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)

Yamnampet, 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	
				Total	**10**	**2**	**12**	**18**	**320**	**480**

B. Tech. CSE- Artificial Intelligence & Machine Learning

Course Structure Regulation - A22

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
				Total	**10**	**3**	**12**	**19**	**320**	**480**

B.Tech. CSE- Artificial Intelligence and Machine Learning

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II Year I Semester

Sl. No.	Course Category	Dept Course	Course Code	Course	L	T	P/ D	C	Max. Marks	
									CI E	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	HS	SMS	9ZC01	Business Economics And Financial Analysis	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	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	9EC62	Object Oriented Programming through Java Lab	0	0	4	2	40	60
9	PC	CSE-AI & ML	9LC61	Python Programming Lab and IT workshop	0	0	3	1.5	40	60
10	ES	EEE and ECE	9AC96	Basic Electrical and Electronics Lab	0	0	3	1.5	40	60
				Total	**14**	**5**	**12**	**22**	**360**	**540**

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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	BS	S&H	9HC16	Quantitative Aptitude and Logical Reasoning	3	0	0	3	40	60
6	HS	S&H	9HC03	Universal Human Values	3	0	0	3	40	60
7	PC	CSE-AI & ML	9LC62	R Programming Lab and Design and Analysis of Algorithms Lab	0	0	3	1.5	40	60
8	PC	IT	9FC63	Database Management Systems Lab	0	0	3	1.5	40	60
9	ES	CSE – AI &ML	9CC83	Computer Organization Lab	0	0	2	1	40	60
10	PS	CSE – AI &ML	9L484	Technical Seminar	0	1	0	1	100	--
				Total	**16**	**2**	**8**	**22**	**460**	**540**

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

B. Tech. CSE- Artificial Intelligence and Machine Learning

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III Year I Semester

Sl.No.	Course Category	Dept Course	Course Code	Course	L	T	P/D	C	Max. Marks	
									CIE	SEE
1	OE	MBA/ECE/EEE/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
				Total	**18**	**2**	**4**	**23**	**400**	**600**

B. Tech. CSE- Artificial Intelligence and Machine Learning

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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	--
				Total	**15**	**2**	**6**	**19**	**380**	**420**

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

B. Tech. CSE- Artificial Intelligence and Machine Learning

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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/EEE/ECE/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		PE -IV Lab	0	0	3	1.5	40	60
9	PS	CSE-AI &ML	9L792	Summer Industry Internship-II	-	-	-	1	40	60
				Total	**18**	**0**	**6**	**22**	**360**	**540**

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/EEE/ECE/ME		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
				Total	**5**	**0**	**20**	**15**	**120**	**180**

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)

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 Modelling Language **(9LC16)**	IT	Agile Software Development **(9FC16)**	CSE-DS	Business Intelligence (**9FC84)**
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
4	**Code**	**9EC42**	**9FC79**	**9EC43**
	CSE Stream	Programming in Java	Database Systems Concepts	Operating Systems Concepts
5	**Code**	**9CC36**	**9CC37**	**9CC38**
	ECE Stream	Fundamentals of digital circuits and Microprocessors	Fundamentals of Communication	Embedded Systems
6	**Code**	**9AC44**	**9AC45**	**9AC47**
	EEE stream	Fundamentals of Measurements and Instrumentation	Fundamentals of Renewable energy sources	Power Electronic Devices and Converters
7	**Code**	**9BC51**	**9BC52**	**9BC53**
	Mechanical Stream	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
	TOTAL		159	160

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
I – I	9HC07	**Engineering Physics**	2	1	0	3

Pre-requisites –Nil

Course Objectives:

1. ExplainQuantum Mechanics to understand wave particle duality, necessity of quantum mechanics to explore the behavior of sub-atomic 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, Hall effect andalso to understand the concept of PN-junction, I-V Characteristics, LED, Solar Cell and Photo diode.
6. To discuss nanotechnology, preparation techniques and characterization (XRD & TEM), CNTs.

Course Outcomes:

After completing the course, students are able to:

CO. No.	**CO Statement**	**Blooms Level**
CO1	Interpret the concept of quantum mechanics, Schroedinger wave equation and its application for one dimensional potential box.	L2
CO2	Explain the principle, construction and working of lasers and fiber optics along with their applications.	L2
CO3	Summarize the phenomenon of magnetism and superconductivity.	L2
CO4	Outline the concepts of dielectrics, polarization and apply the same for piezo, ferro and Pro-electricity.	L2, L3

CO5	Identify the nature of semiconductors and demonstrate the semiconductor devices.	L2, L3
CO6	Characterize the nano and bulk materials for various applications.	L3

UNIT-I: (CO1)

Wave nature of particles, Schroedinger equation and its application (8 Periods)

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: (CO2)

Lasers and Fiber Optics (6+6 Periods)

Lasers: Characteristics of LASER, Spontaneous and Stimulated Emission of Radiation, Einstein's Coefficients and their significance. Meta-stable State, Pumping, Population Inversion and Optical resonator. 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), optical Fiber communication system, Fiber Optic Sensors-Temperature sensor, Pressure sensor and Medical Endoscopy.

UNIT-III: (CO3)

Magnetism and Superconductivity.(5+4 Periods)

Magnetic Materials: Origin of Magnetic Moment-Bohr Magneton. Ferromagnetic domain, Magnetization process by using domain, B-H curve explanation based on Domain theory and important outcomes of the curve.Hard and Soft Magnetic Materials.

Super conducting Materials: General properties of Superconductors. Effect of Magnetic Field, Critical current density, Meissner effect, Penetration depth.Type-I and Type-II superconductors, BCS theory, Magnetic levitation.

UNIT-IV: (CO4) (8 Periods)

Dielectric materials: Electric Dipole, Dipole Moment, Dielectric Constant, Electric Susceptibility. Electronic, Ionic polarizability (Quantitative) and 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: (CO5) (5+5 Periods)

Semiconductors and Semiconductor devices

Semiconductors: Fermi Level in Intrinsic and Extrinsic Semiconductors. Carrier concentration of Intrinsic and Extrinsic Semiconductor (qualitative).Direct& Indirect Band Gap Semiconductors, 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: (CO6)

Nanomaterials and their fabrication: (**7 Periods)**

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

TEXT BOOKS:

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

REFERENCES:

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

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
I – I	9FC01	**Problem Solving Using C**	3	0	0	3

Pre-requisites –Nil

Course Objective:
Acquire **problem solving** and coding skills using C language.

Course Outcomes:

After completion of this course student will be able to:

CO1: Explain the basic computer concepts and illustrate programming principles of C language. [L2, L4]
CO2: Develop C programs to solve simple mathematical and engineering problems using decision control, loop statements, arrays and strings. [L3, L4]
CO3: Apply modular programming using functions to develop reusable code. [L3, L4]
CO4: Analyse memory-oriented concepts using pointers to implement inter function, functioncommunication, pointer arithmetic. [L4]
CO5: Describe file handling concepts using C. [L2]

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 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.
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 YashavantKanetkar

REFERENCES :

(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

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
I – I	9HC11	**Matrix Algebra and Calculus**	2	1	0	3

Pre-requisites – Mathematics Knowledge at Pre-University Level

Course Objectives:
To make the students to understand and expected to learn
1. The concepts of linear algebra
2. Differential calculus
3. Analytical solutions of ODE

Course Outcomes:
After the course completion the students will be able to:

CO1: Solve the linear system of equations. [L3]
CO2: Determine the eigenvalues and eigenvectors of the matrix and apply Cayley Hamilton theorem to obtain the higher powers of a matrix. [L3, L5]
CO3: Identify the nature of the quadratic form and reduction of the quadratic form to its canonical form. [L2]
CO4: Apply appropriate mean value theorems to obtain the mean values and find the power series expansion of a function. [L2, L3]
CO5: Solve the first order and higher order ordinary differential equations with constant coefficients. [L3]

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 ofEigen 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.

SUGGESTED READINGS:

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.

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
I – I	9HC01	**Essential English Language Skills**	2	0	0	2

Pre-requisites – Nil

Course Objectives:
To enable students to:
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 are 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:

CO1: Demonstrate competence with suitable accuracy in vocabulary, and language fluency.
CO2: State the definition of nouns, verbs, adjectives, and adverbs.
CO3: Identify the differences of each tense and use the tenses accurately.
CO4: Identify specialized reading strategies for specific types of texts
CO5: Produce written work that is substantive, organized, and grammatically accurate.

UNIT 1. Vocabulary-1:
1.1 Root words
1.2 Synonyms and Antonyms
1.3 Homonyms, Homophones and Homographs
1.4 One-word substitutes

UNIT 2. Vocabulary-2
2.1 Idioms and Phrases
2.2 Confusables

UNIT 3.Grammar-1
3.1 The Parts of Speech
3.2 Use of Articles
3.3 Omission of Articles

UNIT 4. Grammar-2
4.1 Tenses
4.2 Prepositions
4.3 Concord

UNIT 5. Reading & Writing

5.1 Techniques of Reading, Reading Comprehension

5.2 Kinds of Sentences

5.3 Punctuation

UNIT 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 Communicatioin 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 HemalathaNagarajan, Frank Bros. & Co.

SREENIDHI INSTITUTE OF SCIENCE AND TECHNOLOGY
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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
I – I	9HC61	**Oral Communication Lab – I**	0	0	2	1

Pre-requisites – Nil

Course Objectives:
To enable students to:
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 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:

CO1: Describe people, objects and situations using simple sentences.
CO2: Use appropriate tenses and expressions in different contexts of conversations.
CO3: Identify major areas of concern in their oral communication and address them.
CO4: Create a SMART plan to enhance their communication skills in English

UNIT-I
Communication Skills: Communication basics, essential elements of effective communication, barriers to communication, setting SMART communication goals.
Activities:
- Ice-breaking activities
- Personal Communication SWOT Analysis
- Communication Case Studies: The Terrible & The Terrific

UNIT-II

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

Activities:

- Odd Word Out
- Minimal Pairs Masti
- Shadow reading

UNIT-III

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

Activity: Role plays 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:

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

UNIT-V

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

Activities:

- Picture descriptions.
- Guessing games - listening to the descriptions.
- Narrating memorable incidents from life.
- Describe your ideal world
- Once upon a time……

UNIT-VI

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

Activities:

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

SUGGESTED READING & REFERENCES:

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

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
I – I	9HC66	**Engineering Physics Lab**	0	0	3	1.5

Pre-requisites – Engineering Physics

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.

Course Outcomes:

After completing the experiments, students are able to:

CO1: Demonstrate the concepts of photoelectric effect, total internal reflection,diffraction and dispersion of light.[L2]

CO2: Demonstrate the concepts of rigidity modulus, periodicity and oscillations.[L2]

CO3: Compare and contrast the Biot-Savart law with Oersted law and explain the concept of magnetostriction.[L4, L3]

CO4: Analyse the resonance, time constant, band gap and forward resistance of a semiconductor diode.[L4]

LIST OF EXPERIMENTS

1. Photoelectric effect - Planck's constant (CO1).
2. Dispersive power of a prism – Spectrometer (CO1).
3. Wavelength of laser using diffraction grating (CO1).
4. Numerical aperture of a given optical fibre (CO1).
5. Field along the axis of a circular coil - Stewart and gee's experiment (CO3).
6. Frequency of AC supply – Sonometer (CO3).
7. Study of series and parallel resonance of an LCR circuit (CO4).
8. Rigidity modulus of a metallic wire- Torsional pendulum (CO2).
9. Energy gap of a given semiconductor diode (CO4).
10. LED forward characteristics (CO4).
11. Time constant of RC-circuit (CO4).

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

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
I – I	9FC61	**Problem Solving using C Lab**	0	0	3	1.5

Pre-requisites – A course on Basic Mathematics

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 them in C.
4. To be able to effectively choose programming components.
5. To solve computing problems in the real world.

Course Outcomes:

After completion of this course student will learn:

1. Enumerate the algorithms for simple problems
2. Classify 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.

[The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.]

1. 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.

2. 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.

3. 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.

4. Unit II (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. $1+x+x^2+x^3+\ldots\ldots\ldots\ldots+x^n$, given x and n.
4. 1! + 2! + 3! + . . . + n!, given n.
5. $1 - x^2/2! + x^4/4! - x^6/6! + x^8/8! - x^{10}/10! + \ldots$ to n terms where the n^{th} term becomes less than 0.0001.

5. Unit II (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.

6. Unit III (Cycle 6)

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.

7. Unit III (Cycle 7)

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.

8. Unit IV (Cycle 8)

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^{th} 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.

9. Unit IV (Cycle 9)

1. a) Write a menu driven style program to compute the above functions (cycle 6) on the choice of the function given by the user.

b) Define macros for the following and use them to find sum of the squares of the minimum and maximum of two given numbers.

2.

a) Larger of two numbers.
b) Smaller of two numbers.
c) Sum of the squares of two numbers.
d) Write a program to generate Pascal's triangle.
e) Write a program to count the number of letters, words, and lines in a given text.

10. 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.

11. Unit VI (Cycle 11)

1. Write a program to: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.

12. Cycle 12:

Case study on Electricity Billing, Restaurant Billing System

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
I – I	9BC01	**Engineering Graphics**	1	0	4	3

Pre-requisites – Nil

Course objectives:

1. To teach students the basic principles of Engineering graphics and instruments used and construct curves.
2. To introduce the concept of projections in drawing and its applications for simple drawing entities ie points and lines.
3. To impart the knowledge of various types of planes and solids and their projections in different position wrtprinciple planes
4. To teach the concept of sections of solids and their developments.
5. To develop a clear understanding of the basic principles involved in three-dimensional Engineering drawings.
6. To teach conversion from three-dimensionaldrawing totwo-dimensionaldrawing and introduce the concepts of CAD.

Course outcomes:

After completing this course, the student will able to:

CO1: Outline the basics of Engineering Graphics,Curves and AutoCAD. [L2]
CO2: Interpret the concepts of orthographic and isometric projections of lines, planes and solids.[L2]
CO3: Draw the sections of solids and development of surfaces.[L1]
CO4: Develop orthographic views from isometric views and vice versa.[L3]

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 **Scales**(concepts)**:**RF,Reducing, Enlarging and Full Scales

Curves: Conic Sections including Rectangular Hyperbola - General method, Cycloid and Involutes of circle.

UNIT – II

Orthographic Projection: Principles of Projection – Methods of projection,First angle and third angle projections.

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 – 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: Introduction, 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.

Introduction to CAD: Benefits of CAD, Graphic input and output devices - Function performed by CAD Software, AUTOCAD-Drawing Entities, Editing commands.

TEXTBOOK:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House (In First-ANGLE PROJECTION METHOD)

REFERENCES:

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

3) AUTOCAD Software Theory and User Manuals

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
I – II	9HC04	**Engineering Chemistry**	2	1	0	3

Pre-requisites – Nil

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 this course, the student will be able to:

CO1: Explain the fundamental aspects of atomic, molecular orbitals and metal complexes[L2]
CO2: List general properties of polymers, lubricants and engineering materials [Ll]
CO3: Outline basic properties of water and its usage in domestic and industrial purposes[L2]
CO4: Summarize electrochemical procedures related to corrosion [L2]
CO5: Interpret potential applications of chemistry and practical utility of various organic reactions and drug molecules[L5]

UNIT-I

Atomic and molecular structure (6L)

Molecular orbitals of diatomic molecules and plots of the multicentreorbitals.Equations for atomic and molecular orbitals. Energy level diagrams of diatomics (F_2, Cl_2CO, 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. Fibers: 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, ozonization. **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)

REFERENCES:

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)

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
I – II	9EC01	**Data Structures**	3	0	0	3

Pre-requisites – Problem Solving using C

Course Objectives:

1. To provide the knowledge of structures, unions, enum and typedef.
2. To understand and learn the applications of Abstract data Type, linear data structures such as stacks, queues and linked list.
3. To comprehend different nonlinear data structures such as trees,graphs,heaps
4. To understand and analyze the concepts of various searching and sorting techniques.

Course Outcomes: After completion of this course student will be able to

CO1: Explain different data structures and select the appropriate data structure to develop applications.[L2, L3]
CO2: Illustrate various linear, non-linear data structures in developing applications.[L2, L3]
CO3: Demonstrate various hashing and collision resolution techniques for enhancing the performance of algorithms.[L3]
CO4: Assess the performance of various searching and sorting techniques.[L5]

UNIT-I

Structures: Introduction, types, initialization and accessing, Array of Structures, Nested Structures, Self-referential structures,

Unions: Unions, enum, typedef, Dynamic Memory allocation.

UNIT-II

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-III

Linked list: introduction, advantages of Linked list over Arrays.
Singly linked list: creation, insertion, deletion and display operations
Doubly linked list: creation, insertion, deletion and display operations
Circular singly linked list: creation, insertion, deletion and display operations, Implementation of Stacks and Queues with singly linked list.

UNIT-IV

Trees: Terminology, Binary Tree: types, representation and traversals (in-order, pre-order, post-order).

Binary Search Tree: introduction, operations (insertion, deletion, display)

AVL Trees: Definition, examples, and operations (insertion, deletion and searching).

UNIT-V

Searching: linear and binary search methods.

Sorting: Bubble Sort, Insertion Sort, Selection Sort, Quick sort, Merge sort, Performance analysis of Searching and Sorting Algorithms.

UNIT-VI

Graphs: terminology, representation, traversals (DFS and BFS).

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

Hashing: Hash Table, Hash functions.

Collision resolution techniques: separate chaining, open addressing-linear probing, quadratic probing, double hashing.

TEXTBOOKS:

1. Data Structures Using C second edition by ReemaThareja, Oxford university press
2. Data Structure through C by YashavantKanetkar.

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.

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
I – II	9HC12	**Advanced Calculus**	2	1	0	3

Pre-requisites – Mathematics Knowledge at Pre-University Level

Course Objectives:
To make the students to understand and expected to learn
1. The concepts of multivariable calculus,
2. Fourier series
3. Vector calculus

Course Outcomes:
After the course completion the students will be able to:

CO1: Compute the Jacobian transformation, the extreme values of a multivariable function and solve the first order linear and non-linear PDEs.[L2, L3]
CO2: Evaluate double integrals using change of order of integration and change of variables triple integrals.[L3,L5]
CO3: Determine Fourier series expansion of a function over the interval. [L5]
CO4: Find directional derivative and solve the problems online, surface and volume integrals. [L1, L3]

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& 2π. 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.

SUGGESTED READINGS:

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.

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
I – II	9AC48	**Basic Electrical and Electronics Engineering**	3	0	0	3

Pre-requisites – Nil

Course Objective:

Understand the concepts of Electrical engineering and their applications.

Course Outcomes:

After studying this course, the student will be able to

- **CO1:** Apply the principles of electrical circuits and DC generation with basic equations.[L3]
- **CO2:** Illustrate the working principles of DC and three phase AC motors.[L2]
- **CO3:** Analyze the construction and working principles of diode, various transistors with applications.[L4]
- **CO4:** Use numbering systems to solve Boolean expressions.[L3]

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.2nd 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.
Electronic Devices and Circuits, Millman&Halkias, TMH publications.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
I – II	9HC62	**Oral Communication Lab - II**	0	0	3	1.5

Pre-requisites – Oral Communications Lab- I

Course Objectives:

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.

Course Outcomes:
At the end of this co urse, the student will be able to:

CO1: Strike a conversation and engage in effective small talk.
CO2: Lose stage fear and confidently interact with others in different roles and tap their creative side.
CO3: Speak for a minute, fluently and cohesively.
CO4: Make official presentations with effective use of PPTs.
CO5: Engage in group discussions in a confident and professional manner.
CO6: Shed fear of questions from the audience and the interviewers.

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 andpractice activities on initiating informal conversations.

- Talk about your favourite things.
- Interview each other.

UNIT-II
Role Play/skit/one act play

- Role play assuming fictional characters and non-fictional characters.
- One Act plays
- 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:

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

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
I – II	9HC64	**Engineering Chemistry Lab**	0	0	3	1.5

Pre-requisites – Nil

Course Objective:
Enable the learners to get hands-on experience on the principles discussed in theory sessions and to understand the applications of these concepts in engineering.

Course Outcomes:

At the end of this co urse, the student will be able to:

CO1: Estimate the hardness and chloride in water. [L5]
CO2: Determine strength of acid by potentiomeric and conductometric methods. [L5]
CO3: Demonstrate preparation of polymer, aspirin and inorganic compound. [L2]

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 (FeSO4 Vs KMNO4 / HCl Vs NaOH)
9. Determination of the rate constant of acid catalyzed hydrolysis of methylacetete
10. Synthesis of a polymer- Thiakol rubber / Urea-Farmaldehyde resin
11. Synthesis of a drug- Aspirin
12. Estimation of Mn^{+7} by Colorimetry method

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
I – II	9EC61	**Data Structures using C Lab**	0	0	3	1.5

Pre-requisites – Problem Solving using C Lab

Course objectives:

1. Create programs on structures and unions
2. Develop the programs on Linear and Non-Linear data structures
3. Write programs on various searching and sorting algorithms.

Course Outcomes:

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

CO1: Develop programmes to illustrate various linear and non-linear data structures using C language. [L3]

CO2: Develop programmes to assess the performance of various searching and sorting techniques using C language. [L3,L5]

Note: lab projects will be allocated to the students at the beginning of the semester.

Cycle 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.

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.

Cycle 2:

Write a C program that implement stack and its operations using arrays

Write a C program that implement Queue and its operations using arrays.

Write a C program that implement Circular Queue and its operations using arrays.

Cycle 3:

Write a C program that uses Stack operations to perform the following:

Converting infix expression into postfix expression

Evaluating the postfix expression

Cycle 4:

Write a C program that uses functions to perform the following operations on singly linked list: Creation ii) Insertion iii) Deletion iv) Traversal

Cycle 5:
Write a C program that uses functions to perform the following operations on doubly linked list:
Creation ii) Insertion iii) Deletion iv) Traversal in both ways

Cycle 6:
Write a C program using functions to perform the following operations on circular singly linked list:
Creation ii) Insertion iii) Deletion iv) Traversal

Cycle 7:
Write a C program to implement operations on the following Data Structures Using Singly linked list:
i) Stack ii) Queue

Cycle 8:
Write a C program that uses functions to perform the following:
Creating a Binary Search Tree.
Traversing the above binary tree in pre-order, in-order and post-order.

Cycle 9:
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:
Linear Search ii) Binary Search

Cycle 10:
Write C programs that implement the following sorting methods to sort a given list of integers in ascending order:
Bubble Sort ii) Insertion Sort iii) Selection Sort

Cycle 11:
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

Cycle 12:
Lab Projects- Design and Develop Case Studies such as,Graph Traversal Techniques, Collision Resolution Techniques.
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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
I – II	9BC61	**Workshop / Manufacturing Processes Lab**	0	1	3	2.5

Pre-requisites –Nil

Course Objective:

Impart knowledge and skill to use tools, machines, equipment, and measuring instruments.

Course Outcomes:

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

1. Demonstrate and make use of the workshop tools for Fitting, Carpentry, Welding, Casting, Smithy, Moulding, Glass cutting and Electric connections [L2]
2. Design and Fabricate jobs with wood, MS flat, GI Sheet material [L3]

LIST OF EXPERIMENTS

S.No	Trades	Experiment name
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. Cross Half Lap joint 4. Half Lap Dovetail joint
3	Electrical & Electronics	5. One lamp one switch 6. Stair-case wiring
4	Welding	7. Practice of Lap and Butt joint by Arc welding
5	Casting	8. Preparation of mould cavity using solid pattern 9. Preparation of mould cavity using split pattern
6	Tin Smithy	10. Preparation of Rectangular Tray 11. Preparation of Square box
7	Plastic moulding & Glass Cutting	12. Injection Moulding 13. Glass Cutting with hand tools
8	Machine Shop (Demonstration only)	14.Demonstration of Turning, Drilling and grinding operations on Lathe, Drilling and grinding machines

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
II – I	9EC02	**Object Oriented Programming Through Java**	2	1	0	3

Pre-requisites – Data Structures

Course Objective:

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

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

CO1: Illustrate the concept of object-oriented programming in Java [L2]
CO2: Apply AWT/SWING controls and applets to develop applications [L3]
CO3: Utilise multithreading and execution handling concepts to build efficient applications[L3]
CO4: Develop applications using I/O streams, packages and collections framework [L3]
CO5: Build client-server applications [L3]

UNIT-I

History of Java, Java buzzwords, datatypes, 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: DataInputStream, DataOutputStream, FileInputStream, FileOutputStream, BufferedReader.

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, JScrollbars, 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, Pearsoneducation.

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

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
II – I	9HC15	Probability And Statistics	2	1	0	3

Pre-requisites – Mathematics Knowledge at Pre-University Level

Course Objective:
Introduce the fundamental concepts of various probability distributions, including discrete and continuous distributions; provide an understanding of sampling distributions and their importance in statistical inference. Teach inferential statistics, including estimation, hypothesis testing, and decision-making based on data. Also explore the concepts of correlation and regression to analyze relationships between variables and predict outcomes.

Course Outcomes:
After the course completion the students will able to:

- **CO1:** Make Use of the probability distributions to obtain mean and Standard deviation of a random variable. [L3].
- **CO2:** Compute the Sampling distribution of a statistic and estimate the population parameter. [L2, L3]
- **CO3:** Test the hypothesis based on the large and small samples. [L4]
- **CO4:** Calculate Correlation coefficient using Karl Pearson's formula and Spearman's rank correlation. [L3]
- **CO5:** Construct a curve by least squares method and find the regression lines. [L3]

UNIT-I
Random Variables and Probability Distributions: Random variables – Discrete and Continuous, probability mass and density functions, expectation and variance. Binomial, Poisson and Normal Distributions.

UNIT-II
Sampling Distributions and Estimation: Sampling distribution of the mean (σ - 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 χ^2 test-Goodness of fit, Independence of Attributes.

UNIT-V

Correlation: Types of correlation, coefficient of correlation, Properties. Methods of finding the coefficient of correlation, Scatter diagram, direct method - Karl Pearson's formula Spearman's rank correlation,

UNIT-VI

Curve fitting and Regression: 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.

Suggested Readings:

1. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
2. Miller and Freund's, Probability and Statistics for Engineers, 8th Edition, Pearson Educations
3. S C Gupta and V K Kapoor, Fundamentals of Mathematical statistics, Khanna publications.

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
II – I	9ZC01	Business Economics And Financial Analysis	3	0	0	3

Pre-requisites – Nil

Course Objective:

To make the students understand the concepts and principles of Business Economics for decision-making at the firm level and also to analyze the Business from the Financial Perspective

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

CO1: Explain the Basics of Economics and its relation to Business Economics - (L1)-U1
CO2: Analyze the production function in terms of cost and revenue – (L4) -U2
CO3: Examine the basic market structures and their relevance to business – (L1) -U3
CO4: Outline the fundamentals of financial accounting and prepare financial statements – (L5) - U4&U5
CO5: Apply financial ratios to analyze the financial performance of the company – (L3) -U6

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, and 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 BOOKS:

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

REFERENCES:

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.

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
II – I	9FC02	**Python Programming**	2	1	0	3

Pre-requisites – Knowledge of C programming

Course Objectives:
Use Python interactively, execute a Python script at the shell prompt, use Python types, expressions, and None, use string literals and string type, use Python statements (if...elif..else, for, pass, continue, . . .), understand the difference between expressions and statements, understand assignment semantics, write and call a simple function., utilize high-level data types such as lists and dictionaries, understand the difference between mutable and immutable types, write a simple class and access methods and attributes, import and utilize a module, read from and write to a text file.

Course Outcomes:
At the end of this course the student will be able to:

CO1: Outline the basic concepts of Python, illustrate syntax and semantics of Python. [L1&L2]
CO2: Infer components of function demonstrate functionalities of string, list, tuples and dictionary to build application. [L2&L3]
CO3: Make use of files built in modules and packages by exploring its functions in building specific application. [L3]
CO4: Examine Python oop concepts and identify motives or causes of different exceptions and handling them. [L4]
CO5: Develop the skills for data processing and GUI designing in Python. [L6]

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)

REFERENCES:
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.

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
II – I	9F303	**Discrete Mathematics**	2	1	0	3

Pre-requisites – 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. Demonstrate 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, Students will be able to:

CO1: Interpret mathematical arguments and identify fallacious reasoning. [L2]
CO2: Describe predicates and effectively use automatic theorem proving. [L2]
CO3: Demonstrate operation on sets, functions, relations. [L2]
CO4: Solve problems that involve computing permutations and combinations,Binomial and Multinomial theorems. [L3]
CO5: Analyse and deduce problems involving recurrence relations and generating functions. [L4]
CO6: Apply graph theory Spanning trees, planar graph,Isomorphism and connectivity. [L3]

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, and Automatic theorem proving.

Objective: student will be able to understand statements, ,their truth value, constructing truth tables and will be able to prove them using different laws such as associative and commutative etc…

UNIT-II

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

Objective: student will be able to use universal and existential quantifiers to describe predicates and effectively use 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, Ring, Homomorphism, Isomorphism.

Objective: student will be able to learn different relations and their properties. use of different algebraic structures and their use in mathematics.

UNIT-IV

Elementary Combinatorics:

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

Objective: student will be able to apply permutations and combinations to solve problems. use of pigeonhole principle and inclusion exclusion principles to solve problems.

UNIT-V

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

Objective:student will learn to solve various recurrence relations by using different techniques.

UNIT-VI

Graph Theory: Basic concepts**,** Representation of Graph, DFS, BFS, Spanning trees, Planar graphs, coloring, Isomorphism and subgraphs, Multi graphs andconnected graphs, Euler Circuits, Hamiltonian graphs, Chromatic numbers,.

Objective: student will learn the basics of graph theory, different ways of traversing the graph and different types of graphs and circuits which has important applications in further subjects.

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:

1.Discrete and Combinational Mathematics- An Applied Introduction-5th 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.

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
II – I	9HC05	**Environmental Science**	3	0	0	0

Pre-requisites – Nil

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 this course, student will be able to:

CO1. Demonstrate ecological principles and natural resources.[L2]
CO2. Interpret biodiversity and environmental pollution. [L5]
CO3. Develop technologies based on environmental regulations which inturn help in sustainable development. [L6]

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, Biomagnification, 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 BOOKS:

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

REFERENCES:

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.
6. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
II – I	9HC63	**Soft Skills Lab**	0	1	2	2

Pre-requisites – Nil

Course objectives:
1. make self-assessment.
2. know the importance of certain soft skills like time management and goal setting.
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:

CO1: Assess themselves and develop soft skills for employability and lifelong learning.[L3, L5]
CO2: Demonstrate values and equity in their personal and professional lives.[L2]

UNIT-1
- 1.1 Introduction to soft skills
- 1.2 SWOT / SWOC Analysis
- 1.3 SWOT / SWOC Grid
- 1.4 Johari window

UNIT-2
- 2.1 Emotional intelligence
- 2.2 Time management
- 2.3 Goal Setting

UNIT-3
- 3.1 Attitude
- 3.2 Professional etiquette & Grooming

UNIT-4
- 4.1 Styles of Communication
- 4.2 Inter-personal Skills
- 4.3 Teamwork, Team building
- 4.4 Leadership Skills

UNIT-5
- 5.1 Problem Solving & Decision making
- 5.2 Critical & Creative thinking

UNIT-6

6.1 Values : Personal, Social & Cultural

LAB (2 PER WEEK)

UNIT-1

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

UNIT-2

Activities :

- big picture challenge
- Goal setting charts

UNIT-3

Practice activities on

- Attitude
- Professional etiquette & Grooming

UNIT-4

- Activities on social skills
- Role Plays
- Team building activities

UNIT-5

Practice activities on

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

UNIT-6

Practice activities

- Role Plays

TEXT BOOK:

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

REFERENCES:

***** SOFT SKILLS – MeenakshiRaman ; * Step Ahead with Soft Skills - Oxford University Press ; * Skill Sutras- JayashreeMohanraj * The Power of Soft Skills – Robert A. Johnson ; * Soft Skills for Everyone – Jeff Butterfield

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
II – I	9EC62	**Object Oriented Programming Through Java Lab**	0	0	4	2

Pre-requisites – Data Structures

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:

CO1: Develop programs by applying the concepts of object-oriented programming to solve mathematical and engineering problems.[L2,L3]

CO2: Build robust applications using multithreading, exception handling, and collections framework with GUI and network programming.[L2,L3]

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 equationax2+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

To display name and address

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 define a method to display it. Change the main method appropriately.

C) In the 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

withoutargument)

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 (intaccno) In each and every method of Account class, reading data from and writing data to instance variables should be done through these variables.

3. A) 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

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.

B) 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 overriding.

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 "Geometric Shape" with methods area( ) and perimeter( ) (Both method's return type and parameter list should be void and empty respectively.

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 "searchingapp" 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 issued.

Define a class ExecutePackage 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.

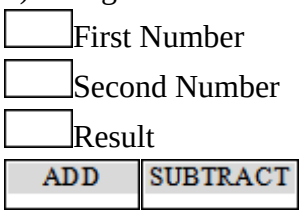
7) Modify the withdraw() method of Account class such that this method should throw "Insufficient Fund Exception" if the account holder tries to withdraw an amount that leads to condition where current balance becomes less than minimum balance otherwise allow the account holder to withdraw and update the balance accordingly.

8.A)Define two threads such that one thread should print even numbers and another thread should print odd numbers.

B) Define more than one thread to print tables using 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).

9) Design the user screen as follows and handle the events appropriately.



10)Write a Java program for handling mouse events and key events.

11)a) Write a program for handling window events.

b) Develop an applet that displays a simple message.

12)Develop a client that sends data to the server and also develop a server that sends data to the client (two-way communication)

13, 14) Develop Lab projects (such as banking application, simple gaming application, scientific calculator, Client-Server Communication in corporating file handling mechanisms, etc.)

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
II – I	9LC61	**Python Programming Lab And IT Workshop**	0	0	3	1.5

Pre-requisites – Nil

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? (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:defdo_twice(f):f()f()

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

```
defprint_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.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
II – I	9AC96	**Basic Electrical and Electronics Lab**	0	0	3	1.5

Pre-requisites – Basic Electrical and Electronics Engineering

Course Objective:
Teach students how to analyse and construct electrical and electronic circuits.

Course Outcomes:
After completing this course, the students will be able to:

CO1: Examine the performance of DC machines and AC machines.[L4]

CO2: Illustrate the principles circuit theorems.[L2]

CO3: Examine the principle of operation of diode and its applications.[L4]

CO4: Analyze the principle of operation of transistor.[L4]

CO5: Develop the principles of verification of logic gates.[L3]

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-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
II – II	9CC56	**Computer Organization And Architecture**	2	0	0	2

Pre-requisites – Nil

Course Objectives:

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

Course Outcomes:

After completing this course, student should be able to :

CO1: Interpret the number system and the structure of computer along with the instruction set and Register transfer language. [L2-U1, U2, U3]
CO2: Distinguish micro-programmed and hard-wired control units. [L3-U3]
CO3: Explain 8086 microprocessor architecture and develop programming. [L2, L3- U4, U5, U6]
CO4: Develop the various interfacing circuits with 8086 microprocessor. [L3-U6]

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-Various 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, 2nd Edition, 1999.

REFERENCES:

1.Computer Organization and Architecture – William Stallings Sixth Edition, Pearson

2.Micro computer systems, The 8086/8088 Family Architecture, Programming and Design – Y.Liu and G.A. Gibson, PHI, 2nd Edition.

3.Advanced micro processorand Peripherals – A.K.Ray and K.M.Bhurchandi, TMH, 2000.

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
II – II	9FC04	**Database Management Systems**	3	0	0	3

Pre-requisites – Nil

Course Objectives:

1. Understand the different issues involved in the design and implementation of a database system.
2. Learn physical and logical database designs, database modeling, 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 modeling, designing, and implementing a DBMS.

Course Outcomes:
After completion of this course student will learn to:

CO1: Illustrate the basic concepts of DBMS, ER model and ER diagrams. [L3]
CO2: Implementing queries using SQL and applying the Relational algebra and Calculus to define expressions for queries in Databases. [L3]
CO3: Apply normalization techniques to improve the database design.[L3]
CO4: Utilise principles of transaction management to ensure data consistency and Concurrency Control in multi-user database environments. [L3]
CO5: Analyse External Storage Organization mechanisms and apply Indexing in databases for query optimization to enhance system performance.[L4]

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 Modeling 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 NormalForm.

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 nonvolatile 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 IndexStructure.

Application – Creating B+ tree on InstructorFile.

TEXT BOOKS:

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

REFERENCES:

1. Data base Systems design, Implementation, and Management, Peter Rob and Carlos Coronel 7thEdition.
2. Fundamentals of Database Systems, ElmasriNavratePearsonEducation
3. Introduction to Database Systems, C.J.DatePearsonEducation

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
II – II	9EC16	**Introduction To Data Science**	3	0	0	3

Pre-requisites – Python Programming, Probability and Statistics

Course Objectives:
Learn concepts, algorithms, techniques and tools to analyze the data, data modelling and visualization of data.

Course Outcomes:
After completion of the course, the student should be able to:

CO1: Explain different levels of Data, various Datasets and demonstrate mathematical models for representation. [L2, L3]-U1, U2
CO2: Summarize and apply the statistical techniques to test the sampling distributions and their goodness. [L2, L3]-U2, U3
CO3: Apply Array handling, Data Manipulation techniques on various datasets and analyze using Visualization techniques. [L3, L4]-U4
CO4: Explain different error handling techniques on data [L2]-U5
CO5: Classify and explain different Machine Learning Techniques. [L2]-U6

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.

REFERENCES :

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.

SREENIDHI INSTITUTE OF SCIENCE AND TECHNOLOGY
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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
II – II	9EC04	**Design And Analysis Of Algorithms**	2	1	0	3

Pre-requisites – Data structures

Course Objectives:

Understand various algorithmic techniques to design different applications.

Course Outcomes:

After completion of this course student will be able to:

CO1: Outline the running times of algorithms using asymptotic analysis. [L1]-U1
CO2: Assess the performance of applications solved using divide and conquer method. [L5]-U2
CO3: Analyze greedy method, dynamic programming and their applications. [L4]-U3, U4
CO4: Analyze the Backtracking, Branch and Bound methods, their applications and explain the concept of P and NP Problems. [L4]-U5, U6

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, Connected and Bi-connected Components.
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, 0/1 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.
Applications: Routing Algorithms in the computer networking

UNIT-V

Backtracking: General method, **Applications-**n-queen's problem, sum of subsets problem, graph colouring, Hamiltonian cycles, Maze generation Problem
Applications: Undo in MS-Word, Games

UNIT-VI

Branch and Bound: General method, **Applications -** Travelling sales person problem,0/1 knapsack problem- LC Branch and Bound solution, FIFO Branch and Bound solution.
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.

TEXT BOOKS:

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.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
II – II	9HC16	**Quantitative Aptitude and Logical Reasoning**	3	0	0	3

Pre-requisites – Nil

Course objectives:

1. Answer general problems in his everyday life within in short time
2. Improve the certain skills of a student such as numerical and logical ability, mental capacity.

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

CO1: Solve logical thinking and analytical related problems and thereby develop their employability skills to face the real-world scenario[L3]

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.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
II – II	9HC03	**Universal Human Values**	3	0	0	3

Pre-requisites – Nil

Human Values Courses: 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. During the Induction Program, students would get an initial exposure to human values through Universal Human Values – I. This exposure is to be augmented by this compulsory full semester foundation course.

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:

CO1: Interpret an understanding of holistic perspective using self-exploration, natural acceptance and basic human aspirations.[L2]

CO2: Observe and practice harmony about self, family, society, nature and existence.[L1,L6]

CO3: Operate themselves on the above holistic understanding and professional ethics.[L3]

UNIT-I
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.

UNIT-II
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.

UNIT-III
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.

UNIT-IV
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.

UNIT-V

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

UNIT-VI

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:

a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers

b. 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.

REFERENCES :

1. JeevanVidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, 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 – Pandit Sunderlal
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)

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
II – II	9LC62	**R Programming Lab And Design And Analysis Of Algorithms Lab**	0	0	3	1.5

Pre-requisites – Nil

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.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
II – II	9FC63	**Database Management Systems Lab**	0	0	3	1.5

Pre-requisites – Nil

Course Objective:

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 this course, the student will be able to:

CO1: Infer database language commands to create simple database and analyze the database using queries to retrieve records. [L3]
CO2: Applying PL/SQL for processing database. [L3]

EXERCISES

1. Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints.
   Example: - Select the roll number and name of the student who secured fourth rank in the class.
3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping ofViews.
4. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char,to_date)
5. i)Creation of simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)
   ii)Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQLblock.
6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.

7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE-APPLICATION ERROR.
8. Programs development using creation of procedures, passing parameters IN and OUT Of PROCEDURES.
9. Program development using creation of stored functions, invoke functions in SQL Statement and write complex functions.
10. Program development using creation of package specification, package bodies, private objects, package variables and cursors and calling stored packages.
11. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
12. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers.
13. Queries using SQL-INJECTION: AND/OR Attack, Comments Attack, String Concatenation Attack, UNION Injection Attack

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 Mc-Graw Hill.
3) SQL and PL/SQL for Oracle 10g, Black Book, Dr. P. S.Deshpande.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
II – II	9CC83	**Computer Organization Lab**	0	0	2	1

Pre-requisites – Nil

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, 2nd Edition, 1999.

REFERENCES:

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, 2nd Edition.
3. Advanced microprocessor and Peripherals – A.K.Ray and K.M.Bhurchandi, TMH, 2000.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
II – II	9L484	**Technical Seminar**	0	1	0	1

Pre-requisites – Nil

Course objectives
Develop an ability to understand and present the latest technological developments in the relevant field to enhance oratory and interview-facing skills.

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

CO1: Identify topics related to relevant domains or disruptive technologies. [L3]
CO2: Survey and organize technical content in presentable form. [L4 & L3]
CO3: Interpret effectively in technological know-how. [L5]

Procedure:

1. Seminar In-charge shall highlight the significance of the Technical Seminar in the first two sessions and enlighten the students on the utility of these seminars.
2. The slots and titles shall be decided upfront and the seminar In-charge shall take signatures from students.
3. The same sheet shall be affixed to the respective classrooms and seminar register.
4. If any student fails to present his/her seminar in the given slot, for genuine reasons, they may be asked to present in the subsequent slot/week.
5. Progress of the seminars needs 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. The report and presentation must contain a topic, introduction, explanation, diagrams, tables, applications, and conclusions.

There shall be a technical seminar evaluated for 100 marks. The evaluation is purely internal and will be as follows:

Sl. No	Description	Marks
1	Literature survey, topic, and content	10
2	Presentation including PPT	10
3	Seminar Notes	05
4	Interaction with the audience after the presentation	05
5	Final Report 3 copies	10
6	Classroom participation	05
7	Punctuality in giving a seminar as per the Scheduled time and date	10
8	Mid Semester Viva (on the seminar topics completed up to the end of the 9^{th} week	15
9	End Semester Viva	30
	Total	**100 Marks**

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

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III – I	**9ZC05**	**Banking Operations and Insurance** (Open Elective-I)	3	0	0	3

Pre-requisites – Nil

Course Objective:
To make the students understand the concepts and principles of Indian Banking and Insurance Business and the role of RBI in regulating the Indian Financial System.

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

CO1: Describe the Indian Banking System and banking regulation. [L1]-U1, U2
CO2: Explain the role of RBI as a regulator of Indian Banking. [L2]-U3
CO3: Describe the new dimensions and products served by the banking system in INDIA. [L1]-U4
CO4: Examine the role of Insurance industry, its regulatory and legal framework of IRDA. [L3]-U5, U6

UNIT-I
INTRODUCTION TO BANKING BUSINESS: Introduction to banking services - History of banking business in India, Structure of Indian banking system: Types of accounts, advances and deposits in a bank, KYC norms.

UNIT-II
BANKING REGULATIONS: 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
CREDIT CONTROL BY RBI: Definition, Objectives of Credit Control, Quantitative methods of Credit Control by RBI: Bank Rate Policy, Open Market Operations, Variation of Reserve Ratio, Qualitative methods of Credit Control by RBI: Fixation of Margin Requirements, Regulation of consumer Credit, Rationing of Credit, Direct Action, Moral Suasion and Publicity

UNIT-IV

NEW DIMENSIONS IN BANKING: Financial Inclusion – Microfinance, E-Banking: Mobile-Banking, Net Banking, Digital Banking, Artificial Intelligence in Banking, CIBIL Score, Negotiable Instruments: Cheque Truncation system.

UNIT-V

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

UNIT-VI

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.

TEXT BOOKS:

1. Varshney, P.N., Banking Law and Practice, Sultan Chand & Sons, New Delhi.
2. General Principles of Insurance Harding and Evantly
3. Mark S. Dorfman: Risk Management and Insurance, Pearson, 2009.

REFERENCES:

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

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III – I	9ZC22	**Basics of Entrepreneurship** (Open Elective-I)	3	0	0	3

Pre-requisites – Nil

Course Objective:
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-ups

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

CO1: Demonstrate the basic knowledge and skill set required for entrepreneurship. [L2]-U1
CO2: Distinguish business models and their validation in entrepreneurship. [L4]-U2, U3
CO3: Examine cost and financial structures and decide suitable pricing strategies. [L4]-U3
CO4: Relate team building and project management styles to project management and entrepreneurship. [L2]-U4, U5
CO5: Identify different marketing strategies and understand business regulations for start-ups. [L3]-U6

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.

TEXT BOOKS:

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
3. Alfred E. Osborne, Entrepreneur's Toolkit, Harvard Business Essentials, HBS Press, USA, 2005.
4. MadhurimaLall, ShikhaSahai, Entrepreneurship, Excel Books, First Edition, New Delhi, 2006.

REFERENCES:

1. S.S. Khanka, Entrepreneurial Development, S. Chand and Company Limited, New Delhi, 2007.
2. H. Nandan, Fundamentals of Entrepreneurship, Prentice Hall of India, First Edition, New Delhi, 2007.
3. 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.
4. *https://www.wfglobal.org/*
5. *https://www.learnwise.org/#/IN/en/home/login,*

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III – I	9ZC08	**Design Literacy and Design Thinking** (Open Elective-I)	3	0	0	3

Pre-requisites – Nil

Course Objective:

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:

After completion of this course student will be able to:

CO1: Outline the inputs and concepts required for design thinking. [L1]-U1, U2
CO2: Illustrate the techniques of idea generation and phases of design thinking. [L4] – U3, U4
CO3: Construct the new product design process. [L3] – U4
CO4: Apply the various design thinking tools for service design. [L3] – U5
CO5: Demonstrate the case studies related to design thinking. [l2] – U6

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. BalaRamadurai, Indian Institute of Technology, Madras.

WEBSITES:

1. **www.smashingmagazine .com**
2. **www.ID**

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III – I	9CC36	**Fundamentals of digital circuits & Microprocessors**(Open Elective-I)	3	0	0	3

Pre-requisites – Nil

Course objectives:
To develop the skills for understanding the design of digital circuits, learn programming skills for 8086 Microprocessor and interfacing peripherals to it.

Course Outcomes:
After studying this course, the students will be able to:

CO1: Apply the rules of Boolean algebra to simplify Boolean expressions using theorems and K-maps and to understand number systems **(L3- Unit I)**
CO2: Design the combinational circuits such as full adders, multiplexers, decoders, and encoders. Code converters etc. **(L4- Unit II)**
CO3: Build the basic memory units (latches and flip-flops) and sequential circuits **(L3-UnitIII)**
CO4: Discuss Architecture, Instructions, and I/O devices interfacing of 8086 and analyzing in single mode and in multi-processor mode. **(L2-- Unit IV, V & VI)**

UNIT-I

Number System and Boolean Algebra: Binary, decimal, octal, hexa decimal, weighted, and un-weighted codes. Axiomatic definition of Boolean algebra, Binary operators, postulates of and theorems. Boolean addition, subtraction, 1's complement, 2's complement. Switching functions, Canonical forms and Standard forms, Simplification of switching functions using theorems. K-map representation, simplification of logic functions using K-map.

UNIT-II
Combinational Logic Design: Single output and multiple output combinational logic circuit design, Binary adders/subtractors, Encoder, Decoder, Multiplexer, Demultiplexer, Parity bit generator, Code-converters.

UNIT-III
Sequential circuits: Classification of sequential circuits, the clocked SR flip flop, J- K, T and D-types flip flops, triggering mechanism of flip-flops, flip-flop conversion, introduction to counters and registers

UNIT-IV

Architecture of 8086 Microprocessor: Memory segmentation, BIU and E.U General Purpose registers, 8086 flag register and function of 8086 Flags, Pin diagram of 8086-Minimum mode and maximum mode of operation.

UNIT-V

Instruction set of 8086: Addressing modes of 8086, Assembly directives, Simple programs. Assembly language programs: involving logical, Branch & Call instructions, sorting.

UNIT-VI

Interfacing with 8086: Interfacing with RAM, ROM, 8255 PPI – Interfacing with keyboard, ADC and DAC Stepper Motor.

TEXT BOOKS:

1. Morris Mano-, Digital design –PHI, 2nd Edition.
2. ZviKohavi and Niraj K Jha -Switching & Finite Automata theory – Cambridge, 3rd Edition.
3. Microprocessors and interfacing – Douglas V. Hall, TMH, 2nd Edition, 1999.
4. Advanced microprocessor & Peripherals - A.K.Ray&K.M.Bhurchandi, TMH, 2000.
5. Fletcher -An Engineering Approach to Digital Design – PHI.
6. Fundamentals of Logic Design, Roth, Kenny, Seventh Edition, Cengage Learning
7. R.P.Jain-Switching Theory and Logic Design- TMH Edition,2003.
8. CVS Rao -Switching Theory and Logic Design –Pearson Education, 2005
9. Microcomputer systems, The 8086/8088 Family Architecture, Programming and Design – Y.Liu and G.A. Gibson, PHI, 2nd Edition.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III – I	9AC44	**Fundamentals Of Measurements & Instrumentation** (Open Elective-I)	3	0	0	3

Pre-requisites – Nil

Course Objective:
The basic principles of all measuring instruments and in the measurement of electrical and non-electrical parameters viz., Resistance, Inductance, Capacitance, voltage, current Power factor, Power, Energy, Strain, Temperature, Torque, Displacement, etc. and the different types of electrical and nonelectrical transducers. It introduces the different signal analyzers and oscilloscopes.

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

CO1: Understand the operation of instruments, interpreting for error compensation and extension of the range. (L1)(U1)
CO2: Demonstrate the operation of Instrument transformers and power factor meters. (L2)(U2)
CO3: Illustrate the operational principles of Wattmeter and Energy Meters with their measurements and extensions of their range. (L2) (U3)
CO4: Identify different techniques of measurement of Resistance, Inductance, and Capacitance values.(L3)(U4)
CO5: Understand the principle of operation of Different types of digital voltmeters, wave analyzers, spectrum analyzers, and Cathode ray Oscilloscope. (L1)(U5)
CO6: Demonstrates the working of different types of transducers and applications. (L2)(U6)

UNIT-I
MEASURING INSTRUMENTS- INSTRUMENT TRANSFORMERS: Significance of Measurement, static characteristic of the system- Linearity, Sensitivity, Precision, Accuracy - Classification - Deflecting, Control and Damping torques, Ammeters and Voltmeters, PMMC, moving iron type instruments, Expression for the Deflecting torque and Control torque, Errors and Compensations, Extension of range using Shunts and Series resistance.

UNIT-II
INSTRUMENT TRANSFORMERS: Introduction, advantages, burden of instrument transformer, Current Transformer - errors in current transformer, Effect of secondary open circuit, Potential transformer- errors in potential transformer, Testing of current transformers with Silsbee's method.

Power Factor Meters: Type of P.F. Meters, Dynamometer, and Moving iron type, 1-ph and 3-ph meters.

UNIT-III

MEASUREMENT OF POWER& ENERGY: Single phase dynamometer wattmeter-LPF and UPF-Double element and three element dynamometer wattmeters', Expression for deflecting and control torques, Extension of range of wattmeter using instrument transformers, Measurement of active and reactive powers in balanced and unbalanced systems, Single phase induction type energy meter, Driving and braking torques, testing by phantom loading, three-phase energy meter.

UNIT- IV

MEASUREMENT OF RESISTANCE - MAGNETIC MEASUREMENTS- A.C. BRIDGES: Principle and operation of D.C. Crompton's potentiometer, Standardization, Measurement of unknown resistance, current, and voltage. Method of measuring low- Medium and High resistance, the sensitivity of Wheatstone's bridge, Carey Foster's bridge, Kelvin's double bridge for measuring low resistance, Measurement of high resistance, loss of charge method, Measurement of inductance, QualityFactor, Maxwell's bridge, Hay's bridge, Anderson's bridge, Owen's bridge. Measurement of capacitance and loss angle, Desauty Bridge, Wien's Bridge, Schering Bridge.

UNIT-V

DIGITAL VOLTMETERS- SIGNAL ANALYZERS- CRO: Digital voltmeters, Successive approximation, Ramp, Dual slope integration continuous balance type, WaveAnalyzers, Frequency selective analyzers, Heterodyne, Application of Wave analyzers, Harmonic Analyzers, Total Harmonic distortion, spectrum analyzers, Basic spectrum analyzers, Spectral displays, Q meter and RMS voltmeters. CRO- Cathode Ray Tube (CRT), Screens, Probes, Applications of CRO, Measurement of frequency and phase using CRO, Block diagram.

UNIT-VI

MEASUREMENT OF NON-ELECTRICAL QUANTITIES: Transducers - Classification of transducers, Advantages of Electrical transducers, Characteristics and choice of transducers, Principal operation of Resistor, Inductor, LVDT and Capacitor transducers,

LVDTApplications, Strain gauge and its principle of operation, Guage factor- Thermistors, Thermocouples, Piezoelectrictransducers, Photovoltaic, Photo conductive cells. Measurement of strain, Gauge Sensitivity, Displacement, Velocity, Acceleration, Force, Torque, Measurement of Temperature.

TEXT BOOKS:

1. Electrical Measurements and Measuring Instruments – E.W. Golding and F.C. Widdis, 5th Edition, Wheeler Publishing.

2.Transducers and Instrumentation– D.V.S Murthy, Prentice Hall of India, 2nd Edition.

3.A course in Electrical and Electronic Measurements and Instrumentation -A.K. Sawhney, Dhanpatrai& Co. 18th Edition.

REFERENCES:

1. Measurements Systems, Applications, and Design – D O Doeblin- Tata MC Graw-Hill.

2.Principles of Measurement and Instrumentation – A.S Morris, Pearson /Prentice Hall of India.

3.Electronic Instrumentation- H.S. Kalsi Tata MC Graw – Hill Edition, 3rd Edition.

4.Modern Electronic Instrumentation and Measurement Techniques – A.D Helfrick and W.D. Cooper, Pearson/Prentice Hall of India.

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III – I	9BC51	**Introduction to Additive Manufacturing Processes**(Open Elective-I)	3	0	0	3

Pre-requisites – Metal Cutting

Course Objective:
To teach students the fundamental concepts of additive manufacturing processes, techniques involved, and various applications of these technologies in relevant areas such as mechanical, Bio-medical, Aerospace, Electronics, etc.

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

CO1: Illustrate the additive manufacturing processes and their relationship with subtractive manufacturing. [L2]-U1
CO2: Demonstrate liquid and solid-based rapid prototype processes with appropriate applications. [L2]- U2
CO3: Apply the principles of casting in Additive manufacturing systems. [L3]-U3
CO4: Develop Additive manufacturing programs using various open-source software. [L3]-U4
CO5: Explain various applications of additive manufacturing using rapid tooling techniques. [L2]-U5, U6

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

TEXT BOOKS:

1. 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
3. Ian Gibson_· David_Rosen, Brent Stucker, AdditiveManufacturingTechnologies3D Printing, Rapid Prototyping, and Direct Digital Manufacturing, Springer
4. Paul F. Jacobs, Rapid Prototyping and Manufacturing ASME Press, 1996.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III – I	9LC11	**SOFTWARE TESTING METHODOLOGIES** (Professional Elective-I)	3	0	0	3

Pre-requisites – Nil

Course Objective:

To Understand the Basic concepts in Software testing, use various software testing methodologies, techniques and tools to verify and validate the software product quality.

Course Outcomes:

After completing this course, student shall be able to:

CO1: Describe and apply the concepts of software testing, Flow graphs, Path testing and Data Flow Testing (L2, L3) (U1, U2)
CO2: Apply the Software testing strategies and use Software Metrics in software development and maintenance (L3) (U3)
CO3: Identify the defects using various testing methodologies and to build Agile software testing process(L3) (U4)
CO4: Apply Software Testing Techniques and use tools to enhance quality of the product. (L3) (U5, U6).

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, 2nd Edition by William E. Perry, Wiley publications (Unit 3,4)
4. Software Testing and continuous Quality Improvement, by William E. Lewis, Gunasekaran,2nd Edition Auerbach publications (Unit 5, Refer Internet)

REFERENCES:

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

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III – I	9LC06	**Data Visualization Techniques** (Professional Elective-I)	3	0	0	3

Pre-requisites – Nil

Course Objective:

To understand various data visualization techniques and their Interaction Concepts and Techniques.

Course Outcomes:

After completing this course, student shall be able to:

CO 1. Illustrate the relationships of various dimensions of data and its stages using various types of visualization techniques(L2) (U1, U2)
CO 2. Apply advanced visualization techniques for higher dimensional data like geo-spatial and Multivariate Data. (L3) (U3, U4)
CO 3. Apply appropriate interaction and Visualization Techniques for Text and Documents. (L3) (U5)
CO 4. Design and apply the virtualization techniques for research initiatives. (L3) (U6).

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, Margon Kaufmann Publishers,2004.

REFERENCES:

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

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III – I	**9LC13**	**DESIGN THINKING** (Professional Elective-I)	3	0	0	3

Pre-requisites – Nil

Course Objective:

To understand the fundamental concepts of design thinking and familiarize with product design process along with ideation of new products and services.

Course Outcomes:

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

CO 1. Develop design thinking skills and creative thinking(L3) (U1, U2, U3)

CO 2. Explain the different design phases for the successful product development. (L2) (U4)

CO 3. Explore the design thinking phases for a good service design. (L3) (U5)

CO 4. Analyse the case studies of design thinking processes. (L4) (U6)

UNIT-I

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-II

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- III

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-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.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III – I	9FC10	**Human Computer Interaction** (Professional Elective-I)	3	0	0	3

Pre-requisites – Nil

Course Objective:

To gain an overview of Human-Computer Interaction (HCI), with an understanding of user interface design in general, and alternatives to traditional computing.

Course Outcomes:

After completion of this course, student will be able to:

CO1: Explain basics and benefits of good Graphical User Interface. [L2]-U1, U2
CO2: Use appropriate GUI components to design an interface. [L3]-U3, U4, U5
CO3: Identify hardware and software tools for different contextual scenarios. [L3]-U6

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.3rd 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.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III – I	9FC05	**Data Warehousing And Data Mining**	2	1	0	3

Pre-requisites – Database Management Systems

Course Objective:

Learn the principles of Data warehouse and Data mining and apply algorithms on data to perform classification and prediction.

Course Outcomes:

After completion of this course, students will be able to:

CO1: Illustrate the functionality of the various data mining functions. [L3]-U1
CO2: Apply pre-processing techniques on various datasets. [L3]-U2
CO3: Create a Data Warehouse and demonstrate the business analysis with OLAP tools. [L5, L3]-U3
CO4: Categorize the kinds of patterns that can be discovered by association rule mining. [L4]-U4
CO5: Compare and contrast different classification and clustering algorithms. [L4]-U5, U6

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

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III – I	9EC03	**Software Engineering**	2	0	0	2

Pre-requisites – Database Management Systems

Course Objective:

Understand the software engineering lifecycle models in the development of software.

Course Outcomes:

After completion of this course, students will be able to:

CO1: Explain the concepts of software engineering and distinguish software development lifecycle models. [L2]-U1, U2
CO2: Analyze different customer requirements and design models. [L4]-U2, U3
CO3: Identify and use the testing techniques and tools to improve the quality of the product. [L2]-U4, U5, U6

UNIT-I

Introduction to Software Engineering: The evolving role of software, Changing Nature of Software, Characteristics 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, the Software Requirements Document.

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

Process Models: Software Development Life Cycle, The waterfall model, Incremental Process models, RAD Model, Unified Process Model, Evolutionary Process models. (Prototype Model, Spiral Model, Concurrent Development Model, V-Model, Agile Model)

UNIT-III

Introduction to UML: Importance of Modeling, Principles of Modeling, Conceptual model of the UML, Architecture.

Diagrams: Class Diagrams, Forward and Reverse engineering for class diagrams. Use case Diagrams, Sequence Diagram.

UNIT-IV

Testing: 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-V

Flow graphs and Path testing: Basics concepts of path testing
Data Flow Testing: Basics of Data Flow Testing
Logic-Based Testing: Decision Tables
Software Metrics: Software Quality, Metrics for Analysis Model, Metrics for Design Model, Metrics for source code, Metrics for testing, Metrics for maintenance.

UNIT-VI

Software Testing Techniques: Black-box Testing, White box testing, Gray box Testing, Boundary Value Analysis, Regression Testing, Cause Effect graphing, CRUD, Database, Mutation Testing, Random Testing, Performance testing, Stress Testing, Spike Testing, Accepting Testing, Alpha and Beta Testing, V& V
Automated Testing Tools: Need for Automated testing tools, Taxonomy of Testing Tools, Exposure to Software Testing Tools: Selenium, UFT .

TEXT BOOKS:

1. Software Engineering, A Practitioner's Approach- Roger S. Pressman, 6th edition. McGrawHill International Edition. (Unit 1,2,5)
2. Grady Booch, James Rumbaung, Ivar Jacobson: The Unified Modeling Language User Guide, Pearson Education. (Unit 3)
3. Software testing techniques – Boris Beizer, Dreamtech, second edition. (Unit 4,5,6, Refer Internet)

REFERENCES:

1. Software Testing and continuous Quality Improvement, by William E. Lewis,Gunasekaran,2nd Edition Auerbach publications (Unit 6, Refer Internet)
2. Software testing tools – by Dr. K.V.K.K Prasad Dreamtech (Unit 4)
3. Software Engineering- Sommerville, 7th edition, Pearson education.
4. Software Engineering- K.K. Agarwal & Yogesh Singh, New Age International Publishers
5. Software Engineering, an Engineering approach- James F. Peters, WitoldPedrycz, John Wiely.
6. Systems Analysis and Design- Shely Cashman Rosenblatt, Thomson Publications.
7. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill Companies
8. Meilir Page-Jones: Fundamentals of Object-Oriented Design in UML, Pearson Education.
9. Pascal Roques: Modeling Software Systems Using UML2, WILEY-Dreamtech India Pvt. Ltd.
10. AtulKahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.
11. Mark Priestley: Practical Object-Oriented Design with UML, TATA McGrawHill
12. Craig Larman Appling UML and Patterns: An introduction to Object – Oriented Analysis and Design and Unified Process, Pearson Education
13. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: UML 2 Toolkit, WILEY-Dreamtech India Pvt. Ltd

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III – I	9LC01	**Introduction To Artificial Intelligence**	3	0	0	3

Pre-requisites – Knowledge on Data Structures.

Course Objectives:

1. To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
2. By using different knowledge representation techniques understand the applications of AI, namely game playing, theorem proving, and machine learning.

Course Outcomes:

After completion of this course, students will be able to:

CO1: Understand the different types of AI agents and also search algorithms for a problem and estimate its time and space complexities. (L2) (U1)
CO2: Apply AI techniques to solve problems of game playing, theorem proving, and machine learning. (L3) (U2)
CO3: Apply different knowledge representation techniques and Planning algorithms for state space search problems. (L3) (U3, U4)
CO4: Apply the applications of Probabilistic Reasoning and Bayesian Networks, and analyseSupervised Learning vs. Learning Decision Trees. (L3) (U5, U6)

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 BOOK:

1. Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig, Pearson Education, Third Edition.

REFERENCES:

1. Artificial Intelligence, 3rd Edn., E. Richand K. Knight (TMH)
2. Artificial Intelligence, 3rd Edn., Patrick Henny Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems–Patterson, Pearson Education.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III – I	9EC05	**Computer Networks**	3	0	0	3

Pre-requisites –Nil

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:
After completion of this course student will be able to:

CO1: Describe the different types of network topologies and protocols useful for real time applications and transmission media. [L1]-U1

CO2: Identify design issues of data link layer and solve problems on Checksum and flow control. [L2]-U2

CO3: Analyze MAC layer protocols and LAN technologies. [L4]-U3, U4

CO4: Use the concepts of sub netting, routing mechanisms and congestion control to design congestion free network. [L3]-U4, U5

CO5: Generalize the concepts, services and protocols of Transport and Application layers. [L2]-U6

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

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III – I	9EC06	**Operating Systems**	2	1	0	3

Pre-requisites – Computer Organization

Course objectives:

Learn working principles of Operating Systems.

Course outcomes:
After completion of this course student will be able to:

CO1: Describe the functional architecture of an Operating System with usage of system calls. [L2]-U1

CO2: Analyze various process scheduling algorithms & pragmatics of scheduling algorithms used by various Operating Systems. [L4]-U2

CO3: Solve issues related to process synchronization and Interposes Communication (IPC) in the Operating System. [L3]-U3

CO4: Illustrate the concepts of Memory Management and deadlock. [L3]-U4

CO5: Discuss the concepts of File System with regard to Directory and Disk ManagementAlgorithms, summarize the aspects of I/O Systems, Protection and Security. [L2]-U5, U6

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, 8th edition.
2. Modern Operating Systems by A. Tanenbaum, 1992, Prentice-Hall.
3. Operating Systems Internals and Design Principles by William Stallings,4th edition, 2001, Prentice-Hall

REFERENCES:

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

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III – I	9LC63	**Software Engineering Lab And Computer Networks Lab**	0	0	2	1

Pre-requisites – Database Management Systems

Course Objectives: To make the students to learn
To Understand the fundamentals of software testing and apply various software testing strategies, techniques, and tools to verify and validate software product quality.

SOFTWARE ENGINEERING LAB

Course Outcomes: At the end of this course, the student will able to

CO1: 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 products (L3)

CO2: Understand the importance and principles of Unified Modelling Language, its building components, and their relationship to the UML paradigm for problem-solving. (L2)

CO3: Develop and design models for the needs specified in the software project. (L4)

CO4: Design class, object, and interactive diagrams and know their significance (L4)

CO5: Design advanced behavioural and architectural modelling and work on case studies (L4)

EXERCISES

1. The student should take up the case study of Unified Library application which is mentioned in the theory, and Model it in different views i.e. Use case view, logical view, component view, Deployment view, Database design, forward and Reverse Engineering, and Generation of documentation of the project.

2. The student takes up the case studies mentioned below, and model it in different views i.e. Use case view, logical view, component view, Deployment view, Database design, forward and Reverse Engineering, and Generation of documentation of the project.

3. Prepare Test Plan document and write Test Cases for Small scale Project (Like for their B. Tech IV Year Project or Post-Graduate Projects), they are learn how to Analyze SRS document in order to prepare Test Plan Document.

4. Demonstrate skills to use modern software testing tools (EX: UFT, Bugzilla, Selenium) and test application (web, Window application) by using the tools.
5. Demonstrate the ability to differentiate between different Testing tools present in the market (like functional testing tools, Test Management Tools, Bug Tracking Tools and Performance Testing Tools) and prepare Test Plan document and write Test Cases for Small scale Project (Like for their B. Tech IV Year Project or Post-Graduate Projects).

CASE TOOLS LAB

Case Studies

1. Automatic Teller Machine
2. Library Management System
3. Railway Reservation System
4. Online Book Shopping System
5. Student Admission System

Week 1

1. Basic Structural Modelling:

i) Class Diagrams. ii) Object Diagrams

Week 2

2. Basic Behavioural Modelling: i) Use case Diagrams

Week 3

3. Basic Behavioural Modelling:

i) Interaction Diagrams (Collaboration and Sequence Diagram)

Week 4

4. i) Basic Behavioural Modelling: Activity Diagram

ii) Architectural Modelling: Deployment Diagram

SOFTWARE TESTING LAB

Week 5

5. a) Write programs in 'C' Language to demonstrate the working of the following constructs:

i) do…while ii) while…do iii) if …else iv) switch v) for

b) A program written in 'C' language for matrix multiplication fails" Introspect the causes for its failure and write down the possible reasons for its failure.

Week 6

6. a) Take any system (e.g. ATM system) and study its system specifications and report the various bugs.

i) Opensource Bug Tracking Tool: Bugzilla

b) Write the test cases for any known application (Ex: Banking application)

Week 7

7.a) Create a test plan document for any application (Ex: Internet Banking Application)

b) Study of Selenium IDE (opensource testing tool)

Week 8-10

8. Study of any Functional and Regression Testing Tools: i) Licensed Tool: UFT 12.01

COMPUTER NETWORKS LAB

Course Outcomes:

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

CO1. Illustrate and analyze farming methods of the data link layer. (L2)
CO2. Illustrate and implement error detection & correction techniques. (L2)
CO3. Illustrate different Routing Algorithms. Understand basic Network Commands. (L4)
CO4. Use of Wire shark and NS-2 tools and CISCO Packet Tracer (L3)

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.

TEXT BOOK:

1. Computer Networks, Andrew S Tanenbaum, David, j. Wetherall, 5th edition. Pearson Education/PHI.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III – I	9LC64	**Artificial Intelligence Lab And Data Mining Lab**	0	0	2	1

Pre-requisites – Nil

Course Objectives:

1. Understand the different types of AI agent, various AI search algorithms and fundamentals of knowledge representations and reasoning.
2. Explore uncertain knowledge and reasoning concepts along with basics at deep learning and reinforcement learning.

Course Outcomes:
At the end of this course the student will be able to:

CO1: understand different types of agents and search algorithms for game theory. (L2)

CO2. Discuss the concept of knowledge representations, reasoning and uncertain knowledge. (L6)

CO3. Explore deep learning and reinforcement learning concepts. (L3)

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. Writ 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

TEXT BOOKS:

1 Ian Goodfellow, YoshuaBengio, 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.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III – I	9L591	**Summer Industry Internship-I**	-	-	-	1

Pre-requisites – All Courses till this Semester

Course Objectives:
To develop skills and knowledge in their respective domain to apply and solve engineering problems.

Course Outcomes:
After completion of this course, students will be able to:
CO1: Use the basic concepts learned in the courses, so far, in conceptualizing, designing, and executing the modules of the projects. [L3]
CO2: Apply technologies and use modern tools to develop software/hardware. [L3]
CO3: Inculcate an enthusiasm to use creative ideas to build innovative projects and prototypes that meet the current needs of the market and society as a whole. [L4]
CO4: Improve their communicative skills and team skills. [L6]

A summer industry internship project shall be carried out by a group of students consisting of 1 or 2 to 3 in number during the summer second-year semester at industries or institutions. This work shall be carried out under the guidance of the faculty assigned as an internal guide as well as an external guide at the industry where students are carrying out summer industry internship projects. The project shall consist of the design, fabrication, software development, or building of a prototype or application app. This can also be of an interdisciplinary nature.

There will be 100 marks in total with 40 marks for internal evaluation and 60 marks for external. The internal evaluation shall consist of:

Presentation:15 marks
Internal Evaluation:15 marks
Report:10 marks
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40 marks

End examination: 60 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, the head of the department, a senior faculty member, and the internal guide.

Presentation:10 marks
Demonstration/ Technology:40 marks
Report:10 marks
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60 marks

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III – II	9EC09	**Cryptography And Network Security** (Professional Elective-II)	3	0	0	3

Pre-requisites – Nil

Course Objectives:
Learn various cryptographic techniques and protocols to thwart against security attacks.

Course Outcomes:
After completion of this course student will be able to:

CO1: Classify the security attacks, security services and also describe the model for network Security. [L2]-U1

CO2: Analyze conventional and Public cryptographic techniques. [L4]-U2

CO3: Classify and analyze Message Authentication, Secure Hash functions and outline the concepts of Kerberos and email privacy. [L3]-U3

CO4: Examine architecture, key management and header formats of IPsec and Outline the various web security threats and protocols. [L3]-U4,U5

CO5: Interpret Intrusion Detection System and Design principles of Firewalls. [L3]-U6

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, RC4, cipher block modes of operation, location of encryption devices, key distribution, public key cryptography principles, public key cryptography algorithms: RSA, DIFFIE HELL MAN

UNIT-III
Digital signatures, digital Certificates, Certificate Authority and key management, Approaches of Message Authentication, Secure Hash Functions: SHA1 and HMAC,Kerberos, X.509 Directory Authentication Service.

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, 4th Edition.
2. Hack Proofing your network by Ryan Russell, Dan Kaminsky, Rain Forest Puppy, Joe Grand, David Ahmad, Hal Flynn Ido Dubrawsky, Steve W.Manzuik and Ryan Permeh, wileyDreamtech

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
4. Principles of Information Security, Whitman, Thomson.
5. Network Security: The complete reference, Robert Bragg, Mark Rhodes, TMH
6. Introduction to Cryptography, Buchmann, Springer.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III – II	9FC13	**Software Project Management** (Professional Elective-II)	3	0	0	3

Pre-requisites – Nil

Course Objectives:
Explain building blocks of software projects and induces the essence of project management.

Course Outcomes:
After completion of this course student will be able to:

CO1: Explain primitives of Project Planning and evolution of software economics. [L2]-U1
CO2: Describe software economics; reduce Software product size, improvement in software processes, improving team effectiveness, improving automation, Achieving quality. [L1]-U1, U2
CO3: Illustrate Life cycle phases and Artifacts of the process. [L2]-U3
CO4: Demonstrate Model based software architectures and Work Flows. [L2]-U4
CO5: Apply Checkpoints for a process such as Major mile stones, Minor Milestones and apply work breakdown structures for an iterative process within cost and schedule. Describe Project Organizations and Responsibilities. [L3]-U5
CO6: Discuss Process Automation, Instrumentation and explain Future Software Project Management such as Modern Project Profiles and Next generation project management. [L2]-U6

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.

UNIT-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.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III – II	9FC08	**Information Retrieval Systems** (Professional Elective-II)	3	0	0	3

Pre-requisites – Data Structures

Course Objectives:

1. To learn the important concepts and algorithms in IRS
2. To understand the data/file structures thatare necessary to design, and implement information retrieval (IR) systems.

Course Outcomes:
After completion of this course student will be able to:

CO1: Identify and Outline IR principles, capabilities of IRsystems, and relate associations with DBMS, and Datawarehousing. [L1]- U1
CO2: Infer functions of cataloguing and Indexing, discuss behaviour of various data structures[L2]- U2, U3
CO3: Analyze different clustering algorithms. [L4]- U3
CO4: Choose various searching methods, searching process metrics to implement search and visualization applications. [L3]- U4, U5
CO5: Discover the components of Multimedia Information Retrieval and illustrate a distributed information retrieval system. [L4]-U6

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 Information Retrieval System Capabilities: Search Capabilities, Browse Capabilities, Miscellaneous Capabilities

UNIT-II
Cataloguing and Indexing: History and Objectives of Indexing, Indexing Process, Automatic Indexing, Information Extraction
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-III
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-IV

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-V

Text Search Algorithms: Introduction, Software text search algorithms, Hardware text search systems. Integrating Structured Data and Text Historical progression, Information retrieval as a relational application, Semi-structured search using a relational schema.

UNIT-VI

Multimedia Information Retrieval – Models and Languages – Data Modeling, Query Languages, Indexing and Searching.

Distributed Information Retrieval: A Theoretical model of distributed retrieval, web search

TEXT BOOK:

1. Information Storage and Retrieval Systems – Theory and Implementation, Second Edition,Gerald J. Kowalski, Mark T. Maybury, Springer

REFERENCES:

1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.
2. Information Storage & Retrieval by Robert Korfhage – John Wiley & Sons.
3. Modern Information Retrieval by Yates and Neto Pearson Education.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III – II	9IC45	**Introduction To Internet Of Things** (Professional Elective-II)	3	0	0	3

Pre-requisites – Nil

Course Objective:

Describe the concepts of various transform (IoT) and develop IoT tools using python and explore about potential businesses opportunities.

Course Outcome:

After completion of this course, students will be able to:

- **CO1:** Summarize the fundamental blocks of Internet of Things. [L2]-U1
- **CO2:** Distinguish IoT and M2M network softwares. [L2]-U2
- **CO3:** Compare and apply protocols in wireless sensor network [L2, L3]-U3
- **CO4:** Design IoT applications in different domains and analyze their performance. [L4,L6]-U5
- **CO5:** Develop and assess basic IoT applications on embedded platform using python.[L6, L5]-U6

UNIT-I
Introduction to IoT: Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs

UNIT-II
IoT& M2M: Machine to Machine, Difference between IoT and M2M, Software define Network

UNIT-III
Network & Communication aspects: Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination

UNIT-IV
Challenges in IoT: Design challenges, Development challenges, Security challenges, other challenges

UNIT-V

Domain-specific applications of IoT: Home automation, Industry applications, Surveillance applications, and Other IoT applications.

Human Body and IoT: Human Sensors, Human sensors with signal transmission, Casestudy on the Working of human sensors, Mapping of human sensors with IOT sensors

UNIT-VI

Developing IoT's: Introduction to Python, Introduction to different IoT tools, developing applications through IoT tools, developing sensor-based applications through embedded system platform, Implementing IoT concepts with Python

REFERENCES:

1. Vijay Madisetti, ArshdeepBahga, "Internet of Things: A Hands-On Approach"

2.WaltenegusDargie, ChristianPoellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III – II	9JC05	**Blockchain Technologies** (Professional Elective-III)	3	0	0	3

Pre-requisites – Information Security

Course Objectives:

To understand how blockchain systems (mainly Bitcoin and Ethereum) work. To securely interact with them, design, build, and deploy smart contracts and distributed applications. Integrate ideas from blockchain technology into their own projects.

Course Outcomes:

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

CO1: Summarize the conceptual working of blockchain using Cryptographic principles. (L2) (U1, U2)

CO2: Explore the Payment Verification protocol, its lifecycle and the different consensus algorithms. (L4) (U2, U3)

CO3: Classify the different types of cryptocurrencies alongside their features. (L4) (U4, U5)

CO4: Outline the legal issues of consideration in the development of blockchain. (L4) (U5)

CO5: Examine the proofs and protocols used in the blockchain technology. (L3) (U6)

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 BOOK:

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July19, 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 SecureDecentralized TransactionLedger,”Yellow paper.2014.

4. Nicola Atzei,Massimo Bartoletti,andTizianaCimoli, A surveyof attacks on Ethereum smart contracts

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III – II	9LC16	**Unified Modeling Language** (Professional Elective-III)	3	0	0	3

Pre-requisites – Nil

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:

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

CO1: Understand various stages and phases of software projects Life cycle (L2)(U1)
CO2: Discuss basic elements of structural and Behavioural Modelling such as Things, Relationships, and Diagrams depending on the views of UML Architecture and SDLC(L2) (U2, U4)
CO3: Designobject diagrams that represent static aspects of a software system. (L4) (U3)
CO4: Design component and deployment diagrams for software systems (L4) (U6)
CO5: Discuss Events and State Chart diagrams for software systems (L2) (U5)

UNIT-I
Introduction to UML: Importance of Modelling, Principles of Modelling, 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 Modelling 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, and Common Modelling techniques for Object Diagrams.

Basic Behavioural Modeling: Use cases, Use case Diagrams.

UNIT-IV

Basic Behavioural Modeling: Interactions, Interaction diagrams, Activity Diagrams.

UNIT-V

Advanced Behavioural 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 Behavioural modelling.

TEXT BOOKS:

1. Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modelling Language User Guide, Pearson Education.
2. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: UML 2 Toolkit, WILEY Dream Tech 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: Modelling Software Systems Using UML2, WILEY Dream Tech 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.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III – II	9LC08	**Augmented Reality and Virtual Reality** (Professional Elective-III)	3	0	0	3

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

CO1: Understand the Concepts and Components of Virtual Reality (L2) (U1)

CO2: Apply Input and Output Models in VR Systems (L3) (U2)

CO3: Analyze Visual Computation and Real-Time Rendering Techniques (L4) (U3)

CO4: Develop Interactive VR Experiences Using Hand Gestures and Object Manipulation (L6) (U4)

CO5: Evaluate Augmented Reality Systems and Their Applications (L5) (U5, U6)

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**.**

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III – II	9FC09	**Image Processing** (Professional Elective-III)	3	0	0	3

Pre-requisites – Computer Graphics

Course Objectives:
Make decisions from image data, online inspection and face recognition.

Course Outcomes:
After completion of this course student will be able to:

CO1: Identify Image Processing terminology &interpret the components of image processing system and its applications. (L3) (U1)
CO2: Examine various methods for Image Enhancement approaches in spatial domain. (L3) (U2)
CO3: Make use of the filtering techniques and Fourier, Geometric transformations and filtering techniques for image restoration. (L3, U3)
CO4: AnalyzeColor image Processing using various approaches for transformation, segmentation, smoothing and sharpening of colorimages. (L4, U4)
CO5: Illustrate and examine Image compression and image morphological processing methods. (L4, U5)
CO6: Apply and evaluate image segmentation and recognition methods. (L3, L5, U6).

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.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III – II	9LC03	**Machine Learning**	3	0	0	3

Pre-requisites – Introduction to Data Science

Course Objectives:

1. To introduce different types of Machine Learning techniques and design of learning system with concept learning and candidate elimination algorithms.
2. Understand various neural network concepts along with optimization techniques.
3. Discuss various graphical models and analytical reasoning techniques.

Course Outcomes:

At the end of this course the student is able to:

CO1: Understand basic types of machine learning and apply linear models like perceptron and regression for classification tasks. (L1 & L3) (U1)

CO2: Design and implement machine learning models like multi-layer perceptrons, RBF networks, and support vector machines for practical applications. (L5 & L3) (U2)

CO3: Analyze decision trees, ensemble learning, and probabilistic models like k-means and Gaussian mixtures for various learning tasks. (L4) (U3)

CO4: Evaluate dimensionality reduction techniques and evolutionary methods like genetic algorithms to improve model performance. (L5) (U4)

CO5: Apply advanced concepts like graphical models (Bayesian networks, Hidden Markov models)and analytical learning techniques to solve complex problems. (L3 & L5) (U5, U6)

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 Neighbour 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.

SREENIDHI INSTITUTE OF SCIENCE AND TECHNOLOGY
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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III – II	9LC04	**Compiler Design**	2	1	0	3

Pre-requisites – Nil

Course Objectives:

1. Understand the concepts of finite automata regular languages, context-free grammar pushdown automata, and Turing machines.
2. Discuss the working of the compiler, and the role of grammars and parsers in compiler design apart from semantic analysis, and code optimization.

Course Outcomes:
At the end of this course the student will be able to:

CO1:Construct finite Automata for a given regular expression, and derive strings with suitable examples. Conceptualize context-free grammar and normal forms. (L6) (U1)

CO2: Designthepushdown automata andTuringMachinefor complexlanguages (L4) (U2) (U3)

CO3: UnderstandLEXtoolandrelate-parsingtechniques (L2) (U4)

CO4: Demonstrate and solve problems on SLR, CLR, LALR, operator precedence parser, LR (0) grammar, and use YACC tool (L2) (U5)

CO5: Understand Semantic Analysis concepts to design compilers: and describe Intermediate code generation such as 3-address code form (L2) (U6)

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, and 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 grammar, Chomsky normal form, Greibach 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 backtracking, 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.

TEXT BOOKS:

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. & Papadimitriou C.H. Pearson /PHI.
4. Theory of Computer Science Automata languages and computation -Mishra and Chandrashekaran, 2nd edition, PHI Course Requirements.
5. Modern Compiler Construction in C, Andrew W. Appel Cambridge University Press.
6. Compiler Construction, LOUDEN, Thomson.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III – II	9IC04	**Intellectual Property Rights**	2	0	0	-

Pre-requisites – Nil

Course Objective:
Impart awareness on intellectual lproperty rights and various regulatory issues related to IPR.

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

CO1: Demonstrate knowledge of Intellectual property and rationale for the legal protection of intellectual property. [L3]-U1

CO2: Summarize Patents, copyrights& GI: Searching, filling, drafting, and legislation. [L2]-U2, U3

CO3: Distinguish Trade Mark & Trade Secrets and protection of Integrated Circuits and **CO4:** Industrial Design in Searching, filing, drafting, and legislation. [L4]-U4, U5

CO5: Adapt different national and international conventions and treaties governing the IPRs to meet international norms. [L6]-U6

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, 3rd 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 &KhushdeepDharni, Intellectual Property Rights, Phi Learning Pvt. Ltd
3. AjitParulekar 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.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III – II	9FC06	**Web Technologies**	2	1	0	3

Pre-requisites – Object-Oriented Programming concepts, Computer Networks

Course Objectives:
To impart the concepts of HTML5, Tailwind CSS, MERN stack and design web applications.

Course Outcomes:
After completion of this course student will be able to:

CO1: DemonstrateHTML5concepts, CSS3 syntax and tailwind CSS framework [L2]-U1
CO2: Illustrate and apply JavaScript: data types, functions, objects and advanced JavaScript concepts. [L2, L3]-U2
CO3: Discuss MERN components and Node modules. [L2]-U3
CO4: Build HTTP web server and explain REST API.[L3,L2]-U4
CO5: Develop Express framework application, connecting and accessing MongoDB database with Node. [L4]-U5
CO6: Illustrate ReactJS features, build and deploy react application. [L2,L3]-U6

UNIT-I
HTML 5: Semantic Elements, Web storage API, HTTP status codes.
CSS 3: Syntax structure, types, box model, Grid, Flexbox. Responsive Web Design using Media Queries, use of viewport, Transition, Animation.
CSS Framework: Tailwind css

UNIT-II
JavaScript: Introduction to JavaScript, data types, functions, Arrays, Objects, Regular expressions
Advanced JavaScript concepts: let, const, arrow functions, destructuring, spread, rest, Prototypal Inheritance, Closure, understanding callbacks, Promise, Async/await.

UNIT-III
Introduction to MERN: What is MERN? MERN components, Server-Less Hello World, Server setup.
Node JS: Introduction to Node.js, REPL, Node Modules: events, OS, HTTP, file i/o, environment variables, dotenv

UNIT-IV

Web Servers: client-server architecture**,** request-response objects, creating a basic HTTP server
Rest API: Introduction to RESTAPIs, HTTP verbs

UNIT-V

Express Framework: Introduction to Express, Installation of Express, Creating first Express application, application, request, and response objects, configuring an Express application, Rendering views, sessions, forms, file upload. Connecting to an SQL database
MongoDB: Introduction to MongoDB, connecting to a MongoDB instance with Node, reading from MongoDB, Writing to MongoDB.

UNIT-VI

Introduction to ReactJS: History of Front – end libraries, Motivation for using React, Key differentiators (Virtual DOM, one–way binding), React Components, JSX, props hooks, state, events, effects, fetching data from API using fetch, form validations, React Router, building and deploying react application.

TEXTBOOKS:

1. Beginning HTML, XHTML, CSS, and JavaScript, Jon Duckett, Wrox Publications, 2010
2. Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node, Vasan Subramanian, 2nd Edition, A Press.

REFERENCES:

1. E – resource: https://nodejs.org/en/docs/
2. E – resource : https://reactjs.org/
3. E – resource :https://tailwindcss.com/
4. E – resource :https://expressjs.com/
5. E – resource :https://web.dev/learn/css
6. E – resource :https://web.dev/learn/html

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III – II	9LC65	**Machine Learning Lab And Compiler Design Lab**	0	0	3	1.5

Pre-requisites – Nil

Course Objectives:

To experiment with various machine learning algorithms and 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.

MACHINE LEARNING LAB

Course Outcomes:

After completion of this course student will be able to:

CO1: Apply common Machine Learning algorithms like Naïve Bayes theorem in practice and implement their own (L2)

CO2: Use the back propagation, genetic, and k-nearest-neighbour's algorithms. (L3)

CO3: Applying DFA to a Specific Language or Regular Expression (L2)

CO4: Design the Classifier algorithm SVM (L6)

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 the database using python
3. Implement k-nearest neighbours classification using python
4. Given the following data, which specify classifications for nine combinations of VAR1and VAR2predict a classification for a case where VAR1=0.906 and VAR2=0.606, using the result of k-means clustering with 3 means (i.e.,3 centroids)

VAR 1	VAR2	CLASS
1.713	1.586	0
0.180	1.786	1
0.353	1.240	1
0.940	1.566	0
1.486	0.759	1
1.266	1.106	0
1.540	0.419	1
0.459	1.799	1
0.773	0.186	1

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 the genetic algorithm.
8. Implement the finite words classification system using the Back-propagation algorithm.
9. Implement Classification on a sample data set using SVM.

COMPILER DESIGN LAB

Course Outcomes: At the end of this course the student will be able to

CO 1: Implementation of DFA for a given Language/ Regular Expression (L4).
CO2: Use of LEX of tool to implement lexical analyzer in compiler design and implementation of Top-Down Parser. (L3)
CO3: Use of YACC tools for implementing bottom-up parser. (L3)

LIST OF EXPERIMENTS (COMPILER DESIGN)

1. Implementation of DFA for a given Language / Regular Expression.
2. Use the LEX tool to implement a lexical analyzer in compiler design and implementation of a Top-Down Parser.
3. Usage of YACC tools for implementing bottom-up parser.

1) Implement DFA accepting the language containing even binary numbers.
2) Implement DFA that accepts all the strings of a's and b's 3rd symbol from is RHS
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 strings of a's and b's where a number of a 's is divisible by 3 and the number of b's is divisible by 2.
5) Write a 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 a lexical analyzer using the c program.
8) write recursive descent parser for the grammar E->E+T, E->T, T->T*F, T->F
   F -> (E)/id.
9) write recursive descent parser for the grammar S->(L) S->a L->L,S L->S
10) Write a C program to calculate the first function for the grammar
    E->E+T E->T T->T*F T->F F->(E)/id
11) Write a YACC program to implement a top-down parser for the given grammar.

Write a YACC program to evaluate algebraic expressions.

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, Springer 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 Professionals‖, 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.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III – II	9FC66	**Web Technologies Lab**	0	0	3	1.5

Pre-requisites – Nil

Course Objectives:
Apply HTML5, CSS3, JavaScript concepts and develop full-stack web applications using MERN stack.

Course Outcomes:
After completion of this course student will be able to:

CO1: Apply HTML5, CSS3, and JavaScript technologies through practical coding exercises. [L3]
CO2: Develop full-stack applications using web frameworks and modern databases. [L3]

Note: **Students can select any 3 Problem Statements from each Cycle**

Cycle 1:

Problem Statement 1: Responsive Personal Portfolio Website (2 hours)
Create a responsive personal portfolio website using HTML5 and CSS3. The website should include sections for your profile, skills, experience, projects, and contact information. Use Tailwind CSS to style the website and ensure it is responsive across different screen sizes.

Problem Statement 2: E-commerce Product Page (3 hours)
Design and develop an e-commerce product page using HTML5, CSS3, and Tailwind CSS. The page should display product information, including images, descriptions, prices, and options for adding to cart. Use Tailwind CSS to create a visually appealing and consistent layout.

Problem Statement 3: Interactive Blog Post with Comments (3 hours)
Create an interactive blog post with comments using HTML5, CSS3, and JavaScript. The blog post should include a title, author, content, and a comment section. Use JavaScript to enable users to submit comments and display them on the page.

Problem Statement 4: Adaptive Landing Page for Different Devices (2 hours)
Develop an adaptive landing page that adjusts its layout and content based on the user's device. Use HTML5, CSS3, and JavaScript to detect the device type and display the appropriate content. Employ media queries and responsive design techniques to ensure the page looks great on all devices.

Cycle 2:

Problem Statement 1: Dynamically Generated Content with JavaScript (2 hours)

Create a web page that dynamically generates content using JavaScript. The page should include a button that, when clicked, generates a new random number and displays it on the page. Use JavaScript to manipulate the Document Object Model (DOM) to add and remove elements.

Problem Statement 2: Interactive Shopping Cart with JavaScript (3 hours)

Develop an interactive shopping cart using JavaScript. The cart should allow users to add and remove items, update quantities, and calculate the total price. Utilize JavaScript arrays and objects to store product information and manage cart operations.

Problem Statement 3: Regular Expression-Based Text Manipulation (3 hours)

Build a web application that performs text manipulation using regular expressions. The application should allow users to enter a text string and provide options for search, replace, and formatting. Implement regular expression patterns to identify and modify specific text elements.

Problem Statement 4: Asynchronous Data Fetching and Display with JavaScript Promises and Async/await (2 hours)

Create a web page that fetches data from an API asynchronously using JavaScript promises and Async/await. The page should display a loading indicator while the data is being fetched and then render the data in a list or table. Demonstrate the use of promises to handle asynchronous operations and improve code readability.

Cycle 3:

Problem Statement 1: Building a Simple REST API with MERN Stack (2 hours)

Create a simple REST API using the MERN stack (MongoDB, Express.js, React.js, and Node.js). The API should allow users to perform basic CRUD (Create, Read, Update, Delete) operations on a data collection, such as a list of tasks or products. Design the API endpoints, implement the server-side logic using Node.js and Express.js, and connect the API to a MongoDB database.

Problem Statement 2: Developing a Server-Side Application with Node.js and Express.js (3 hours)

Build a server-side application using Node.js and Express.js. The application should provide an endpoint to accept user input, perform some processing, and return a response. Implement error handling and logging mechanisms to ensure the application runs reliably. Explore using Node.js modules for common tasks, such as file I/O and data validation.

Problem Statement 3: Working with Environment Variables and Dotenv in Node.js Applications (2 hours)

Create a Node.js application that utilizes environment variables and dotenv to manage sensitive configuration data. Implement dotenv to load environment variables from a .env file and use them throughout the application. Demonstrate how to access and update environment variables securely.

Problem Statement 4: Implementing Event-Driven Programming with Node.js (3 hours)

Develop an event-driven Node.js application that utilizes the Node.js Event Emitter API. Create custom events to represent different occurrences, such as user actions or sensor readings. Register event listeners to handle these events and perform appropriate actions. Explore using modules like async/await to manage asynchronous event handling.

Cycle 4:

Problem Statement 1: Building a Simple Web Server with HTTP Request Handling (2 hours)

Create a basic HTTP server using Node.js and Express.js. The server should handle GET and POST requests, respond with appropriate HTTP status codes, and parse request payloads. Implement route handling to direct requests to specific functions for processing.

Problem Statement 2: Designing and Implementing a REST API for Resource Management (2 hours)

Design a REST API for managing a collection of resources, such as books or products. Define the API endpoints for each resource operation (Create, Read, Update, Delete) and map them to HTTP verbs (POST, GET, PUT, DELETE). Implement the API using Node.js and Express.js, including error handling and validation checks.

Cycle 5:

Problem Statement 1: Developing a Full-Stack Web Application with Express and MongoDB (2 hours)

Create a full-stack web application using Express.js and MongoDB. The application should allow users to create, read, update, and delete (CRUD) data stored in a MongoDB database. Implement the Express framework to handle routing, request processing, and templating. Utilize MongoDB to store and retrieve data using the Node.js MongoDB driver.

Problem Statement 2: Building a REST API with Express and MongoDB for User Management (3 hours)

Design and implement a REST API using Express.js and MongoDB for user management. The API should allow users to register, login, update their profiles, and manage their data. Implement authentication and authorization mechanisms to secure user access. Utilize MongoDB to store user information and session data.

Problem Statement 3: Creating a File Upload Application with Express and MongoDB (2 hours)

Develop a file upload application using Express.js and MongoDB. The application should allow users to upload files, store them in MongoDB, and retrieve them later. Implement file handling techniques to ensure secure and efficient file uploads and storage. Utilize MongoDB to store file metadata and references.

Problem Statement 4: Implementing Image Processing and Display with Express and MongoDB (3 hours)

Build an image processing and display application using Express.js and MongoDB. The application should allow users to upload images, apply image processing filters, and display the processed images. Utilize image processing libraries to manipulate images and store processed images in MongoDB. Implement image rendering techniques to display images on the web page.

Cycle 6:

Problem Statement 1: Building a Dynamic ReactJS Application with State Management (2 hours)

Create a dynamic ReactJS application that manages state using hooks. The application should display a list of items and allow users to add, remove, and update items. Implement state management techniques to keep the UI in sync with data changes. Utilize hooks like use State and use Effect to handle state updates and side effects.

Problem Statement 2: Developing a Data-Driven ReactJS Application with API Fetching (3 hours)

Build a data-driven ReactJS application that fetches data from an API and renders it on the UI. The application should display a list of data items retrieved from the API and allow users to filter and search for items. Implement data fetching techniques using the fetch API or libraries like Axios. Utilize state management to store and update data from the API.

Problem Statement 3: Creating a User Interface with React Router for Navigation (2 hours)

Develop a user interface with React Router for navigation between different components and routes. The application should have multiple pages, such as a home page, a contact page, and an about page. Implement React Router components to handle routing and provide smooth transitions between pages. Utilize nested routes to organize complex navigation structures.

Problem Statement 4: Building and Deploying a ReactJS Application to a Hosting Platform (3 hours)

Build a complete ReactJS application and deploy it to a hosting platform like Netlify or Vercel. The application should have a functional UI, interact with APIs, and handle user input. Implement build tools like Webpack or Parcel to bundle and optimize the application. Configure the deployment environment and deploy the application to the chosen hosting platform.

REFERENCES:

1. E – resource: https://nodejs.org/en/docs/
2. E – resource : https://reactjs.org/
3. E – resource :https://tailwindcss.com/
4. E – resource :https://expressjs.com/
5. E – resource :https://web.dev/learn/css
6. E – resource :https://web.dev/learn/html

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III – II	9L680	**Comprehensive Viva Voce**	-	-	-	1

Pre-requisites – All core Courses till this Semester

CourseObjectives:

Assess a student's over all knowledge of the field of engineering

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

CO1: Discuss and summarize Core, and advanced subjects that they have studied till the completion of that academic year.[L2]

Comprehensive Viva Voce will be conducted in the third year second semester for 100marks. Two Internal Exams(Oral) of 50 marks each will be considered for CIE. There will be no Semester End Exam for this course

A student must secure 40% of the total marks to obtain a pass grade.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV – I	9ZC15	**Financial Markets And Services** (Open Elective-II)	3	0	0	3

Pre-requisites – Nil

Course Objective:
Understand Financial Markets and the Services offered in Indian Financial System within this framework.

Course Outcomes:
After completion of this course student will be able to:

CO1: Explain the structure of Indian Financial System and role of money market and its instruments. [L2]-U1, U2
CO2: Illustrate about Indian Capital Markets and Fund based financial services. [L2]-U3, U4
CO3: Demonstrate knowledge on Indian Mutual Fund Industry. [L3]-U5
CO4: Describe various fee based financial services provided in India. [L1]-U6

UNIT-I
INTRODUCTION: Investment – Investment Attributes, Structure of Indian Financial System, Financial Markets, Classification of Financial Markets, Financial Sector reforms- 1991.

UNIT-II
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.

UNIT-III
CAPITAL MARKETS: Securities Market – Organization and Structure, Listing, Trading and Settlement, Buying and Selling of shares, Stock Market Quotations, Stock Market Indices, SEBI and Regulation of Primary and Secondary Markets.

UNIT-IV
FUND BASED FINANCIAL SERVICES: Lease Finance, Hire purchase Finance, Factoring - Definition, Functions, Advantages, Evaluation, Forfeiting, Bills Discounting, Venture Capital Financing.

UNIT-V

MUTUAL FUNDS: Definition, Structure and functioning of Unit Trust of India and Mutual Funds, Types of Mutual Fund Schemes, Growth of Indian Mutual funds and their Regulation, Role of AMFI.

UNIT-VI

FEE BASED FINANCIAL SERVICES: Stock Broking, Credit Rating, Underwriting, Banker to an Issue, Debenture Trustees and Portfolio managers, Challenges faced by Investment Bankers. Merchant Banking: Definition, 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.
3. Vasant Desai: Financial Markets and Financial Services, Himalaya,2009
4. Pathak: Indian Financial Systems, Pearson, 2009
5. M.Y. Khan: Financial Services, TMH, 2009.

REFERENCES:

1. S. Gurusamy: Financial Services and System, Cengage,2009
2. Justin Paul and Padmalatha Suresh: Management of Banking and Financial Services, Pearson, 2009.
3. Gomez, Financial Markets, Institutions and Financial Services, PHI, 2012.
4. R M Srivatsava: Dynamics of Financial Markets and Institutions in India, Excel, 2013.

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV – I	9ZC23	**Advanced Entrepreneurship (Open Elective-II)**	3	0	0	3

Pre-requisites – Nil

Course Objective:
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:
After completion of this course student will be able to:

CO1: Explain the students to gain knowledge on the need of revisiting business models and also learn about types of business models. [L2]-U1
CO2: Discovers the various types of business planning that are needed to implement the business model [L4]-U2
CO3: Identify various funding options for an entrepreneur and also the team members involved in it [L3]-U3
CO4: Explains the digital platforms and tools available for marketing and also for online storage of documents [L2]-U4
CO5: Evaluate the growth of the startups using performance and financial metrics and seeking support and final project[L5]-U5, U6

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 .

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV – I	9ZC09	**Co-creation and Product Design (Open Elective-II)**	3	0	0	3

Pre-requisites – Nil

Course Objective:
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:

After completion of this course student will be able to:

CO1: Outline the significance of Human Centered Design from customer perspective. [L1]-U1, U2
CO2: Examine the scope of emerging technologies in the field of product design. [L3]-U3
CO3: Design the product prototypes and develop the testing solutions. [L4]-U4
CO4: Determine the relevance of reverse engineering and ergonomics at work place. [L3]-U5
CO5: Apply the knowledge into practice with regard to IPR's. [L3]-U6

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.

TEXT BOOKS:

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.

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV – I	9CC37	**Fundamentals of Communication** (Open Elective-II)	3	0	0	3

Pre-requisites – Nil

Course Objectives:

To develop an understanding on various wired and wireless communication and signal transmission schemes

Course Outcomes:
After studying this course, the students will be able to:

CO1: Explain the concepts of analog and digital modulation techniques. **(L2-UNIT- I& II)**
CO2: Explore the fundamentals of telecommunication and networks. **(L3-UNIT- III)**
CO3: Discuss the basic principles of optical communication, including light propagation, optical fibers, and waveguides. **(L2-UNIT- IV)**
CO4: Differentiate the various wireless technologies (e.g., satellite, cellular, Wi-Max, Bluetooth)and their applications. (**L2-UNIT- V & VI)**

UNIT - I
Introduction: Need for Modulation, Frequency translation, Qualitative analysis of Analog Modulation-AM, FM & PM, Transmitter fundamentals, TRF and Super heterodyne receiver.

UNIT - II
Simple description on Modulation: Pulse Modulation-PAM, PWM, PPM, Pulse Code Modulation, Delta Modulation, Qualitative analysis of Digital Modulation Techniques, FSK, PSK.

UNIT - III
Telecommunication Systems: Evolution of Telecommunication system, Switching systems: Crossbar, Time-Division, Space Division.
Networking and Local Area Networks: Network fundamentals, Ethernet, LAN topologies.

UNIT - IV

Optical Communication: Optical Principles, Optical Communication Systems, Fiber –Optic Cables, Optical Transmitters & Receivers, Wavelength Division Multiplexing.

UNIT - V

Satellite Communication: Satellite Orbits, satellite communication systems, satellite subsystems, Ground Stations Satellite Applications, Global Positioning systems.

UNIT - VI

Cellular and Mobile Communications: Cellular telephone systems, AMPS, GSM, CDMA and WCDMA.

Wireless Technologies: Bluetooth, Zig Bee, Wimax, Infrared wireless, RFID communication, UWB.

TEXT BOOKS:

1. Principles of Electronic Communication Systems, Louis E. Frenzel, 3e, McGraw Hill publications,4th edition, 2016.
2. Introduction to data communications and networking, Wayne Tomasi, Pearson, Education, 2005.
3. Electronic Communications systems, Kennedy, Davis 4e, MC GRAW HILLEDUCATION, 1999
4. Theodore Rapp port, Wireless Communications - Principles and practice, Prentice Hall, 2002.
5. Roger L. Freeman, Fundamentals of Telecommunications, 2e, Wiley publications.

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV – I	9AC45	**Fundamentals Of Renewable Energy Sources** (Open Elective-II)	3	0	0	3

Pre-requisites – Nil

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., Wind energy, Biomass energy, geothermal energy, and ocean energy.

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

CO1: Understand the role and potential uses of renewable energy sources viz. solar.(L1)(U1)
CO2: Demonstrates the knowledge of different techniques of solar collection and storage.(L2) (U2)
CO3: Describe different types of windmills and bio-gas and understand performance characteristics. (L2)(U3)
CO4: Illustrate the potential uses of geothermal energy in India and characterize different types of geothermal wells. (L2)(U4)
CO5: Explain different methods of kinetic energy extraction from Ocean waves, tides, and thermal energy extraction from Oceans. (L2)(U5)
CO6: Demonstrates the principle of operation of Fuel Cells.(L3) (U6)

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.

REFERENCES:

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

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV – I	9BC52	**Principles Of Operations Research (Open Elective-II)**	3	0	0	3

Pre-requisites – Nil

Course Objectives:
The course aims at building capabilities in the students for analysing different situations in the industrial/ business scenario involving limited resources and finding the optimal solution within constraints.

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

CO1: Build a mathematical model (linear programming problem) for production, distribution of goods, and economics. [L3]-U1
CO2: Solve the problem of transportation involving a large number of shipping routes with optimal transportation cost. [L3]-U2
CO3: Use Johnson's rule to create the optimal sequencing schedule for a sequencing problem and make decisions about replacing an item using a replacement policy. [L3]-U3
CO4: Analyze the performance measures of the Queuing system and Calculate the EOQ for minimizing the total inventory cost. [L4]-U4, U5
CO5: Apply simulation techniques for solving various types of problems and general idea development about Markov chains. [L3]-U6

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 X 2 & 2 X 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

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV – I	9FC77	**Scripting Languages** (Professional Elective –IV)	3	0	0	3

Pre-requisites – Nil

Course Objective:
Implement the server-side programs to create server-side scripts using PHP, JQuery and AJAX.

Course Outcomes:
At the end of this course, the student is able to :

CO1: Write the code illustrating the variables and Control structures of PHP. (U1) (L1)
CO2: Explore functions, arrays and File handling. (U2) (L2)
CO3: Build applications using advanced OO-PHP and handle the Exceptions. (U3) (L3)
CO4: Perform the CRUD operations onto the databases using front-end. (U4) (L3)
CO5: Process the form parameters and implement session tracking. (U5) (L5)
CO6: Explore JQuery and AJAX basics in the web page creation. (U6) (L2)

UNIT-I
Introduction to PHP: History of PHP, General Language Features, Installation and configuring Apache and PHP. PHP Basics: Styles of PHP Tags, Comments, Output functions, Datatypes, Identifiers. Variables: Declarations, Scope, Super Global Variables, Variable Variables, Constants, Expressions, Operators, String Interpolation, Control Structures.

UNIT-II
Functions: Invoking and Creating Functions, Passing Arguments by Value and Reference, Default Argument Values, Recursive Functions, and Function Libraries.
Arrays: What is an Array? , How to create an Array, Types of Arrays and Array Functions.
File handling:Opening, Reading, Writing and Closing a file. File-related functions.

UNIT-III
Introduction to OOPS: Introduction, Objects, Declaring a class, new keyword and constructor, Destructor, Access method and properties using $this variable, Public,private, protected properties and methods, Static properties and method, Class constant, Inheritance & code reusability, Polymorphism, Parent:&self:: keyword, instance of operator, Abstract method and class, Interface, Final.
Exception Handling:Understanding Exception and error Try, catch, throw

UNIT-IV

PHP and Web Forms: Working with HTML Forms, Pass data from a form to a PHP Script, Validate form data. Work with multivalued form components.

Database Connectivity with MySql: Introduction to Mysql, Connection with MySql Database, performing basic database operation (DML) (Insert, Delete, Update, Select), Setting query parameter, Executing query. SQL Injection, PHP Authentication.

UNIT-V

Multiple Database Handling**,** upload and retrieve images to database, Registration and Login forms with validations, Sending an email, Multipart Message,Session Tracking using PHP.

UNIT-VI

JQuery: Introduction to JQuery, Validation using JQuery, JQuery Forms, JQuery Examples.

AJAX : Introduction to AJAX, PHP with AJAX, Working with database

TEXT BOOK:

1. Beginning PHP and MySQL From Novice to Professional Fourth Edition by W. Jason Gilmore, Apress.

REFERENCES:

1. PHP: The Complete Reference by Steven Holzner, Mc Graw Hill.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV – I	9FC16	**Agile Software Development** (Professional Elective –IV)	3	0	0	3

Pre-requisites – Software Engineering and OOAD

Course Objectives:

Understand Agile Software Development and examine their applications in the real world and addresses their impacts on developing software.

Course Outcomes:

After completion of this course, student will be able to:

CO1: Summarize the various agile methodologies. [L2]-U1

CO2: Apply the XP practices, pair programming and agile modelling for real-time projects. [L3]-U2,U3

CO3: Examine the process of Feature-Driven Development and Regaining Control.[L3]-U4

CO4: Relate Agile Modelling and RUP and choose appropriate tools to help with Agile Development. [L2]-U5

CO5: Identify obstacles in Agile software development and gain familiarity with agility. [L3]-U6

UNIT-I

Introduction: Agile Methods, Agile Manifesto, and Agile Modeling Introduction, What Is Agile, The Agile Manifesto, Agile Methods, XP: Extreme Programming, DSDM, SCRUM, Feature-Driven Development, Modeling Misconceptions, Agile Modeling, Tools of Misconceptions, Updating Agile Models

UNIT-II

Extreme Programming: Introduction, Core XP Values, The Twelve XP Practices, About Extreme Programming, Planning XP Projects, Test First Coding, Making Pair Programming Work

UNIT-III

Agile Modeling and XP: Introduction, The Fit, Common Practices, Modeling Specific Practices, XP Objections to Agile Modeling, Agile Modeling and Planning XP Projects, XP Implementation Phase

UNIT-IV

Feature-Driven Development: Introduction, Incremental Software Development, Regaining Control: The Motivation behind FDD, Planning an Iterative Project, Architecture Centric, FDD and XP

UNIT-V

Agile Methods with RUP and PRINCE2 and Tools and Obstacles: Agile Modeling and RUP, FDD and RUP, Agile Methods and PRINCE2, Tools to Help with Agile Development, Eclipse: An Agile IDE.

UNIT-VI

Obstacles to Agile Software Development, Management Intransigence, The Failed Project Syndrome, Contractual Difficulties, Familiarity with Agility

TEXT BOOKS:

1. Agile software construction,1/e,JohnHunt, springer, 2005
2. Agile and Iterative Development: a manager's guide, Addison-Wesley Craig Larman,Pearson Education - 2004.

REFERENCES:

1. The Art of Agile Development, Pearson, Robert C. Martin, Juli, James Shore, Chromatic,2013, O'Reilly Media.
2. Agile Testing, Elisabeth Hendrickson, Quality Tree Software Inc 2008.

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV – I	9LC17	**DEVOPS** (Professional Elective –IV)	3	0	0	3

Pre-requisites – Nil

Course Objectives:
1. Discuss the Devops concepts and software development models.
2. Apply the concepts of project management and system integration.
3. Implement automated system update and DevOps lifecycle.

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

CO1: Understand and Explain DevOps Practices (L2) (U1)

CO2: Analyze Software Architecture and DevOps Integration (L4) (U2)

CO3: Apply Source Code Management Techniques (L3) (U3)

CO4: Design and Implement Automated Build Pipelines (L6) (U4)

CO5: Evaluate Testing Automation and Deployment Tools and Techniques (L5) (U5, U6)

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.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV – I	9JC04	Ethical Hacking (Professional Elective –IV)	3	0	0	3

Pre-requisites – Knowledge in information security, Web application

Course Objective:
Introduce the methodologies and framework of ethical hacking for enhancing the security.

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

CO1: Distinguish the components of Information Security Models. (L2) (U1, U2)

CO2: Plan for a controlled attack and interpret the results. (L5, L6) (U3, U4)

CO3: Apply the knowledge of tools to support ethical hacking to meet the business challenges. (L3) (U2, U4)

CO4: Enumerate comprehensive deliverables and integrate security findings. (L4) (U5, U6)

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, Overal 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.

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV – I	9FC17	**Cloud Computing** (Professional Elective –V)	3	0	0	3

Pre-requisites – Nil

Course objectives :

1. Understand and analyze the basic cloud computing models and applications.
2. Implement security issues in cloud technology and also cloud resources in the market.

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

CO1: Summarize the characteristics of cloud technologies and differentiate the cloudservice and deployment models and to explore vendor-specificservices. [L2]-U1,U2

CO2: Illustrate different architectures for cloud applications, and create and run Amazon ec2 instances through Python programs.[L2]-U3

CO3: Classify the performance of cloud services and summarize the innovative applicationsof IOT on cloud. [L2]-U4

CO4: Demonstrate to deploy the cloud-based applications. [L3]-U5

CO5: Discuss various security aspects in cloud computing.[L2]-U6

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,VijayMedisetti,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 Compuitng: John W. Rittinghouse ,JamesRansome,CRC press.
4. Virtualization Security: Dave Shackleford2013,SYBEX a Willy Brand.
5. Cloud Computing and Software Service: Ahson, iiyas.2011.
6. Cloud Computing Bible: Sosinsky 2012 Wiley India.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV – I	9FC84	**Business Intelligence** (Professional Elective –V)	3	0	0	3

Pre-requisites – Nil

Course Objectives:
Understand the modeling process behind business analytics and analyze different data analysis tools and techniques.

Course Outcomes:
At the end of this course the student will be able to:

CO1: Explain the importance of business intelligence and its applications in todaysreal world. (U1) (L2)
CO2: Illustrate the different form of analytics such as business analytics, descriptive andpredictive analytics on different forms of data. (U2) (L4)
CO3: Articulate the various phases essentially required for business analytics. (U3) (L3)
CO4: Appraising the technological components and business process management in theoperational intelligence. (U4) (L4)
CO5: Examine different data models helpful in creating decision support systems. (U5) (L4)
CO6: Summarize the various tools and metrics of web analytics and web mining. (U6) (L2)

UNIT-I
Introduction to Business Intelligence: Business Intelligence, Mobile Business Intelligence, Real-time Business Intelligence (Text Book-1)

UNIT-II
Analytics: A Comprehensive Study, Business Analytics, Analytics, Software Analytics, Embedded Analytics, Learning Analytics, Predictive Analytics, Prescriptive Analytics, Social Media Analytics, Behavioral Analytics (Text Book-1)

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 (Text Book-1)

UNIT-IV

Operational Intelligence: Technological Components, Operational Intelligence, Business Activity Monitoring, Complex Event Processing, Business Process Management, Metadata, Root Cause Analysis (Text Book-1)

UNIT-V

Prescriptive Analytics ,Decision Support Systems Modeling - Mathematical Models for Decision Support - 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 (Text Book-2)

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 Book-2)

TEXT BOOKS:

1. Drew Bentley, Business Intelligence and Analytics, Published by Library Press
2. Efraim Turban, Ramesh Sharda, DursunDelen, “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.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV – I	9LC21	**Quantum Computing** (Professional Elective –V)	3	0	0	3

Pre-requisites – Nil

Course Objectives:
Discover the principles of quantum computing and problem-solving using finite dimensional mathematics

Course Outcomes:
At the end of this course the student will be able to:

CO1: Understand essential linear algebra, including matrix math and complexnumbers, for foundational quantum computing concepts (L1) (U1)
CO2: Explain basic quantum physics concepts like quantum states, uncertainty, and entanglement, and their role in quantum computing (L2) (U2)
CO3: Apply quantum mechanics theories, including quantum electrodynamics and entanglement, to understand quantum communication and cryptography (L3) (U3)
CO4: Analyze quantum architecture and hardware, including qubits, quantum gates, and circuits, for building quantum systems (L4) (U4)
CO5: Evaluate quantum algorithms such as Deutsch's and Shor's, and assess the impact of quantum computing on cryptography (L5) (U4, U5)

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 Matrice, 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.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV – I	9LC22	**Parallel And Distributed Computing** (Professional Elective –V)	3	0	0	3

Pre-requisites – Nil

Course Objectives:

1. Learn the fundamental idea underlying parallel and distributed computing. Investigate the approaches used for parallel and distributed environments.
2. Understand the networking components of parallel and distributed computing.
3. Give an overview of the computational elements of parallel and distributed computing.

Course Outcomes:
At the end of this course the student will be able to:

CO1: Examine techniques for parallel and distributed (L5) (U1) environments.

CO 2: Analyze the networking aspects of Distributed and Parallel Computing (L4) (U2

CO3: Analyze performance difficulties in parallel and distributed computing. (L4) (U3)

CO 4: Tools usage for parallel and distributed computing (U4)

CO 5: Understanding high performance computing techniques (L2) (U5) (U6)

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.

TEXT BOOKS:

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 Mesh Based and Meshless Methods", Springer, 2015.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV – I	9LC02	**Advanced Artificial Intelligence And Deep Learning**	3	0	0	3

Pre-requisites – Machine Learning

Course Objectives:

1. Understand the various kinds of AI agents. Know different AI search methods (uninformed, informed, heuristic, constraint satisfaction, and genetic algorithms).
2. Study the fundamentals of knowledge representation (logic-based, frame-based, semantic nets), inference, and theorem proving. Demonstrate working knowledge of reasoning with partial and/or uncertain information.
3. The ability to apply knowledge representation, reasoning, and machine learning approaches to real-world issues. The ability to use convolution network concepts in real-world applications.

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

CO1: Identify different types of agents and their relationships with the environment. (L3) (U1)

CO2: Demonstrate the application of agents handling applications dealing with conflict resolution. (L2) (U2)

CO3: Understanding on a logical level and be able to transfer it to a form suitable for implementation. (L2) (U3)

CO4: Derive inferences applying rules of First Order Logic. (L6) (U4)

CO5: Formulate an approach for applications involving complete and incomplete Planning. (L6) (U5)

CO6: Choose the appropriate learning strategy needed for solving a given problem. (L6) (U6)

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, 3rd 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.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV – I	9LC18	**Natural Language Processing**	3	0	0	3

Pre-requisites – Data Structures, Finite Automata and Probability Theory

Course Objectives:

Discuss about word and document structure, semantic parsing, and syntax analysis. Know how different language models and representation systems hinder the processing of concepts.

Course Outcomes:

After completion of this course, students will be able to:

CO1: Understand and Describe the Structure of Words and Documents (L2) (U1)

CO2: Analyze and Parse Syntactic Structures (L4) (U2)

CO3: Illustrate and Implement Semantic Parsing Techniques (L2) (U3)

CO4: Assess Predicate-Argument Structures and Meaning Representation. (L5) (U4)

CO5: Develop Language Models, overall structure of discourse and Evaluate Their Performance (L4) (U5, U6)

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, Treebanks: 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.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV – I	9FC15	**Big Data Analytics**	3	0	0	3

Pre-requisites – Machine Learning

Course Objectives:

To explore the fundamental techniques and principles in achieving big data analytics with stream processing.

Course Outcomes:
After completion of this course student will be able to:

CO1: Comprehend the fundamentals of big data analytics using Hadoop to solve the real-life problems. (L2, U1)
CO2: Outline the concepts of map reduce, hivein big data environment and differentiate NoSQL and SQL databases. (L2, L4, U2, U3)
CO3: Develop the algorithms to process big data using Apache Spark Low Level API. (L3, U4, U5).
CO4: Make use of Stream Processing techniques to develop social media applications (L3, U6)

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 HadoopEcoSystem, 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, HBasearchitecture, 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 &MateiZaharia, O'Reilley, 2018 Edition

REFERENCES:

1. "Hadoop Operations", O'Reilley, Eric Sammer,2012
2. "ProgrammingHive", O'Reilley,E.Capriolo,D.Wampler,andJ.Rutherglen,2012
3. "HBase: The Definitive Guide", O'Reilley, Lars George,2011
4. Big Data, Big Analytics: Emerging, Michael Minnelli, Michelle Chambers,and AmbigaDhiraj

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV – I	9LC66	**Deep Learning Lab And Big Data Analytics Lab**	0	0	3	1.5

Pre-requisites – Nil

Course Objectives:

Gain basic ideas and principles in data center design; cloud management techniques and cloud software deployment considerations; also give exposure on the foundations Of Deep Learning, to Build the Neural Network.

Course Outcomes:

After completion of this course student will be able to:

CO1: Discuss system, network, and storage virtualization and outline their role in enabling the cloud computing system model (L2)

CO2: Illustrate the Fundamental Principles of Deep Learning (L2)

CO3: Identify The Deep Learning Algorithms for Various Types of Learning Tasks in various domains (L3)

CO4: Implement Deep Learning Algorithms and Solve Real-world problems (L4)

CO5: Use Excel as an Analytical tool and visualization tool (L3)

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 to 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 the IMDB dataset, and use RNN layers with LSTM/GRU notes.
7. Applying the Autoencoder algorithms for encoding the real-world data.
8. Applying Generative Adversarial 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 BOOKS:

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.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV – I	9LC67	**Scripting Languages Lab** (Professional Elective –IV)	0	0	3	1.5

Pre-requisites – Any high-level programming language (C, C++).

Course Objectives:
Gain knowledge on Ruby, PHP, PERL and TCL operations. also, the skill to implement Scripting Languages.

Course Outcomes:
After completion of this course student will be able to:

CO-1. Identify the between typical scripting languages and typical system and application programming languages. (L1)
CO-2. Implement Perl, TCL, and Ruby (L4)
CO-3. Demonstrate programming skills in scripting language(L2)

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 that accepts the user's first and last name and prints them in reverse order with a space between them.
4. Write a Ruby script to accept a filename from the user and 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 the 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 compare 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.
4. 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.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV – I	9LC68	**Agile Software Development Lab** (Professional Elective –IV)	0	0	3	1.5

Pre-requisites – Software Engineering and OOAD

Course Objectives:

Describe the agile relationship between development and IT operations. Understand the skill sets and high-functioning teams involved in Agile Software development and related methods to reach a continuous delivery capability to implement automated system update and Agile Software development lifecycle

Course Outcomes:

After completion of this course student will be able to:

CO1: Apply the principles and practices of extreme programming in real– world problems(L3)
CO2: Illustrate proper coding standards and guide lines in an agile process. (L4)
CO3: lustrate an agile process by exploring the possible risks and threats in the software process. (L4)

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)
2. Creation of UbuntuEC2 instance, connect (open putty session), practice Linux commands and terminate, SSH-authentication setup between different servers, Security groups, and Key pairs (Public key, Private keys). (Amazon Web Services)
3. **Installing Git, sign up process for Git, Subversion controls/Git working with local repositories, remote repositories, Software configuration management (SCM) using Git, Managing projects from Git. (Git/GitHub)**
4. Installation of Git server, Git commands, Cloning fetch/pull, Merging in Git, and Branching strategies of Git. **(Git/GitHub)**
5. Continuous integration continuous deployment tools, Jenkins installation, User profile and management in Jenkins, Builds setup and pipeline of jobs in Jenkins. **(Jenkins Frame Work)**
6. Jenkins master &slave node configuration**,** Jenkins workspace management, Securing Jenkins-authentication, Authorization, Confidentiality, Creating users. **(Jenkins Frame Work)**
7. Jenkins plugins- Installing Jenkins plugins, SCM plugins, Build and test, Artifacts, Integration with Git, Create a docker Image. (Jenkins Frame Work)

8. Docker terminologies, Installation of Docker, Docker image creation and Docker hands-on, Docker container creation/start/stop/destroy. (Docker)
9. Installing Ansible on Linux (Aws-Ec2 server) and SSH-authentication setup, Understanding modules, Ansible playbooks, Playbooks creation and execution. (Ansible)
10. Writing and executing different types of playbooks, Playbook with direct static tasks, Playbook with a dynamic variable pass, Playbook with roles. **(Ansible)**

TEXT BOOKS:

1. Andrew Stellman and Jennifer Greene, Learning Agile,1st 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,1st ed. Mumbai: Shroff-O'Reilly,2018.
2. Pierluigi Riti, Pro Devops with Google Cloud Platform with Docker, Jenkin sand Kubernetes,1st ed., NewYork: Apress,2018.
3. James's shore and Shanewarden, The art of Agile development,1sted., Mumbai: Shroff-O'Reilly,2018.

SREENIDHI INSTITUTE OF SCIENCE AND TECHNOLOGY
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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV – I	9LC69	**Devops Lab** (Professional Elective –IV)	0	0	3	1.5

Pre-requisites – Nil

Course Objectives:
Understand the skill sets and high-functioning teams involved in DevOps and related methods to reach a continuous delivery capability Implement automated system update and DevOps lifecycle

Course Outcomes:
After completion of this course student will be able to:

CO: Identify components of Devops environment (L3)
CO: Applydifferent project management, integration, testing and code deployment tools (L3)
CO3: Illustrate different DevOps Software development models (L4)

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 the 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
3. Linux System Programming, Robert Love, O'Reilly, SPD.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV – I	9LC70	**Ethical Hacking Lab** (Professional Elective –IV)	0	0	3	1.5

Pre-requisites – Theoretical knowledge of Ethical Hacking, Automata and Compiler Design

Course Objectives:
The aim of the course is to introduce the methodologies framework tools of ethical hacking to get awareness in enhancing the security and to get knowledge on various attacks and their detection

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

CO1: Use the available tools to support an ethical hacking procedure. (L3)
CO2:Interpret the results of a controlled attack. (L2)
CO3: Illustrate different types scanning using tools (L4)

LIST OF EXPERIMENTS (ETHICAL HACKING)

1. Setup a honey pot and monitor the honey pot on the 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, and cookies extraction using the Burp suite tool

TEXTBOOK:

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.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV – I	9L792	**Summer Industry Internship – II**	-	-	-	1

Pre-requisites – All Courses till this Semester

Course Objectives: To enhance the skills and knowledge in multidisciplinary and thrust areas to apply and solve complex problems.

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

CO1: Apply advanced technologies and modern tools to build multidisciplinary products. [L3]
CO2: Inculcate an enthusiasm to use creative ideas to build innovative projects and prototypes that meet the current needs of the market and society as a whole. [L4]
CO3: Improve their communicative skills and team skills. [L6]

A summer industry internship project shall be carried out by a group of students consisting of 1 or 2 to 3 in number during the summer second-year semester at industries or institutions.
This work shall be carried out under the guidance of the faculty assigned as an internal guide as well as an external guide at the industry where students are carrying out summer industry internship projects. The project shall consist of the design, fabrication, software development, or building of a prototype or application app. This can also be of an interdisciplinary nature.
There will be 100 marks in total with 40 marks for internal evaluation and 60 marks for external
The internal evaluationshall consist of:

Presentation:15 marks
Internal Evaluation:15 marks
Report:10 marks
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40 marks

End examination: 60 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, the head of the department, a senior faculty member, and the internal guide.

Presentation:10 marks
Demonstration/ Technology:40 marks
Report:10 marks
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60 marks

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV – II	9ZC19	**Project And Risk Management (Open Elective-III)**	3	0	0	3

Pre-requisites – Nil

Course Objective:

Use knowledge of Project Management and Risk management avenues for making better financial decisions.

Course Outcomes:

After completion of this course, students will be able to:

CO1: Describe the concepts of project management and project formulation. [L1]-U1, U2
CO2: Demonstrate the procedure for project implementation. [L2]-U3
CO3: Identify the risk management process and methods. [L3]-U4
CO4: Analyze the role of Derivatives and Options and Swaps as a risk management tool. [L4]-U5, U6

UNIT-I
BASICS OF PROJECT MANAGEMENT: Concept and characteristics of a project - types of projects - Project life cycle - Challenges and problems of project management - Qualities & functions of a project manager.

UNIT-II
PROJECT FORMULATION: Generation of Project Ideas; Monitoring the environment; Preliminary Screening of Projects; Feasibility study; Project Selection, Detailed Project Report: Market, Technical, Financial and Economic aspects

UNIT-III
PROJECT IMPLEMENTATION: Pre-requisites for Successful Project Implementation; Control of in-progress Projects (Gantt chart, PERT, CPM); Financing of Projects, Project Risk Management Process, Post-audit; Abandonment Analysis

UNIT-IV

RISK MANAGEMENT: Risk – Definition, Types of Risk, Approaches to Risk Management, Risk Management Process and Techniques.

UNIT-V

DERIVATIVES – I: Introduction to Financial Derivatives, Types of Derivative Instruments – Forwards, Futures, Differences between Forwards and Futures, Margin Limits.

UNIT-V1

DERIVATIVES –II:

a) Options: Definition, Operation of Option contracts, Call Option, Put Option, Factors determining Option values.

b) Swaps: Definition, Types of Swap agreements, Mechanics of Interest rate swaps, Mechanics of Currency swaps.

TEXT BOOKS:

1. H. Nandan, Fundamentals of Entrepreneurship, Prentice Hall of India, First Edition, New Delhi, 2007.
2. Jeffrey K. Pinto "Project Management", 2nd edition, Pearson
3. Dhandapani Alagiri "Structured Finance – Concepts & Perspectives", ICFAI University press.
4. Projects by Prasanna Chandra, McGraw-Hill Publishing Co. Ltd

REFERENCES:

1. Project Management: Systems approach to Planning Scheduling and Controlling, H. Kerzner.
2. The Complete Real Estate Documents by Mazyar M. Hedayat, John J. Oleary
3. The Fundamentals of Listing and Selling Commercial Real Estate - By Keim K. Loren (Author)

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV – II	9ZC24	**Product And Services** (Open Elective-III)	3	0	0	3

Pre-requisites – Nil

Course Objectives:
Study the concepts of Product management and Services Design.

Course Outcomes:
After completion of this course student will be able to:

CO1: Explain the students about basic concepts of product [L2]-U1
CO2: Demonstrate ten the students with the process of new product development and stages in the process. [L2]-U2
CO3: Inspect the new product using testing, product planning and the preparatory groundwork for launching a new product [L4]-U3
CO4: Explains the students to understand the nature of services, its differences with the goods and the application of marketing principles for services [L2]-U4, U5
CO5: Examines the quality of services and also helps in knowing various forms of delivering services [L4]-U6

UNIT-I
INTERPRETATIONS ON PRODUCT: Meaning of Product, Product Market Fit Analysis, Product Levels, Product Mix, Product Pruning, and Product Cannibalization. Types of Product Classification

UNIT-II
PRODUCT INNOVATION and VALIDATION: New products-What is a new product, New Product Development Process, Idea generationSystems,Concept test, Product testing, Pre-launch, Market test, Final evaluation using "Stage / Gate Process. Product Validity, Break Even Analysis, Financial, and Market Analysis.

UNIT-III
LAUNCHING PRODUCT: Cost Analysis, Steps to fix the final price, Promotion Planning, Digital Marketing and Methods, Retailing, Types of Retailing online Retailing, Post Market Analysis of the Launch

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, Servicescape

UNIT-V

SERVICE PROCESS DESIGN and SERVICE DISTRIBUTION: Service Design Meaning, Tools for Service Design, Attributes of a Good Design Customer Involvement in the Production Process, Role of Intermediaries, Methods of Distribution of Services

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.

TEXTBOOKS:

1. Dr. S.L. Gupta, Product Management, Wisdom Publications
2. C.Merle Crawford, New Product Management
3. Valarie A.Zeithaml& Mary Jo-Bitner: Services Marketing—Integrating Customer Focus Across the Firm, 3/e, Tata McGraw Hill, 2007.

REFERENCES:

1. Thomas J.Delong&Asish Nanda: Managing Professional Servies—Text and Cases, McGraw-Hill International, 2006.
2. Christopher Lovelock: Services Marketing People, Technology, Strategy, Fourth Edition, Pearson Education, 2006

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV – II	9ZC10	**Entrepreneurship And Business Design** (Open Elective-III)	3	0	0	3

Pre-requisites – Nil

Course Objective:

Understand the essentials of building their startups and to familiarize with business design process develop business models, and market their product.

Course Outcomes:
After completion of this course student will be able to:

CO1: Explain the essential concepts of entrepreneurship. [L2]-U1
CO2: Distinguish the different phases of UI/UX.[L2]-U2
CO3: Develop the attentiveness on design of business strategy and services. [L3]-U3, U4
CO4: Illustrate the concept of business model and its validation. [L4]-U5
CO5: Identify the sources of funding and risk assessment. [L3]-U6

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 cantered 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.

REFERENCES:

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.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV – II	9CC38	**Embedded Systems** (Open Elective-III)	3	0	0	3

Pre-requisites – Nil

Course Objectives:

To equip students with the skills to design, develop, and optimize embedded systems for specific applications using hardware and software integration.

Course Outcomes:
After completing this course, students shall be able to:

CO1: Identify the design constraints and challenges of a modern embedded system **(L3- Unit-I)**
CO2: Explore the architecture, register, and memory organization of the 8051 microcontrollers**(L3- Unit-II)**
CO3: Interpret the hardware interface and assembly language program to interface the DC motor, keyboard, and LCDperipherals with 8051**(L2- Unit-III)**
CO4: Discuss the interfaces for Embedded System using various protocols and hardware modules **(L2- Unit-IV)**
CO5: Explain the concepts and design requirements related to real-time systems, getting embedded software into the target system **(L2- Unit-V & VI)**

UNIT-I

Introduction to Embedded Systems: Embedded Systems, Comparing Embedded and General Computing, Complex System Design and Processors, Classification of Embedded Systems, Embedded System Design Process, Formalization of System Design, Embedded SOC and VLSI Circuit Technology, Application examples of Embedded Systems.

UNIT-II

8051 Architecture, Memory Organization and Programming: 8051 Architecture, features, addressing modes, Instruction set, Input/Output Ports and Circuits, External Memory, Counter and Timers, Serial data, Input/Output, Interrupts; The Assembly Language programming Process, Programming the 8051, Data Transfer and Logical Instructions. Arithmetic Operations, Decimal Arithmetic. Jump and Call Instructions, use of C programming for 8051.

UNIT-III

8051 Real World Interfacing: Part A - Real World Interfacing, Performance metrics, Memory map, Processor and Memory selection,

Part B - IO Subsystem, Sensors and Actuators, LED and LCD Interfacing, Keyboard Interfacing, Stepper Motor Interfacing, DC motor Interfacing Using PWM

UNIT-IV

Embedded Communication Interface: Serial and Parallel Communication, Timer and Counting Devices, Watchdog Timer, Real Time Clock, I^2C, SPI protocol, ISA, PCI, Internet Enabled Systems, Wireless and Mobile Systems Protocols

UNIT-V

Introduction to Real-Time Operating Systems: Tasks and Task States, Tasks and Data, Semaphores, and Shared Data; Message Queues, Mailboxes and Pipes, Timer Functions, Events, Memory Management, Interrupt Routines in an RTOS Environment. (Chapters 6 and 7 from Text Book 3, Simon).

UNIT-VI

Basic Design Using a Real-Time Operating System: Principles, Semaphores and Queues, HardReal-Time Scheduling Considerations, Saving Memory and Power, An example RTOS like uC-OS (Open Source);

Embedded Software Development Tools: Host and Target Machines, Linker! Locators for Embedded Software, Getting Embedded Software into the Target System; Debugging

TEXTBOOKS:

1. Embedded Systems- Architecture, Programming and Design 2E, Raj Kamal, TMH
2. Introduction to Embedded Systems, K.Shibu, Tata McGraw-Hill
3. The 8051 Microcontroller and Embedded Systems Using Assembly and C – Mazidi, Pearson Education India, 2nd edition, 2008.
4. An Embedded Software Primer, David E. Simon, Pearson Education
5. Computers and Components: principles of embedded *computing* system design, Wayne Wolf, Elseveir.
6. 8051 Application Notes by Atmel.

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV – II	9AC47	**Power Electronics Devices And Converters** (Open Elective-III)	3	0	0	3

Pre-requisites – Nil

Course Objective:
With the advent of semiconductor devices, a Revolution is taking place in the power transmission distribution and utilization. This course introduces the basic concepts of power semiconductor devices, Converters, and choppers and their analysis.

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

CO1: Understand the construction and operation of various power semiconductor devices and analyze about the series and parallel operation of SCRs. (L2)(U1)
CO2: Analyze the operation of different configurations of single-phase converters for different loads. (L3)(U2)
CO3: Analyze the operation of different configurations of three-phase converters for different loads. (L3)(U3)
CO4: Explain the operation of different types of choppers. (L2)(U4)
CO5: Explain the operation of inverters and applications of inverters. (L2)(U5)
CO6: Explain the working of an AC voltage controller and Cyclo-Converters for different configurations. (L3)(U6)

UNIT-I
POWER SEMICONDUCTOR DEVICES:
Thyristors, Silicon Controlled Rectifiers (SCRs), BJT, PowerMOSFET, Power IGBT, DIAC, TRIAC, GTO, and their characteristics. Basic theory of operation of SCR, Static characteristics, two transistor analogy, turn on and turn off methods, Dynamic characteristics of SCR, turn on and turn off mechanism., SCR, UJT firing circuit, Series and parallel connections of SCR's, Snubber circuit details, Specifications and Ratings of SCR's, BJT, IGBT.

UNIT-II

SINGLE-PHASE CONTROLLED CONVERTERS: Phase control technique, Single Phase Line commutated converters, Midpoint and Bridge connections; Half controlled and fully controlled converters, Derivation of average load voltage and current with R and RL loads,

UNIT-III

THREE-PHASE CONTROLLED CONVERTERS: Three-phase half-controlled and fully controlled bridge converters with R and RL loads, Effect of Source inductance, Waveforms, and Numerical Problems.

UNIT-IV

CHOPPERS: Choppers, Time ratio control, and Current limit control strategies Step down choppers Derivation of load voltage and currents with R, RL, and RLE loads, Step up Chopper, load voltage expression, Jones chopper and waveforms, Problems, Buck, Boost, Buck-Boost choppers. (Qualitative treatment).

UNIT-V

INVERTERS: Inverters, Single phase inverters, Half and Full bridge VSI & CSI inverters, Waveforms, Voltage control techniques for inverters, three-phase inverters with 120degrees and 180 degrees mode of conduction, Pulse width modulation techniques (Multiple Pulse and Sinusoidal), Numerical problems.

UNIT-VI

AC VOLTAGE CONTROLLERS & CYCLO CONVERTERS: AC voltage controllers, Single phase two SCRs in anti-parallel with R and RL loads, Derivation of RMS load voltage, current and power factor waveforms, Firing circuits, Numerical problems, Cycloconverters, Single phase midpoint cyclo converters with Resistive and inductive load (Principle of operation only), Bridge configuration of single phase cyclo converter (Principle of operation only), Waveforms

TEXTBOOKS:

1. Power Electronics - P.S.Bimbhra, Khanna Publishers.
2. Power Electronics Circuits, Devices, and Applications - M. H. Rashid, Prentice Hall of India, 2nd edition.

REFERENCES:

1. Power Electronics - Vedam Subramanyam, New Age International (P) Limited, Publishers.
2. Power Electronics - V. R. Murthy 1st edition, OXFORD University Press.
3. Power Electronics - P. C. Sen,Tata Mc Graw Hill Publishing.
4. Power Electronics - M. D. Singh & K. B. Kanchandhani, Tata Mc Graw Hill Publishing Company.

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Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV – II	9BC53	**Principles Of Automation And Robotics** (Open Elective-III)	3	0	0	3

Pre-requisites – Nil

Course Objective:
Understand the principles of automation, the importance of automated flow lines and its types and to learn the concepts of Robotics, kinematics of robots, principles of robot drives and controls, sensors used in robots, and programming methods.

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

CO1: Explain the production system that includes pneumatic and hydraulic components. [L2]-U1
CO2: Analyze flow lines with various methods of work part transfer mechanical buffer storage control functions. [L4]-U2
CO3: Build up various automated material handling and storage system models. [L3]-U3
CO4: Apply adaptive control systems to material requirement plans I and II. [L3]-U4
CO5: Demonstrate industrial robots with the help of kinematics analysis and type of applications. [L2]-U5, U6

UNIT-I
Introduction: Production system, Automated manufacturing systems, Reasons, Principles and strategies of automation, Basic elements of automated system, pneumatic and hydraulic circuit components, Assembly system and line balancing: Manual Assembly process, and work transport systems, Line pacing, Analysis of manual assembly lines, line balancing methods-problems, ways of improving line balance lines.

UNIT-II
Analysis of Automated flow lines: System configuration, Work part transfer, General terminology and analysis of transfer lines without and with buffer storage.
Automated Assembly systems: Fundamentals and Design of assembly systems.

UNIT-III

Automated material handling: Principles, Types of equipment, functions, analysis and design of material handling systems, conveyor systems, automated guided vehicle systems-technology, Analysis of material transport systems.

Automated storage systems: Basic terminology, AS/RS; Carousel storage, work in process storage,

UNIT-IV

Adaptive control systems: Introduction, Adaptive control with optimization, Adaptive control with constraints, Application of A.C. in Machining operations. Use of various parameters such as cutting force, Temperature, vibration and acoustic emission. Concept of Concurrent Engineering, MRP, MRP II, Techniques of Rapid Prototyping.

UNIT -V

Robotics: Classification and structure of Robotic systems, structure of continuous path robot systems, drives and control systems, and control approaches for robots.

UNIT-VI

Robot arm kinematics, the direct kinematics problem and inverse kinematic solutions, planning of manipulator trajectories, robot sensors, range sensors, proximity sensors, touch sensors, force and torque sensors, programming, manual teaching, lead through teaching, programming languages, storing and operating task programs, robot selection and application.

TEXTBOOKS:

1. Automation, Production Systems and Computer Integrated Manufacturing: M.P. Groover. /PE/PHI
2. Mittal and Nagrath, ‘Robotics and Control’, Tata Mc Graw Hill.

REFERENCES:

1. Computer control of Manufacturing Systems by Yoram Coreom.
2. CAD / CAM/ CIM by Radhakrishnan.

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV – II	9FC07	**Cyber Security And Cyber Laws**	2	0	0	2

Pre-requisites – Nil

Course Objectives:

1. To develop a foundational understanding of cybersecurity concepts, Learning about cybersecurity tools and techniques and legal and ethical implications of cybersecurity.
2. To develop problem-solving and critical thinking skills

Course Outcomes:
After completion of this course student will be able to:

CO1: Summarize the cryptographic procedures and understand its primitives. [L2]-U1
CO2: Outline Security policy in Legislation and Comprehend E-Commerce framework, models and its associated threats. [L4]-U2
CO3: Demonstrate the role of electronic signatures in E-Commerce and summarize the various Laws relating to it. [L2, L3]-U3
CO4: Categorize international cyber laws and cybercrimes and explore Penalties, Compensation and Adjunction of violations of provisions of IT Act 2000. [L4]-U4, U5
CO5: Classify and outline theoffenses under the Cyberspace law and the Internet in India. [L2]-U6

UNIT-I
Introduction to cyber-security, cryptography, Types of Attacks, Secret Key Cryptography
Introduction: Cyber-attacks, Defence 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, and Protection of Intellectual Property Rights in Cyberspace in India.

UNIT-IV

International Efforts relating to Cyberspace laws and Cybercrimes

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

Offenses under the Cyberspace, Internet in India and Miscellaneous provisions of IT Act and Conclusions

Some important offenses 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.

REFERENCES:

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.

Cyber Forensics: A Field Manual for Collecting, Examining, and Preserving Evidence of Computer Crimes, Second Edition, Albert Marcella, Jr., Doug Menendez, Auerbach Publications, 2007

SREENIDHI INSTITUTE OF SCIENCE AND TECHNOLOGY
(An Autonomous Institution approved by UGC and 'A+' Grade Awarded by NAAC)

Syllabus for B.Tech-Computer Science and Engineering(Artificial Intelligence and Machine Learning) – A22 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV – II	9L896	**Project**	0	0	20	10

Pre-requisites – All Courses till this Semester

Course Objectives:
To enhance the knowledge on selecting a domain, identify problem statements,usage of tools to develop products or software to solve industrial needs or societal problems.

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

CO1: Apply engineering principles and other relevant disciplines to solve complex problems. [L3]
CO2: Use research-based knowledge to design and develop the software or prototype using modern software tools wherever applicable. [L3]
CO3: Defend effectively in professional contexts [L5]
CO4: Identify the importance of professional responsibility and making informed judgments based on legal and ethical principles. [L3 & L5]
CO5: Function effectively and efficiently as a member of the team or a team leader [L5]

A project shall be carried out by a group of students consisting of 1 or 2 to 3 in number in the fourth year second semester. This work shall be carried out under the guidance of the faculty assigned as an internal guide and shall involve design, fabrication, software/ productdevelopment,or any other significant activity. This can also be of an interdisciplinary nature.

Out of a total of 100 marks for project work (in the final year second semester), 40 marks shall be for Continuous Internal Evaluation and 60 marks for the Semester External Evaluation at the end of the Semester.

Semester End 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, an HOD, a Senior Faculty Member, and an Internal Guide.

Division of Marks for Continues Internal Evaluation - 40 marks

Sl.No	Description	Marks
1	Abstract Seminar at the end of 3 weeks	5
2	Design Seminar at the end of 8 weeks	5
3	Implementation / Demonstration of Seminar at the end of 12 weeks	10
4	Evaluation of Project by Internal Guide	10
5	Project Report	10
6	Total	40

Division of Marks for Semester End External Evaluation –60 Marks

Sl.No	Description	Marks
1	Project Report	10
2	Presentation	20
3	Demonstration/Defense of project	30
	Total	60

A student must secure 40% of the total marks to obtain a pass grade.