEXT BOOKS:**

1. Joakim Verona. Practical Devops, Second Edition. Ingram short title; 2nd edition (2018). ISBN-10: 1788392574
2. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications. ISBN: 9788126579952.
3. Beginning Linux Programming, 4th Edition, N.Matthew, R.Stones, Wrox, Wiley India Edition, rp-2008.

**REFERENCES:**

1. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley
2. Edureka DevOps Full Course - [https://youtu.be/S\\_0q75eD8Yc](https://youtu.be/S_0q75eD8Yc)
3. Linux System Programming, Robert Love, O'Reilly, SPD.

**SYLLABUS FOR B. TECH. IV YEAR I SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
PE-IV (ETHICAL HACKING) LAB**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**Code: 9LC67**

**Prerequisites:** Theoretical knowledge of Ethical Hacking, Automata and Compiler Design

**Course Objectives:**

1. The aim of the course is to introduce the methodologies framework tools of ethical hacking to get awareness in enhancing the security
2. To get knowledge on various attacks and their detection

**Course Outcomes:** At the end of this course, the student will be able to

1. Use the available tools to support an ethical hacking procedure.
2. Interpret the results of a controlled attack.

**LIST OF EXPERIMENTS (ETHICAL HACKING):**

1. Setup a honey pot and monitor the honey pot on network
2. Write a script or code to demonstrate SQL injection attacks
3. Create a social networking website login page using phishing techniques
4. Write a code to demonstrate DoS attacks
5. Install rootkits and study variety of options
6. Study of Techniques uses for Web Based Password Capturing.
7. Identify System Vulnerabilities with OpenVAS
8. Implement Passive scanning, active scanning, session hijacking, cookies extraction using Burpsuite tool.

**TEXT BOOK:**

1. James S. Tiller, “The Ethical Hack: A Framework for Business Value Penetration Testing”, Auerbach Publications, CRC Press.

**REFERENCES:**

1. EC-Council, “Ethical Hacking and Countermeasures Attack Phases”, Cengage Learning.
2. Michael Simpson, Kent Backman, James Corley, “Hands-On Ethical Hacking and Network Defense”, Cengage Learning.

**SYLLABUS FOR B. TECH. IV YEAR I SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
SUMMER INDUSTRY INTERNSHIP – II**

**L T P C**  
**0 0 0 1**

**Code: 9L792**

**Prerequisite:** All Courses till this Semester

Students shall carry out the project in industry during summer vacation for 3 - 6 weeks and the evaluation is carried out in fourth year first Semester.

**Course Objectives:**

To enhance the knowledge on selecting a project, learn related tools and enhance programming and communication skills for employability.

**Course Outcomes:**

At the end of this course the student will be able to

1. Use the concepts learned in the courses, so far, in conceptualizing, designing and executing the modules of the projects.
2. Exhibit the interest in learning the modern tools and technologies through the bridge courses arranged in the college, beyond the curriculum, and hence developing the software.
3. Inculcate an enthusiasm to use the creative ideas to build the innovative projects and prototypes which are meeting the current needs of the market and society as a whole.
4. Improve their communicative skills and team skills.

A summer industry internship project shall be carried out by a group of students consisting of 2 to 4 in number during the Sixth Semester summer vacation at industries. This work shall be carried out under the guidance of the faculty assigned as internal guide as well as external guide at industry where students are carrying out summer industry internship projects. Project shall consist of design, fabrication, software development or building of prototype or application app. This can be of interdisciplinary nature also.

There will be 100 marks in total with 30 marks of internal evaluation and 70 marks of external

The **Internal Evaluation** shall consist of:

Day to Day Work (Internal Guide 10M and External Guide: 5M)	:	15 Marks
Report	:	05 Marks
Demonstration / Presentation (Internal Presentation is evaluated by HOD, senior faculty and internal guide)	:	10 Marks

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30 Marks

**End Examination**

: 70 Marks.

External Evaluation of the project (viva-voce) shall be conducted by a committee appointed by the Chief Superintendent. The end examination will be carried out by a committee consisting of an external examiner, head of the department, a senior faculty member and the internal guide.

**SYLLABUS FOR B. TECH. IV YEAR II SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
FUNDAMENTALS OF RENEWABLE ENERGY SOURCES  
(OPEN ELECTIVE-III)**

**Code: 9AC45**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Objectives:**

Becomes familiar with solar energy, its radiation, Collection, storage and application and also gets introduced to other forms of Renewable Energy sources viz., the Wind energy, Biomass energy, geothermal energy and ocean energy.

**Course Outcomes :**

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

1. Understand the role and potential of new and renewable energy sources realize the potential of solar energy, its impact on environment; define and understand the terms describing the different angles that one may incur in setting up a solar panel and be able to use the instruments for measuring solar radiation.
2. Demonstrates the knowledge of different techniques of solar collection and storage.
3. Classify different types of horizontal and vertical axis wind mills and understands the performance characteristics of the same. The student also demonstrates the knowledge of different Bio-gas digesters and factors influencing its yield.
4. Understand the potential of geothermal energy in India and will be able to characterize different types of geothermal wells.
5. Differentiate the different methods of kinetic energy extraction from Ocean waves and tides and thermal energy extraction from Oceans.
6. Demonstrates the knowledge of Direct Energy Conversion in different phenomena viz., Joule Thomson effect, Seebeck effect, Peltier effect etc. and the principle of operation of Fuel Cells.

**UNIT-I**

**PRINCIPLES OF SOLAR RADIATION:** Role and potential of new and renewable source, The solar energy option, Environmental impact of solar power, Physics of the sun, the solar constant, Extraterrestrial and terrestrial solar radiation, Solar radiation on titled surface, Instruments for measuring solar radiation and sun shine, Solar radiation data.

**UNIT-II**

**SOLAR ENERGY COLLECTION STORAGE AND APPLICATIONS:** Flat plate and concentrating collectors, Classification of concentrating collectors, orientation and thermal analysis, advanced collectors. Different methods, Sensible, Latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

### **UNIT-III**

**WIND ENERGY:** Sources and potentials, Horizontal and vertical axis windmills, Performance characteristics, Betz criteria

**BIO-MASS:** Principles of Bio-Conversion, Anaerobic/aerobic digestion, Types of Bio-gas digesters, Gas yield, Combustion characteristics of bio-gas, Utilization for cooking, I.C.Engine operation and economic aspects.

### **UNIT-IV**

**GEOTHERMAL ENERGY:** Resources, types of wells, methods of harnessing the energy, Potential in India.

### **UNIT-V**

**OCEAN ENERGY:** OTEC, Principles utilization, Setting of OTEC plants, Thermodynamic cycles. Tidal and wave energy, Potential and conversion techniques, Mini-hydel power plants and their economics.

### **UNIT-VI**

**DIRECT ENERGY CONVERSION:** Need for DEC, Carnot cycle, Limitations, principles of DEC. Thermoelectric generators, seebeck, Peltier and joul Thomson effects, Figure of merit, materials, Applications, MHD generators, Principles, Dissociation and ionization, Hall effect, Magnetic flux, MHD accelerator, MHD Engine, Power generation systems, Electron gas dynamic conversion, economic aspects. Fuel cells – principles - Faraday's law's - Thermodynamic aspects - selection of fuels and operating conditions.

### **TEXT BOOKS:**

1. Non-Conventional Energy Sources - G.D. Rai
2. Renewable Energy Technologies - Ramesh & Kumar /Narosa.

### **REFERENCE BOOKS:**

1. Renewable energy resources - Tiwari and Ghosal/ Narosa.
2. Non-Conventional Energy - Ashok V Desai /Wiley Eastern.
3. Non-Conventional Energy Systems - K Mittal /Wheeler

**SYLLABUS FOR B. TECH. IV YEAR II SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
PRODUCT AND SERVICES  
(OPEN ELECTIVE –III)**

**L T P C  
3 0 0 3**

**Code: 9ZC24**

**Course Objectives:**

This course helps to provide the basic concepts of Product and Services. This course will enable the students to study areas of basic insights in product management and Services Design.

**Course Outcomes:**

At the end of this course the student will be able to

1. Understand the basic concepts of product.
2. Determine the process of new product development and stages in the process.
3. Understand the concept of product testing, product planning and the preparatory groundwork for launching a new product
4. Differentiate various types of services, its differences with the goods and the application of marketing principles for services.
5. Understand the attributes of a good service design and the tools for producing and distributing the services.
6. Identify the importance of quality of services and also introduce some measurement scales to evaluate the service quality.

**UNIT- I**

**PRODUCT AS A COMMERCIAL FACTOR:** Product concept: premarketing, product definition, product dimensions. Product classification- by its nature, by final use by reasons for purchase, by consumer groups.

**UNIT- II**

**PRODUCT INNOVATION:** New products-What is a new product, Concept, Reasons, Succeed and failure factors, Launch process, Opportunities identification, Idea generation Systems, Evaluation, Check list, Financial analysis, Product concept.

**UNIT- III**

**PRODUCT MANAGEMENT:** Concept test, Product testing, Pre-launch, Market test, Final evaluation “Stage / Gate Process” A sequence system for a product launch. Product planning and development-Product planning, Price planning, Break even point analysis, Communications Planning, Advertising Planning, Distribution planning

**UNIT – IV**

**INTRODUCTION TO SERVICE:** Meaning and Definition of Service, Characteristics of Services, Classification of Service, Five levels of Service, Service versus Physical Goods, 7 P’s for Marketing of Services, Marketing Mix for Tourism, Hospitality, Education, and Health Industry.



**UNIT – V**

**SERVICE PROCESS DESIGN:** Challenges & Critical Success Factors, Distribution Methods for Service, Process of Service Delivery, Tools for Service Design, Customer involvement in the Production Process, Tools for Innovation, Role of Intermediaries, Attributes of a Good Design.

**UNIT – VI**

**QUALITY OF SERVICE:** Definition of Service Quality, Elements of Service Quality, Service Quality Measuring Tools; SERVQUAL Scale, Service Quality Gap Analysis, Objective Service Metrics, Cost of Quality in Service. Challenges and Problems of Service Quality in India.

**TEXT BOOKS:**

1. Dr. S.L. Gupta, Product Management, Wisdom Publications.
2. C.MerleCrawford ,New Product Management.

**REFERENCE BOOKS:**

1. Valarie A.Zeithaml& Mary Jo-Bitner: Services Marketing—Integrating Customer Focus Across the Firm, 3/e, Tata McGraw Hill, 2007.
2. Thomas J.Delong&Asish Nanda: Managing Professional Servies—Text and Cases, McGraw-Hill International, 2006.
3. Christopher Lovelock: Services Marketing People, Technology, Strategy, Fourth Edition, Pearson Education, 2006

**SYLLABUS FOR B. TECH. IV YEAR II SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
ENTREPRENEURSHIP AND BUSINESS DESIGN  
(OPEN ELECTIVE –III)**

L	T	P	C
3	0	0	3

**Code: 9ZC10**

**Course Objective:**

The objective of the course is to make students understand the essentials of building their start-ups and to familiarize with business design process develop business models, and market their product.

**Course Outcomes:**

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

1. Understand the essentials of entrepreneurship and the key role played by the entrepreneurs.
2. Differentiate the different phases of UI /UX.
3. Outline the attentiveness on designing a business strategy.
4. Explore on designing and delivery of services.
5. Understand reverse engineering methods in product development.
6. Indicate information on IPR, and patent application.

**UNIT – I**

**Introduction to Entrepreneurship:** Meaning of Entrepreneurship. Reasons feeding the Entrepreneurial fire. Understanding Entrepreneurship as a Process. Multiple roles of Entrepreneur: Intrapreneur, Inventor, Coordinator, Manager and Controller. Psychological and behavioural aspects of First-Generation Entrepreneur.

**UNIT – II**

**Introduction to UI/UX:** Human centered design and benefits, the distinction between UX and UI, UX process – user research, prototyping strategies, UI principles, UI analysis, UI design, UI components and Responsive design.

**UNIT – III**

**Designing a Business Strategy:** Define a problem and frame a strategic question, map the lives of users, journey mapping and ideation, color theory, killing the ideas through Stage Gate Models, pitching of full-fledged, idea, choosing the Start-Up Team.

**UNIT – IV**

**Designing Services and Services Delivery:** Services as solutions, Service delivery pathways, rapid branding and marketing strategies, key metrics for Design thinking. Types of New services, Mix of core services and secondary and enhancing services, service flower and service design matrix.

**UNIT – V**

**Business Model:** Meaning of business model, Difference between business model and business planning, the business model canvas, Risks and Assumptions, Validation of business models, building solution demo and MVP, revenue streams and pricing strategies.

**UNIT – VI**

**Entrepreneurial Funding and Risk Management:** Bootstrapping, Angel Investors, Venture capitalists, Private equity funding, customer acquisition, return on equity and Break even analysis, Risk propensity Vs. Risk avoidance, Locus of control of entrepreneur, Risk estimation techniques, risk avoidance strategies.

**TEXT BOOKS:**

1. Adrian McEwen, Hakim Cassimally – “Designing the Internet of Things”, Wiley Publications, 2012
2. Hedman, J., &Kalling, T. (2003). The business model concept: theoretical underpinnings and empirical illustrations. European journal of information systems, 12(1), 49-59.
3. Cabrera, J. (2017). Modular Design Frameworks: A Projects-based Guide for UI/UX Designers.

**REFERENCE BOOKS:**

1. J. Chris Leach & Ronald W. Melicher “Entrepreneurial Finance, Fourth Edition”, South Western, Cengage Learning, 2012.
2. Robert D. Hisrich&VelandRamadani – “ Effective Entrepreneurial Management, Strategy, Planning, Risk Management, and Organization” , Springer, 2017.
3. Mæhlum, A. R. (2017). Extending the TILES Toolkit-from Ideation to Prototyping (Master's thesis, NTNU).
4. Norman, D. (2013). The design of everyday things: Revised and expanded edition. Basic books.

**SYLLABUS FOR B. TECH. IV YEAR II SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
FINANCIAL MARKETS AND SERVICES  
(OPEN ELECTIVE –III)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Code: 9ZC15**

**Prerequisite:** Banking Operations, Insurance and Risk Management

**Course Objectives:**

The objective of the course is to provide to students an understanding of Financial Markets, the major Institutions involved and the Services offered within this framework.

**Course Outcomes:**

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

1. Understand the financial structure and the financial sector reforms after 1991.
2. Identify the role of RBI and the Regulating and credit policies adopted by the RBI.
3. Analyze the role of Non-Banking financial institutions and the role of financial institutions in India.
4. Understand the role of regulatory bodies like SEBI and also to know the capital and money market instruments.
5. Understand about the asset fund based financial services
6. Expose to investment banking and merchant banking.

**UNIT-I**

**INTRODUCTION:** The structure of financial system, Equilibrium in financial markets, Indicators of Financial Development, Financial system and Economic Development, Financial Sector Reforms after 1991.

**UNIT-II**

**BANKING INSTITUTIONS:** Structure and Comparative performance, Functions and Role of RBI, Competition, Interest rates, Spread; Bank Capital Adequacy norms; Banking Innovations – BPLR to Base rate, Core Banking System, Financial Inclusion, Current rates: Policy rates, Reserve Ratios, Exchange rates, Lending/ Deposit rates.

**UNIT-III**

**NON BANKING FINANCIAL INSTITUTIONS:** Structure and functioning of Unit Trust of India and Mutual Funds, Growth of Indian Mutual funds and their Regulation, Role of AMFI. Performance of Non-Statutory Financial Organizations: IFCI, IRBI, NABARD, SIDBI and SFCs.

**UNIT-IV**

**FINANCIAL AND SECURITIES MARKETS:** -, Role and functions of SEBI, Structure and functions of Call Money Market, Government Securities Market – T-bills Market, Commercial Bills Market, Commercial paper and Certificate of Deposits; Securities Market – Organization and Structure, Listing, Trading and Settlement, SEBI and Regulation of Primary and Secondary Markets.

**UNIT-V**

**ASSET/FUND BASED FINANCIAL SERVICES:** Lease Finance, Consumer Credit and Hire purchase Finance, Factoring - Definition, Functions, Advantages, Evaluation, Forfeiting, Bills Discounting, Housing Finance, and Venture Capital Financing. Fee-based Advisory services: Stock Broking, Credit Rating.

**UNIT-VI**

**INVESTMENT BANKING AND MERCHANT BANKING:** Investment Banking: Introduction, Functions and Activities, Underwriting, Banker to an Issue, Debenture Trustees and Portfolio managers, Challenges faced by Investment Bankers. Merchant Banking: Definition, Merchant Banks Vs Commercial Banks, Services of Merchant Banks.

**TEXT BOOKS:**

1. L.M. Bhole: Financial Institutions and Markets, TMH, 2009.
2. E. Gordon, K. Natarajan: Financial Markets and Services, Himalaya Publishing House, 2013.

**REFERENCES:**

1. Vasant Desai: Financial Markets and Financial Services, Himalaya,2009
2. Pathak: Indian Financial Systems, Pearson, 2009
3. M.Y. Khan: Financial Services, TMH, 2009.
4. S. Gurusamy: Financial Services and System, Cengage,2009
5. Justin Paul and Padmalatha Suresh: Management of Banking and Financial Services, Pearson, 2009.

**SYLLABUS FOR B. TECH. IV YEAR II SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
CYBER SECURITY AND CYBER LAWS**

**Code: 9FC07**

**L T P C  
2 0 0 2**

**Course Objectives:**

1. To learn fundamentals of cryptography and its application to network security.
2. To understand network security threats, security services, and countermeasures.
3. To learn computer security, Internet, E-commerce and E-governance with reference to Free
4. Market Economy
5. To learn International Efforts relating to Cyberspace laws and Cyber crimes
6. To learn Law relating to electronic records and intellectual property rights in India
7. To understand ethical laws of computer for different countries.
8. To learn Penalties, Compensation and Offences under the Cyberspace and Internet in India
9. To learn Miscellaneous provisions of IT Act and Conclusions

**Course Outcomes:**

At the end of this course the student will be able to

1. Familiarize the cryptographic procedures and Understand its primitives
2. Outline Security policy in Legislation and Comprehend E-Commerce frame work, models and its associated threats
3. Justify the role of electronic signatures in E-Commerce and summarize the various laws relating to it.
4. Categorize international cyber laws and cyber crimes.
5. Explore Penalties, Compensation and Adjunction of violations of provisions of IT Act 2000
6. Classify and Outline the offences under the Cyberspace law and the Internet in India

**UNIT-I**

**Introduction to cyber Security, cryptography, Types of Attacks, Secrete Key Cryptography**

Introduction: Cyber attacks, Defense Strategies and Techniques Mathematical background for Cryptography: Modulo arithmetic, The greatest common divisor, Useful Algebraic Structures, Chinese Remainder Theorem Basics of Cryptography: Secret versus Public key Cryptography, Types of attacks, Elementary substitution Ciphers, Elementary Transposition Ciphers, Other Cipher Properties Secrete Key Cryptography: Product Ciphers, DES Construction, Modes of Operation, MAC and other Applications, Attacks, Linear Crypt analysis.

**UNIT-II**

**Introduction to Computer Security, Internet, E-commerce and E-governance with reference to Free Market Economy**

Definition, Threats to security, Government requirements, Information Protection and Access Controls, Computer security efforts, Standards, Computer Security mandates and legislation, Privacy considerations, International security activity, Conceptual Framework

of E-commerce: governance, the role of Electronic Signatures in E-commerce with Reference to Free Market Economy in India.

### **UNIT-III**

#### **Law relating to electronic records and intellectual property rights in India**

Legal aspects of Electronic records / Digital signatures, Cyber laws, the roles and regulations of Certifying Authorities in India, Protection of Intellectual Property Rights in Cyberspace in India.

### **UNIT-IV**

#### **International Efforts relating to Cyberspace laws and Cyber crimes**

International efforts related to Cyber laws, Council of Europe (COE) convention on Cyber Crimes.

### **UNIT-V**

#### **Penalties, Compensation**

Penalties, Compensation and Adjunction of violations of provisions of IT Act 2000 and judicial review.

### **UNIT-VI**

#### **Offences under the Cyberspace, Internet in India and Miscellaneous provisions of IT Act and Conclusions**

Some important offences under the Cyberspace law and the Internet in India, Other offences under the Information Technology Act in India, The role of Electronic Evidence and miscellaneous provisions of the IT Act.

### **TEXT BOOKS:**

1. Network security and Cryptography by Bernard Menezes CENGAGE Learning Publications, 2010.
2. Cyber Laws and IT Protection, Harish Chander, PHI, 2012.

### **REFERENCE BOOKS:**

1. Debby Russell and Sr. G.T Gangemi, "Computer Security Basics (Paperback)", 2ndEdition, O' Reilly Media, 2006.
2. Wenbo Mao, "Modern Cryptography – Theory and Practice", Pearson Education, New Delhi, 2006.
3. Cyberspace and Cybersecurity, George Kostopoulos, Auerbach Publications, 2012.
4. Cyber Forensics: A Field Manual for Collecting, Examining, and Preserving Evidence of Computer Crimes, Second Edition, Albert Marcella, Jr., Doug Menendez, Auerbach Publications, 2007.

**SYLLABUS FOR B. TECH. IV YEAR II SEM  
COMPUTER SCIENCE AND ENGINEERING (AI & ML)  
PROJECT**

**Code: 9L896**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>20</b>	<b>10</b>

**Prerequisite: All Courses till this Semester**

**Course Objectives:**

To enhance the knowledge on selecting a project, learn related tools and enhance programming and communication skills for employability.

**Course Outcomes:**

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

1. Estimate the human and physical resources required, and make plan for the development of Project.
2. Break down the Project into tasks and determine handover procedures.
3. Identify links and dependencies, and schedule to achieve deliverables.
4. Allocate roles with clear lines of responsibility and accountability with team spirit.
5. Design and develop the software or prototype using modern software tools wherever applicable to meet societal needs.
6. Present the Project done and submit the report.

A project shall be carried out by a group of students consisting of 2 to 3 in number in fourth year second Semester. This work shall be carried out under the guidance of the faculty assigned as internal guide and shall involve design, fabrication, software development or any other significant activity. This can be of interdisciplinary nature also.

Out of total 100 marks for project work (in the final year second Semester), 30 marks shall be for Internal Evaluation and 70 marks for the External Evaluation at the end of the Semester.

External Evaluation of the project (viva-voce) shall be conducted by a committee appointed by the Chief Superintendent. The committee consists of an external examiner, HOD, a Senior Faculty Member and Internal Guide.

Division of Marks for Internal Evaluation – 30 Marks

Division of Marks for External Evaluation – 70 Marks