Scheme and Syllabus

of

Proposed programme for 2022-26 Batch

on

B. TECH. (COMPUTER SCIENCE AND ENGINEERING WITH ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

By

Skill Department of CS/IT

Skill Faculty of Engineering & Technology

Shri Vishwakarma Skill University

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It is certified that this Scheme and Syllabus, developed and checked by us, is completed in all respects.

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VISION AND MISSION

VISION OF UNIVERSITY

To emerge as one of the foremost institutions of quality in skill education acknowledges by industry, nationally and internationally.

MISSION OF UNIVERSITY

To focus on quality of skill education, aspired by students and admired by industry, nationally and internationally.

VISION OF THE DEPARTMENT

To build highly skilled and competent professionals with a futuristic outlook for research and innovation who can also generate sustainable employment with virtuous professional values.

MISSION OF THE DEPARTMENT

- To impart skill education and training as per industry needs in the domain of Computer Science & Engineering.
- To develop and maintain the state of art infrastructure for building sustainable skilled IT ecosystem in the domain.
- To cultivate the environment for fostering new ideas, research and innovations leading to emergence of skilled entrepreneurs, leaders, innovators and professionals.

Program Outcomes (POs)

The following are the PO's defined for the Graduate program in Engineering by NBA:

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Educational Objectives (PEOs)

PEO 1: To produce engineering graduates with skill and knowledge in basic science, Mathematics & Engineering for the application in the domain.
PEO 2: To produce engineering graduates who can demonstrate technical competence in the field of Computer Science in order to develop solutions to the complex problems.
PEO 3: To produce engineering graduates who will continue to learn and adapt latest technologies to solve real life problems.
PEO 4: To produce graduates who contribute to the development of nation effectively in a multi-disciplinary environment.
PEO 5: To produce graduates who pursue research for sustainable development of self and nation.

Program Specific Objectives (PSOs)

At the end of course, Student:

PSO 1: should be able to understand the concepts of computer science and their applications in the field of Artificial intelligence, Machine Learning, and other relevant areas.
PSO 2: Should have an ability to apply technical knowledge and usage of latest tools and technologies related to computer Science and engineering for solving real world problems.
PSO 3: Should have the capability to analyze, comprehend, design & develop sustainable and efficient solution for computer science and engineering for a variety of engineering applications and thus demonstrating professional ethics & concern for societal well being

Mapping of PO, PEO and PSO's

Mapping	PEO1	PEO2	PEO3	PEO4	PEO5	PSO1	PSO2	PSO3
PO1	**3**	**2**	**1**	**1**	**-**	**1**	**-**	**2**
PO2	**1**	**3**	**2**	**1**	**-**	**3**	**3**	**1**
PO3	**-**	**3**	**3**	**-**	**-**	**3**	**3**	**2**
PO4	**-**	**2**	**3**	**1**	**-**	**-**	**2**	**-**
PO5	**-**	**3**	**2**	**2**	**-**	**1**	**3**	**2**
PO6	**-**	**-**	**-**	**1**	**3**	**-**	**1**	**3**
PO7	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**3**
PO8	**-**	**-**	**-**	**-**	**3**	**-**	**1**	**3**
PO9		**2**	**3**	**2**	**2**	**-**	**1**	**2**
PO10		**2**	**3**	**2**	**3**	**1**	**2**	**-**
PO11	**-**	**-**	**-**	**2**	**3**	**-**	**2**	**3**

Scheme of B.Tech. CSE(AI/ML)

	Semester-I					
Code	**Course Name**	**L**	**T**	**P**	**Credits**	
ETPH101	Applied Physics/ Engineering Physics	2	0	0	2	BS
ETCS103	Programming with C	2	0	0	2	ES
ETEE105	Basic Electrical & Electronics Engineering	2	1	0	3	ES
ETHS107	Professional Communication	2	0	0	2	HS
ETMT109	Engineering Mathematics	3	1	0	4	BS
ETHS111	Green Technology and Sustainability	2	0	0	2	BS
ETPH151	Applied Physics/ Engineering Physics Lab	0	0	4	2	BS
ETCS153	Programming with C Lab	0	0	4	2	ES
ETEE155	Basic Electrical & Electronics Engineering Lab	0	0	4	2	ES
ETHS157	Professional Communication Lab	0	0	4	2	HS
ETME159	Engineering Skills Practices-I	0	0	6	3	ES
	Total	13	2	22	26	
	Semester-II					
	Course Name	**L**	**T**	**P**	**Credits**	
ETPH102	Quantum Physics	2	0	0	2	BS
ETEE104	Digital Logic & System Design	2	0	0	2	ES
ETCS106	Data Structures	3	0	0	3	PC
ETHS108	Entrepreneurship	3	0	0	3	HS
ETCS110	Foundations of Data Analytics	3	0	0	3	BS
ETPH152	Quantum Physics Lab	0	0	4	2	BS
ETEE154	Digital Logic & System Design Lab	0	0	4	2	ES
ETCS156	Data Structures Lab	0	0	2	1	PC
ETME158	Engineering Graphics and Design	1	0	4	3	ES
ETCS160	Foundations of Data Analytics Lab	0	0	4	2	BS
ETME162	Engineering Design Project-I (6 Self-Effort Hours)	0	0	6	3	PROJECT
	Total	14	0	24	26	
	Semester-III					
	Course Name	**L**	**T**	**P**	**Credits**	
ETCS201	Discrete Mathematics	3	1	0	4	PC
ETCS203	Computer Organization and Architecture	3	0	0	3	PC
ETCS205	Database Management Systems	3	0	0	3	PC
ETCS207	Design and Analysis of Algorithms	3	0	0	3	PC
ETCS209	Artificial Intelligence	3	0	0	3	PC
ETCS211	Signal System	3	0	0	3	ES
ETCS251	Database Management Systems Lab	0	0	2	1	PC
ETCS253	Design and Analysis of Algorithm Lab	0	0	2	1	PC

ETCS255	Artificial Intelligence Lab	0	0	2	1	PC
ETCS257	Signal System Lab	0	0	2	1	ES
ETCS261	Summer Internship (6 weeks)*	-	-	-	2	PW
ETAU213	Sports and Yoga/ Indian Constitution	2	0	0	-	AU
	Total	**20**	**1**	**8**	**25**	

	Semester-IV					
Code	**Course Name**	**L**	**T**	**P**	**Credits**	
ETCS202	Operating Systems	3	0	0	3	PC
ETCS204	Object Oriented Programming using C++	2	0	0	2	PC
ETCS206	Machine Learning	3	0	0	3	PC
ETCS208	Computer Networks	3	0	0	3	PC
ETCS 210	MOOC -I (Software Engineering)	3	0	0	3	PC
ETHS212	Universal Human Values and Professional Ethics	2	1	0	3	HS
ETCS252	Operating System Lab	0	0	2	1	PC
ETCS254	Object Oriented Programming using C++ Lab	0	0	4	2	PC
ETCS256	Machine Learning Lab	0	0	2	1	PC
ETCS260	Minor Project-I	0	0	6	3	PW
	Total	**17**	**2**	**12**	**24**	
	Semester-V					
	Course Name	**L**	**T**	**P**	**Credits**	
ETCS301	Theory of Computation	3	1	0	4	PC
ETCS303	Deep Learning	3	0	0	3	PC
ETCS305	Optimization Techniques	3	1	0	4	PC
	Program Elective- I	3	0	0	3	PE
ETCS309	Natural Language Processing	3	0	0	3	PC
ETCS351	Deep Learning Lab	0	0	2	1	PC
ETCS353	NLP Lab	0	0	2	1	PC
	Program Elective- I Lab	0	0	2	1	PC
ETCS361	Summer Internship (6 weeks) *	-	-	-	2	CS
	TOTAL	15	2	6	22	
	Semester-VI					
	Course Name	**L**	**T**	**P**	**Credits**	
ETCS302	Advanced ML	3	0	0	3	PC
	Compiler Design	3	1	0	4	PC
	Program Elective II	3	0	0	3	PE
	Open Elective-I	3	0	0	3	OE
ETCS352	Advanced ML Lab	0	0	2	1	PC
	Program Elective II Lab	0	0	2	1	PE
ETCS360	Capstone Project - I	0	0	10	5	PW

	TOTAL	**12**	**1**	**14**	**20**	
	Semester-VII					
	Course Name	**L**	**T**	**P**	**Credits**	
ETCS401	Soft Computing	3	0	0	3	PC
	Program Elective III	3	0	0	3	PE
	Program Elective IV	3	0	0	3	PE
ETCS451	Soft Computing Lab	0	0	2	1	PC
	Program Elective III Lab	0	0	2	1	PE
	Program Elective IV Lab	0	0	2	1	PE
ETCS461	Capstone Project - II	0	0	20	10	PW
	TOTAL	**9**	**0**	**26**	**22**	
	Semester VIII					
	Course Name	**L**	**T**	**P**	**Credits**	
ETCS460	Internship	0	0	0	16	PW
	Open Elective-II via (MOOC)	3	0	0	3	OE
	Total	3	0	0	19	

*MOOC courses may be decided at the time of commencement of the course

Table 4. List of Professional Core Elective courses for B.Tech. programme

1. Human Computer Interface	2. Multi-agent Intelligent
3. Robotics and Automation	4. Information Retrieval
5. Speech and Natural Language Processing	6. Feature Engineering
7. Quantum Computing	8. Internet of Things
9. 3D Gaming	10. Modelling and simulation
11. Big data analytics	12. Computer Vision
13. Digital Image Processing	14. Data Warehouse and data Mining
15. Cloud Computing	16. May be decided at the time of offering

Table 5. List of Open Elective courses

1	Open Source Technology	7	Rural Technology & Community Development
2	Software Project Management	8	Block chain Technology
3	Real Time Operating System	9	Game Theory with Engineering Applications
4	Embedded Systems	10	Supply Chain Management-Planning
5	Knowledge Management and digital Economy	11	Cyber Law and Ethics
6	Soft Computing	12	May be decided at the time of offering

Evaluation Scheme of B.Tech.

Type of Exam	Internal	External	Total
Theory Subject	30	70	100
Practical Subject	60	40	100

Division of Theory Internal Marks – 30 Marks

Sessional 1	Sessional 2	Class Attendance	Assignment/class Performance/ Presentation	Total
5	5	10	10	30

Division of Practical Internal Marks – 60 Marks

Class Performance	Lab File	Lab Attendance	Viva -Voice	Total
20	15	10	15	60

Division of Practical External Marks – 40 Marks

Lab Exam	File	Viva -Voice	Total
10	10	20	40

Instruction for Paper Setter:

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2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 20 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 5 units as per the syllabus. Every unit shall have two questions each of 10 marks each. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain sub-parts / sub-questions.
4. Each Unit shall have a marks weightage of 14.
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required

Syllabus First Year First Semester

ETPH101: Applied Physics/ Engineering Physics							
B. Tech. CSE (AI/ML) Semester – I							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	30
2	0	0	2		**External Examination**	**:**	70
Effective from Session:				**w.e.f. 2022-2023**	**Total**	**:**	100
Date of BoS approval:				13/03/2020	**Duration of Exam**	**:**	3 Hours
Prerequisite				Understanding of atomic & molecular structures			

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4. Each Unit shall have a marks weightage of 14.
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objective:

The objective of the course is to strengthen the fundamentals of physics and then build an interface of theoretical concepts with their industrial/engineering applications

Course Outcome:

By the end of this course, the student will be able to:

- **CO1.** Recall various phenomenon of physics including Laplace and Poisson's equations for electrostatic potential, Faraday's Law and its applications
- **CO2.** Understanding the basics of electrostatics and magnetostatics
- **CO3.** Identify and classify various phenomenon in real life into electro- or magneto statics.
- **CO4.** Explain the basics of electrostatics, magneto statics and electromagnetic laws.
- **CO5.** Apply the acquired knowledge in designing and understanding the physical phenomenon of Electrostatic and Magneto static.

Course Content:

Unit 1: Electrostatics in vacuum: Calculation of electric field and electrostatic potential for a charge distribution; Divergence and curl of electrostatic field; Laplace's and Poisson's equations for electrostatic potential and uniqueness of their solution and connection with steady state diffusion and thermal conduction; Practical examples like Farady's cage and coffee-ring effect; Boundary conditions of electric field and electrostatic potential; method of images; energy of a charge distribution and its

expression in terms of electric field.

Unit 2: Electrostatics in a linear dielectric medium: Electrostatic field and potential of a dipole. Bound charges due to electric polarization; Electric displacement; boundary conditions on displacement; Solving simple electrostatics problems in presence of dielectrics – Point charge at the center of a dielectric sphere, charge in front of a dielectric slab, dielectric slab and dielectric sphere in uniform electric field

Unit 3: Magnetostatics: Bio-Savart law, Divergence and curl of static magnetic field; vector potential and calculating it for a given magnetic field using Stokes' theorem; the equation for the vector potential and its solution for given current densities.

Magnetostatics in a linear magnetic medium: Magnetization and associated bound currents; auxiliary magnetic field: Boundary conditions on and. Solving for magnetic field due to simple magnets like a bar magnet; magnetic susceptibility and ferromagnetic, paramagnetic and diamagnetic materials; Qualitative discussion of magnetic field in presence of magnetic materials.

Unit 4: Faraday's law: Faraday's law in terms of EMF produced by changing magnetic flux; equivalence of Faraday's law and motional EMF; Lenz's law; Electromagnetic breaking and its applications; Differential form of Faraday's law expressing curl of electric field in terms of time-derivative of magnetic field and calculating electric field due to changing magnetic fields in quasi-static approximation; energy stored in a magnetic field.

Displacement current, Magnetic field due to time-dependent electric field and Maxwell's equations: Continuity equation for current densities; Modifying equation for the curl of magnetic field to satisfy continuity equation; displace current and magnetic field arising from time dependent electric field; calculating magnetic field due to changing electric fields in quasistatic approximation. Maxwell's equation in vacuum and non-conducting medium; Energy in an electromagnetic field; Flow of energy and Poynting vector with examples. Qualitative discussion of momentum in electromagnetic fields.

Unit 5: Electromagnetic waves: The wave equation; Plane electromagnetic waves in vacuum, their transverse nature and polarization; relation between electric and magnetic fields of an electromagnetic wave; energy carried by electromagnetic waves and examples. Momentum carried by electromagnetic waves and resultant pressure. Reflection and transmission of electromagnetic waves from a non-conducting medium-vacuum interface for normal incidence.

Textbook:

1. David Griffiths, Introduction to Electrodynamics

References:

1. Halliday and Resnick, Physics
2. W. Saslow, Electricity, magnetism and light

ETPH151: Engineering Physics Lab							
B. Tech. CSE (AI/ML) Semester-1							
L	**T**	**P**	**Credits**	Core Course	**Internal Examination**	**:**	60
0	0	4	2		**External Examination**	**:**	40
Effective from Session:				**w.e.f. 2023-2024**	**Total**	**:**	100
Date of BoS approval:				13/03/2020	**Duration of Exam**	**:**	
Prerequisite				**NIL**			

Course Objective:

Hands-on understanding the phenomenon taught in theory.

Course Outcome:

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

- **CO1.** Recall the theorical concept and will be able to corelate with the practical.
- **CO2.** Understanding of magnetic field, and resonance phenomenon
- **CO3.** Explain the resonance phenomenon in LCR circuits
- **CO4.** Explain fundamentals of Lorentz force in a vacuum tube
- **CO5.** Apply the knowledge learnt in measurement of Lorentz force in a vacuum tube.

Course Content:

1. Experiments on electromagnetic induction and electromagnetic breaking;
2. LC circuit and LCR circuit;
3. Resonance phenomena in LCR circuits;
4. Magnetic field from Helmholtz coil;
5. Measurement of Lorentz force in a vacuum tube.

Textbook:

1. David Griffiths, Introduction to Electrodynamics

References:

1. Halliday and Resnick, Physics
2. W. Saslow, Electricity, magnetism and light

ETCS103: Programming with C							
B. Tech. CSE (AI/ML) Semester – I							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	30
2	0	0	2		**External Examination**	**:**	70
Effective from Session:				**w.e.f. 2022-2023**	**Total**	**:**	100
Date of BoS approval:				13/03/2020	**Duration of Exam**	**:**	3 Hours
Prerequisite							

Instruction for Paper Setter:

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3. Apart from question 1 which is compulsory, rest of the paper shall consist of 5 units as per the syllabus. Every unit shall have two questions each of 10 marks each. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain sub-parts / sub-questions.
4. Each Unit shall have a marks weightage of 14.
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives:

- To acquire problem solving skills
- To be able to develop flowcharts
- To understand structured programming concepts
- To be able to write programs in C Language

Course Outcomes:

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

CO1. Recall and understand the basics constructs of a programming language.
CO2. Demonstrate the problem solving and critical thinking skills.
CO3. Applying the knowledge of programming skills in problem solving using C language.
CO4. Analyzing the Different programs in terms of their complexity and efficiency
CO5. Test the program for its correctness from all possible inputs.
CO6. Design the program in C language to solve any problem.

Course Content:

Unit 1: Introduction to Computers: Computer Systems, Computing Environments, Computer Languages, Creating and Running Programs, Software Development, Flow charts. Number Systems: Binary, Octal, Decimal, Hexadecimal

Introduction to C Language: Background, C Programs, Identifiers, Data Types, Variables, Constants, Input / Output Statements

Arithmetic Operators and Expressions: Evaluating Expressions, Precedence and Associativity of Operators, Type Conversions.

Unit-2: Conditional Control Statements: Bitwise Operators, Relational and Logical Operators,

If, If-Else, Switch-Statement and Examples. Loop Control Statements: For, While, Do- While and Examples. Continue, Break and Go to statements
Functions: Function Basics, User-defined Functions, Inter Function Communication, Standard Functions, Methods of Parameter Passing. Recursion- Recursive Functions.
Storage Classes: Auto, Register, Static, Extern, Scope Rules, and Type Qualifiers.

Unit 3: Preprocessors: Preprocessor Commands
Arrays: Concepts, Using Arrays in C, Inter-Function Communication, Array Applications, Two- Dimensional Arrays, Multidimensional Arrays, Linear and Binary Search, Selection and Bubble Sort.

Unit 4: Pointers: Introduction, Pointers for Inter-Function Communication, Pointers to Pointers, Compatibility, L value and R value, Arrays and Pointers, Pointer Arithmetic and Arrays, Passing an Array to a Function, Memory Allocation Functions, Array of Pointers, Programming Applications, Pointers to void, Pointers to Functions, Command- line Arguments.
Strings - Concepts, C Strings, String Input/Output Functions, Arrays of Strings, String Manipulation Functions.

Unit 5: Structures: Definition and Initialization of Structures, Accessing Structures, Nested Structures, Arrays of Structures, Structures and Functions, Pointers to Structures, Self-Referential Structures, Unions, Type Definition (typedef), Enumerated Types.
Input and Output: Introduction to Files, Modes of Files, Streams, Standard Library Input/output Functions, Character Input/output Functions.

Textbook:

1. B.A. Forouzan and R.F. Gilberg, "*A Structured Programming Approach in C",* Cengage Learning, 2007

Reference:

1.Kernighan BW and Ritchie DM, "*The C Programming Language"*, 2nd Edition, Prentice Hall of India, 2006.
2. Rajaraman V, "*The Fundamentals of Computer"*, 4th Edition, Prentice-Hall of India, 2006.

ETCS153: Programming with C Lab							
B. Tech. CSE (AI/ML) Semester-1							
L	**T**	**P**	**Credits**	Core Course	**Internal Examination**	**:**	70
0	0	4	2		**External Examination**	**:**	30
Effective from Session:				**w.e.f. 2022-2023**	**Total**	**:**	100
Date of BoS approval:				13/03/2020	**Duration of Exam**	**:**	
Prerequisite							

Course Objectives:

The objective of the course is to give exposure to the student about the implementation of different algorithm in C language.

Course Outcome:

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

- **CO1.** Understand the fundamentals of programming in C Language
- **CO2.** Write, compile and debug programs in C
- **CO3.** Formulate given problems and give solutions by programming it in C.
- **CO4.** To be able to effectively choose programming components to solve computing problems in real-world.

Course Content:

1. Finding the maximum and minimum of given set of numbers
2. Finding Roots of a Quadratic Equation
3. Sin x and Cos x values using series expansion
4. Conversion of Binary to Decimal, Octal, Hexa and Vice versa
5. Generating a Pascal triangle and Pyramid of numbers
6. Recursion: Factorial, Fibonacci, GCD
7. Matrix addition and multiplication using arrays
8. Bubble Sort, Selection Sort
9. Programs on Linear Search and Binary Search using recursive and non-recursive procedures.
10. Functions for string manipulations
11. Finding the No. of characters, words and lines of given text file
12. File Handling programs.

Textbook:

1. B.A. Forouzan and R.F. Gilberg, "*A Structured Programming Approach in C",* Cengage Learning, 2007

Reference:

1. Kernighan BW and Ritchie DM, "*The C Programming Language"*, 2nd Edition, Prentice Hall of India, 2006.
2. Rajaraman V, "*The Fundamentals of Computer"*, 4th Edition, Prentice-Hall of India, 2006.

ETEE105: Basic Electrical & Electronics Engineering							
B. Tech. CSE (AI/ML) Semester-1							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	30
2	1	0	3		**External Examination**	**:**	70
Effective from Session:				**w.e.f. 2022-2023**	**Total**	**:**	100
Date of BoS approval:				13/03/2020	**Duration of Exam**	**:**	3 Hours
Prerequisite							

Instruction for Paper Setter:

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4. Each Unit shall have a marks weightage of 14.
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives:

To introduce the fundamentals of Electrical and electronics Engineering including circuit analysis, transformers, machines, analog and digital electronics

Course Outcome:

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

CO1. Acquire knowledge about the electric circuit and electronics
CO2. Develop skills in analyzing electrical circuits, and transformers
CO3. Understand the DC machines and its working principle
CO4. Explain the theory, construction, and operation of electronic devices

Course Content:

Unit I: Electrical Circuit Analysis: Voltage & Current sources: dependent & independent source, source conversion. Analysis of D.C. circuits: Mesh & Loop analysis, Nodal analysis. Network Theorems: Thevenin's, Norton's, superposition theorem etc. Star- Delta circuits. 1-Φ AC Circuits: Review of 1-Φ phase AC circuits under sinusoidal steady state conditions, Resonance, Active, Reactive and Apparent power, Power factor. 3-Φ AC circuits: Balanced and Unbalanced supply, Star and Delta connections, power measurement.

Unit II: Transformers: Magnetic Circuits: Review of laws of electromagnetism, Flux, MMF and their relation, analysis of magnetic and electric circuit. Single-phase transformer: Basic concepts, constructional features, EMF equation, voltage, current and impedance transformation, Equivalent circuits.

Unit III: Electrical Machine: DC Machines: Constructional features, working principle, emf equation, types of DC machines and their characteristics.
Induction Machines: Constructional features, working principle, emf equation, concept of slip and torque–slip characteristics. Synchronous Machines: Constructional features, working principle and emf equation.

Unit IV: Digital Electronics: Number systems: decimal, binary, octal, hexadecimal, their complements, operation and conversion, floating point and signed numbers. Demorgan's theorem, Logic Gates: Basic and Universal Gates, their representation, truth table and realization, Half and Full adder circuits, Flip-Flops etc.

Unit V: Electronic Devices and Circuits: Introduction to semiconductors, Diodes: types of diodes and their characteristic. Bipolar Junction Transistors: working, configurations (CC, CB & CE) and mode of operation.

Textbook:

1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
2. S. Ghosh, "Fundamentals of Electrical and Electronics Engineering", PHI Publications.
3. J.B. Gupta, "Text book of Basic Electrical and Electronics Engineering", S. K. Kataria Publications
4. D.C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.

References:

1. V.D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India.
2. D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
3. Hughes Edward, Electrical & Electronic Technology, Pearson Education, 2007.
4. Alexander.C. K. & Mathew. N. O. Sadiku, Fundamentals of Electrical circuits, Tata McGraw Hill, 2008.
5. P.S. Bhimbhara, "Electrical Machinery" Khanna Publishers
6. Milmann & Halkias, "Integrated Electronics" TMH
7. M.Morris Mano, "Digital Logic and Computer Design" Pearson

ETEE155: Basic Electrical & Electronics Engineering Lab							
B. Tech. CSE (AI/ML) Semester-1							
L	**T**	**P**	**Credits**	Core Course	**Internal Examination**	**:**	60
0	0	4	2		**External Examination**	**:**	40
Effective from Session:				**w.e.f. 2022-2023**	**Total**	**:**	100
Date of BoS approval:				13/03/2020	**Duration of Exam**	**:**	
Prerequisite							

Course Objectives:

The students will be able to have hands-on experience on the topics related to curriculum of Basic Electrical and Engineering.

Course Outcomes:

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

CO1. Recall the theoretical concept and corelate to practical
CO2. Understand the application of theory concepts
CO3. Implement and verify theories and concepts covered in theory like Kirchhoff‟s laws, Norton Theorem and Superposition Theorem
CO4. Calculate different parameters of transformer

Course Content:

List of practicals:

1. Study of the Cathode Ray Oscilloscope (CRO).
2. Verification of Kirchhoff‟s laws
3. Verification of Norton Theorem
4. Verification of Superposition Theorem
5. Verification of Thevenin Theorem.
6. Determination of parameters and losses using open-circuit and short-circuit tests on a single-phase transformer.
7. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single-phase transformer
8. Determination of open circuit characteristics of a separately excited DC generator.
9. Characteristics of separately excited and self-excited dc generators
10. Demonstration of cut-out sections of machines: dc machine, three phase induction machine, singlephase induction machine and synchronous machine.
11. Study of electronic components and equipment’s.
    a. Resistor Colour coding using digital multi-meter.
    b. Assembling electronic components on bread board.
12. Measurement of ac signal parameters using cathode ray oscilloscope and function generator.
13. Soldering and desoldering practice.
14. Verification of logic gates (OR, AND, OR, NOT, NAND, EX-OR).

15. Implementation of half adder circuit using logic gates.

Textbook:

1. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
2. S. Ghosh, “Fundamentals of Electrical and Electronics Engineering”, PHI Publications.
3. J.B. Gupta, “Text book of Basic Electrical and Electronics Engineering”, S.K.Kataria Publications
4. D.C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.

References:

1. V.D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India.
2. D.P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.
3. Hughes Edward, Electrical & Electronic Technology, Pearson Education, 2007.
4. Alexander.C. K. & Mathew. N. O. Sadiku, Fundamentals of Electrical circuits, Tata McGraw Hill, 2008.
5. P.S. Bhimbhara, “Electrical Machinery” Khanna Publishers
6. Milmann & Halkias, “Integrated Electronics” TMH
7. M.Morris Mano, “Digital Logic and Computer Design” Pearson

ETHS107: Professional Communication							
B. Tech. CSE (AI/ML) Semester-1							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	30
2	0	0	2		**External Examination**	**:**	70
Effective from Session:				**w.e.f. 2022-2023**	**Total**	**:**	100
Date of BoS approval:				13/03/2020	**Duration of Exam**	**:**	3 Hours
Prerequisite							

Instruction for Paper Setter:

1. There should be 11 questions in the end term examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 20 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 5 units as per the syllabus. Every unit shall have two questions each of 10 marks each. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain sub-parts / sub-questions.
4. Each Unit shall have a marks weightage of 14.
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives:

- Enhance the Employability and Career Skills of students
- Orient the students towards grooming as a professional
- Make them Employable Graduates
- Develop their confidence and help them attend interviews successfully.

Course Outcome:

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

CO1. Recall the basic concept for effective presentations and communication
CO2. Understand use of different modes of written communication for effective use in a professional environment
CO3. Illustrate communication skills by Participating confidently in Group Discussions
CO4. Confident Presentation and communication at job interviews
CO5. Develop adequate Soft Skills required for the workplace

Course Content:

Unit 1: Vocabulary Building: The concept of Word Formation, Root words from foreign languages and their use in English, Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives. Synonyms, antonyms, and standard abbreviations.

Unit 2: Basic Writing Skills: Sentence Structures, use of phrases and clauses in sentences, Importance of proper punctuation, creating coherence, organizing principles of paragraphs in documents, Techniques for writing precisely

Unit 3: Identifying Common Errors in Writing: Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies, Clichés

Unit 4: Nature and Style of sensible Writing: Describing, Defining, Classifying, Providing

examples or evidence, Writing, introduction and conclusion
Unit 5: Writing Practices: Comprehension, Précis Writing and Essay Writing

Textbook:

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007
3. On Writing Well. William Zinsser. Harper Resource Book. 2001

References:

1. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
2. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.

ETHS157: Professional Communication Lab							
B. Tech. CSE (AI/ML) Semester-1							
L	**T**	**P**	**Credits**	Core Course	**Internal Examination**	**:**	60
0	0	4	2		**External Examination**	**:**	40
Effective from Session:				**w.e.f. 2022-2023**	**Total**	**:**	100
Date of BoS approval:				13/03/2020	**Duration of Exam**	**:**	3 Hrs.
Prerequisite							

Course Objectives:

The objective is that the student will acquire basic proficiency in English speaking, writing, listening and reading skills.

Course Outcome:

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

CO1. Recite the concept taught in theory and able to corelate with practical
CO2. Understand the role of effective speaking and communication
CO3. Demonstrate good communication skills including speaking, writing, listening and reading
CO4. Present confidently at interviews, presentations and group discussion

Course Contents:

Oral Communication

(This Unit involves interactive practice sessions in Language Lab)

1. Listening Comprehension
2. Pronunciation, Intonation, Stress and Rhythm
3. Common Everyday Situations: Conversations and Dialogues
4. Communication at Workplace
5. Interviews
6. Formal Presentations

Textbook:

1. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

ETMT109- Engineering Mathematics							
B. Tech. CSE (AI/ML) Semester – I							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	30
3	1	0	4		**External Examination**	**:**	70
Effective from Session:				**w.e.f. 2022-2023**	**Total**	**:**	100
Date of BoS approval:				13/03/2020	**Duration of Exam**	**:**	3 Hrs.
Prerequisite							

Instruction for Paper Setter:

1. There should be 11 questions in the end term examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 20 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 5 units as per the syllabus. Every unit shall have two questions each of 10 marks each. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain sub-parts / sub-questions.
4. Each Unit shall have a marks weightage of 14.
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives:

The objective of the paper is to facilitate the student with the basics of Applied Mathematics that are required for an engineering student. To impart basic knowledge on complex numbers, series, basics of calculus, linear algebra, ordinary differential equation.

Course Outcome:

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

CO1. Acquire basic knowledge in
- Complex number systems and infinite series
- Calculus of one variable
- Linear Algebra
- Ordinary differential equations

CO2. Develop skills in analyzing:
- Different methods for differential equation for obtaining appropriate solutions
- Different methods and theorems for Convergence and Divergence of Infinite series
- Methods to handle problem related to calculus

CO3. Develop skills in designing mathematical model Formulate and represent any problem mathematically

CO4. Apply the Skill to solve the processes using ODE.

Course Content:

Unit-1: Complex Numbers and Infinite Series: De Moivre's theorem and roots of complex numbers. Euler's theorem, Logarithmic Functions, Circular, Hyperbolic Functions and their Inverses.

Unit II: Convergence and Divergence of Series: Convergence and Divergence of Infinite series,

Comparison test D'Alembert's ratio test. Higher ratio test, Cauchy's root test. Alternating series, Lebnitz test, Absolute and conditional convergence.

Unit III: Calculus of One Variable: Successive differentiation. Leibnitz theorem (without proof) McLaurin's and Taylor's expansion of functions, errors and approximation. Asymptotes of Cartesian curves. Curveture of curves in Cartesian, parametric and polar coordinates, Tracing of curves in Cartesian, parametric and polar coordinates (like conics, astroid, hypocycloid, Folium of Descartes, Cycloid, Circle, Cardiode, Lemniscate of Bernoulli, equiangular spiral). Reduction Formulae for evaluating Finding area under the curves, Length of the curves, volume and surface of solids of revolution.

Unit IV: Linear Algebra – Matrices: Rank of matrix, Linear transformations, Hermitian and skeew – Hermitian forms, Inverse of matrix by elementary operations. Consistency of linear simultaneous equations, Diagonalisation of a matrix, Eigen values and eigen vectors. Caley – Hamilton theorem (without proof).

Unit V: Ordinary Differential Equations: First order differential equations – exact and reducible to exact form. Linear differential equations of higher order with constant coefficients. Solution of simultaneous differential equations. Variation of parameters, Solution of homogeneous differential equations – Canchy and Legendre forms.

Text books:

1. Kresyzig, E., "Advanced Engineering Mathematics", John Wiley and Sons. (Latest edition).
2. Jain, R. K. and Iyengar, S. R. K., "Advanced Engineering Mathematics", Narosa, 2003 (2^{nd} Ed.).
3. "Advanced Engineering Mathematics", Dr. A. B. Mathur, V. P. Jaggi (Khanna publications)

References:

1. Mitin, V. V.; Polis, M. P. and Romanov, D. A., "Modern Advanced Mathematics for Engineers", John Wiley and Sons, 2001.
2. Wylie, R., "Advanced Engineering Mathematics", McGraw-Hill, 1995.

ETHS111: Green Technology and Sustainability							
B. Tech. CSE (AI/ML) Semester- 1							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	30
2	0	0	2		**External Examination**	**:**	70
Effective from Session:				**w.e.f. 2022-2023**	**Total**	**:**	100
Date of BoS approval:				13/03/2020	**Duration of Exam**	**:**	3 hrs.
Prerequisite							

Instruction for Paper Setter:

1. There should be 11 questions in the end term examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 20 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 5 units as per the syllabus. Every unit shall have two questions each of 10 marks each. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain sub-parts / sub-questions.
4. Each Unit shall have a marks weightage of 14.
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives:

- To the design, manufacture and use of chemical products so as to reduce or eliminate chemical hazards intentionally.
- To create better, safer, chemicals while choosing the safest, most efficient ways to synthesis them.
- The main goal of Green Technology is to eliminate hazards right at the design stage.
- To demonstrate how chemical production could be achieved without posing hazard to human health and environment.

Course Outcome:

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

CO1. Recall and demonstrate an ability to integrate the many disciplines and fields that intersect with environmental concerns
CO2. Understand the need of green technology and its sustainability
CO3. Demonstrate critical thinking skills in relation to environmental affairs
CO4. Demonstrate an integrative approach to environmental issues with a focus on sustainability
CO5. Analyze the purpose and basic difference among various waste management techniques
CO6. Develop awareness on maintaining healthy environment

Course Content:

Unit 1: Introduction of Green protocol: Need, Goal and Limitation of Green Technology, Principles of Green Technology with their explanations and examples. Sustainable development, atom economy, reduction of toxicity.

Unit 2: Waste: Production, Prevention, Problems and Source of waste, cost of Waste, Waste minimization technique, waste treatment and recycling.

Unit 3: Environmental chemicals: Chemical speciation – speciation of lead, mercury, arsenic and chromium. Structure and property-activity relationship, fate of organics in the environment – transformation reactions (hydrolysis, elimination, oxidation-reduction etc). Risk evaluation of environmental chemicals, Biochemical effects of arsenic, lead, mercury and pesticides.

Unit 4: Water and Biodegradation: Analysis of water and water quality parameters – concept of pH, measurement of acidity, alkalinity, hardness, residual chlorine, chlorides, DO, BOD, COD, fluoride and nitrogen. Biodegradation – biodegradation of carbohydrates, proteins, fats and oils and detergents.

Unit 5: Atmosphere: Structure of atmosphere, chemical and photochemical reactions in the atmosphere. Ozone Chemistry: formation and depletion of ozone layer, oxides of nitrogen and sulphur. Acid rain mechanism of formation and effects. Photochemical smog, and sulfurous smog. Greenhouse effect, global warming, greenhouse gases.

Textbook:

1. C.N Sawyer, P.L McCarty and G.F Parkin, Chemistry for Environmental Engineering and Science, 5th ed. Tata McGraw-Hill, 2003.
2. Das, A. K. Environmental Chemistry with Green Chemistry, Books and allied (P) Ltd. Ahluwalia, V.K. Green Chemistry: Environmentally Benign Reactions, Ane Books India, New Delhi, 2006.

References:

1. Sanghi, R. and Srivastava, M.M. Green chemistry: Environment Friendly Alternatives, Narosa Publishing House.
2. Paul Anastas, John C. Warner, John Warner Joint; Green Chemistry: Theory and Practice New Ed Edition; Oxford University press, USA, 2000

ETME159- Engineering Skills Practices-I							
B. Tech. CSE (AI/ML) Semester- 1							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	60
0	0	6	3		**External Examination**	**:**	40
Effective from Session:				**w.e.f. 2022-2023**	**Total**	**:**	100
Date of BoS approval:				13/03/2020	**Duration of Exam**	**:**	0hrs
Prerequisite							

Course Objectives:

- The objective of this course is to give an exposure on the basic practices followed in the domain of mechanical, electrical, electronics and communication engineering.
- The exercises will train the students to acquire skills which are very essential for the engineers through hands-on sessions.

Course Outcome:

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

CO1. Acquire basic knowledge about
- Welding and its type
- Fitting, drilling, tapping
- Types of Domestic wiring practice
- PCB Making

CO2. Develop skills in analyzing:
- Difference among various welding techniques and choose a suitable welding technique
- Differentiate various types of Domestic wiring and their usage
- Designing PCB for a given problem
- Fitting – Drilling & tapping concepts

CO3. Understanding the purpose of welding and its applications

CO4. Identification of different defects

Course Content:

Experiments will be framed to train the students in following common engineering practices:

Unit 1: Welding: Introduction and classification of welding processes, welding terms (terminology), welding positions, joints and filler metals. Gas welding and Gas cutting: Principle, Oxyacetylene welding equipment, Flame cutting. Specimen preparation and making of lap joint, butt joint. T-joint with Oxyacetylene gas welding.

Unit 2: Electric arc welding: Principle, equipments, types-MIG, TIG, submerged arc and others, Welding electrodes, classification and selection of electrodes, welding arc and its characteristics, arc stability, arc blow.

Resistance welding- principle and their types i.e. spot, seam, projection, upset and flash. Welding Defects, their causes and remedies. Brazing and soldering.

Making of lap, Butt, T-joints etc. with electric arc welding, Study of MIG and TIG welding equipment and making a weld joint by this process, study of resistance welding processes and prepare a spot welded joint.

Unit 3: Basic manufacturing processes: Fitting – Drilling & tapping – Material joining processes Specimen preparation and Fitting: Square joint, V joint, half round joint, dovetail joint

Unit 4: PCB making: Assembling and testing – Electrical wiring. Familiarization of electronic components by Nomenclature, meters, power supplies, function generators and Oscilloscope – Bread board assembling of simple circuits: IR transmitter and receiver

LED emergency lamp – Communication study: amplitude modulation and demodulation PCB**:** designing and making of simple circuits – Soldering and testing of electronic components and circuits

Unit 5: Various types of Domestic wiring practice: Fluorescent lamp connection, Staircase wiring – Estimation and costing of domestic and industrial wiring – power consumption by Incandescent, CFL and LED lamps.

House-wiring: wiring for ceiling rose and two lamps (bulbs) with independent switch controls with or without looping, wiring for stair case lamp, wiring for a water pump with single phase starter

Textbook:

1. Welding Technology by R.S. Parmar, (khanna Publishers).
2. Workshop Technology Vol.1 by B.S Raghuwanshi (Dhanpat Rai & Co.)
3. Uppal S. L., “Electrical Wiring & Estimating”, 5Edn, Khanna Publishers, 2003.
4. Chapman. W. A. J., Workshop Technology, Part 1 & 2, Taylor & Francis.

Reference:

1. Clyde F. Coombs, “Printed circuits hand book”, 6Edn, McGraw Hill, 2007.
2. John H. Watt, Terrell Croft, “American Electricians' Handbook: A Reference Book for the Practical Electrical Man”, Tata McGraw Hill, 2002.

Syllabus First Year Second Semester

ETPH102- Quantum Physics							
B. Tech. CSE (AI/ML) Semester – II							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	30
2	0	0	2		**External Examination**	**:**	70
Effective from Session:				**w.e.f. 2022-2023**	**Total**	**:**	100
Date of BoS approval:				13/03/2020	**Duration of Exam**	**:**	3 Hrs
Prerequisite							

Instruction for Paper Setter:

1. There should be 11 questions in the end term examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 20 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 5 units as per the syllabus. Every unit shall have two questions each of 10 marks each. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain sub-parts / sub-questions.
4. Each Unit shall have a marks weightage of 14.
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course objective:

This course develops concepts in quantum mechanics such that the behavior of the physical universe can be understood from a fundamental point of view. It provides a basis for further study of quantum mechanics. Content will include: Review of the Schrodinger equation, operators, Eigen functions, compatible observables, infinite well in one and three dimensions, degeneracy; Fourier methods and momentum space; Hermiticity; scalar products of wave functions, completeness relations, matrix mechanics; harmonic oscillator in one and three dimensions; sudden approximation; central potentials, quantization of angular momentum, separation of radial and anqular variables, spherical harmonics, hydrogen atom, spin.

Course Outcome:

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

CO1. Recite the basic of Schrodinger equations and its applications
CO2. Perform the basic theoretical studies and calculations for quantum systems using the Schrödinger equation.
CO3. Calculate basic properties of atoms and molecules and electron physics using quantum physics.
CO4. Carry out spectroscopic studies of different elements and interpret the results.
CO5. Describe the importance of quantum physics in nature, engineering and society
CO6. Present the results of experimental investigations and discuss their quantum mechanical interpretation.

Course Content:

Unit 1: Wave nature of particles and the Schrodinger equation

Introduction to Quantum mechanics, Wave nature of Particles, Time-dependent and time independent

Schrodinger equation for wave function, Born interpretation, probability current, Expectation values, Free-particle wave function and wave-packets, Uncertainty principle

Unit 2: Mathematical Preliminaries for quantum mechanics
Complex numbers, Linear vector spaces, inner product, operators, eigenvalue problems, Hermitian operators, Hermite polynomials, Legendre's equation, spherical harmonics.

Unit 3: Applying the Schrodinger equation
Solution of stationary-state Schrodinger equation for one dimensional problem– particle in a box, particle in attractive delta-function potential, square-well potential, linear harmonic oscillator. Numerical solution of stationary-state Schrodinger equation for one dimensional problem for different potentials Scattering from a potential barrier and tunneling; related examples like alpha-decay, field-ionization and scanning tunneling microscope

Unit 4: Applying the Schrodinger equation for 3-D problems
Three-dimensional problems: particle in three-dimensional box and related examples, Angular momentum operator, Rigid Rotor, Hydrogen atom ground-state, orbitals, interaction with magnetic field, spin Numerical solution stationary-state radial Schrodinger equation for spherically symmetric potentials

Unit 5: Introduction to molecular bonding
Particle in double delta-function potential, Molecules (hydrogen molecule, valence bond and molecular orbitals picture), singlet/triplet states, chemical bonding, hybridization

Textbook:

1. Eisberg and Resnick, Introduction to Quantum Physics

Reference:

1. D.J. Griffiths, Quantum mechanics Richard Robinett, Quantum Mechanics Daniel McQuarrie, Quantum Chemistry

ETPH52- Quantum Physics Lab							
B. Tech. CSE (AI/ML) Semester- II							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	60
0	0	4	2		**External Examination**	**:**	40
Effective from Session:				**w.e.f. 2022-2023**	**Total**	**:**	100
Date of BoS approval:				13/03/2020	**Duration of Exam**	**:**	0hrs
Prerequisite							

Course Objective:

Hands-on experience to correlate theory with practical

Course Outcome:

CO1. Recall the theoretical concepts
CO2. Understand the spectroscopy and laser phenomenon
CO3. Experiment with different equipment's and handling of its different parameters

Tentative List of Experiments

1. **ELECTRON SPIN RESONANCE:** Spin is an intrinsic characteristic of fundamental particles and results in charged particles having an associated magnetic dipole field. In this experiment, you will use a technique similar to nuclear magnetic resonance (a.k.a. magnetic resonance imaging, or MRI, in the medical industry) to measure the magnetic moment of the electron.
2. **NUCLEAR SPECTROSCOPY:** Nuclear have discrete quantum states just as atoms do. The emission of gamma rays corresponds to transitions between these quantum states. In this experiment, you study the spectra of several nuclei, and also learn about gamma ray detection and energy measurement. This is a good place to learn about the basic methods of particle detection used in particle physics!
3. **SUPERCONDUCTORS and the SUPERCONDUCTING QUANTUM INTERFERENCE DEVICE:** In this experiment you will learn about the properties of superconductors, a phase of matter with zero electrical resistance and remarkable magnetic properties. You will get to use a SQUID to make high precision measurements of magnetic flux. You will see that the flux threading a hole in a superconductor is quantized, thus demonstrating quantum effects on a macroscopic scale.
4. **LASER MODES:** In this laboratory you will use a Fabry-Perot interferometer to study the spectrum of light emitted from an open cavity laser. The experiment reveals the quantization of laser modes by the cavity of the laser. You will learn about how lasers operate and study several quantum effects which lead to the creation of a distribution of wavelengths from the laser.
5. **SCANNING TUNNELING MICROSCOPY:** We know from quantum mechanics that an electron (or any particle) can pass through a region in which classically it would have negative

kinetic energy (i.e., a classically forbidden region). You will study this phenomenon in its most remarkable application--the imaging device known as an STM (for scanning tunneling microscope.) You will use quantum mechanical tunneling to make images of micro fabricated devices and to image individual atoms of graphite on surfaces.

6. **THE PHOTOELECTRIC EFFECT:** An anomalous experimental result that stimulated the early development of quantum physics is the emission of electrons from a metal when light shines on the metal. (Einstein won the Nobel Prize for his explanation of this effect.) You will plot curves of photocurrent versus bias voltage and determine Planck's constant.
7. **ELECTRON DIFFRACTION:** You will see how electron matter waves can interfere with a crystalline solid to give regular patterns of constructive and destructive interference called a diffraction pattern; this allows one to deduce information about the structure of the solid given enough information about the original electrons.

ETEE104- Digital Logic and System Deisgn							
B. Tech. CSE (AI/ML) Semester – II							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	30
2	0	0	2		**External Examination**	**:**	70
Effective from Session:				**w.e.f. 2022-2023**	**Total**	**:**	100
Date of BoS approval:				13/03/2020	**Duration of Exam**	**:**	3 Hrs
Prerequisite							

Instruction for Paper Setter:

1. There should be 11 questions in the end term examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 20 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 5 units as per the syllabus. Every unit shall have two questions each of 10 marks each. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain sub-parts / sub-questions.
4. Each Unit shall have a marks weightage of 14.
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objective:

The objectives of the course are:

- To understand basics of Boolean algebra
- To understand the combination and sequential circuit with the difference between these
- To understand A/D and D/A converters

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO1. Recall the basic concepts of digital logic and systems
CO2. Understand working of logic families and logic gates.
CO3. Design and implement Combinational and Sequential logic circuits.
CO4. Understand the process of Analog to Digital conversion and Digital to Analog conversion.
CO5. Be able to use PLDs to implement the given logical problem.

Course Content:

Unit 1: Fundamentals of Digital Systems and logic families: Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes, characteristics of digital lCs,

digital logic families, TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri-state logic.

Unit 2: Combinational Digital Circuits: Standard representation for logic functions, K-map representation, simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, DeMultiplexer /Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, ALU, elementary ALU design, popular MSI chips, digital comparator, parity checker/generator, code converters.

Unit 3: Sequential circuits and systems: A 1-bit memory, the circuit properties of Bistable latch, the clocked SR flip flop, J- K, T- and D-types flip flops, applications of flip-flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters, counters design using flip flops, special counter IC's, asynchronous sequential counters, applications of counters.

Unit 4: A/D and D/A Converters: Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, examples of D/A converter lCs, sample and hold circuit, analog to digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter, A/D converter using voltage to frequency and voltage to time conversion, specifications of A/D converters, example of A/D converter ICs

Unit 5: Semiconductor memories and Programmable logic devices: Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read only memory (ROM), read and write memory (RAM), content addressable memory (CAM), charge de coupled device memory (CCD), commonly used memory chips, ROM as a PLD, Programmable logic array, Programmable array logic, complex Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA).

Text book:

1. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
2. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.

References:

1. "Digital Principles and applications", Donald P Leach, Albert Paul Malvino, GoutamSaha. McGrawHill , 8th Edition,2015.
2. 2. Digital Logic & State Machine Design, David J. Comer, Oxford University Press, 3rd Reprinted Indian Edition, 2012
3. Digital Logic Design, R.D. Sudhakar Samuel, Elsevier

ETEE54- Digital Logic and System Design Lab							
B. Tech. CSE (AI/ML) Semester- II							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	60
0	0	4	2		**External Examination**	**:**	40
Effective from Session:				**w.e.f. 2022-2023**	**Total**	**:**	100
Date of BoS approval:				13/03/2020	**Duration of Exam**	**:**	0hrs
Prerequisite							

Course Objective:

The objectives of the course are to make student aware about the practical implementation of Boolean logics, combinational and sequential circuits.

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO1. Recall theory and correlate with the practical
CO2. Understand working of logic families and logic gates
CO3. Design and implement Combinational and Sequential logic circuits for a given problem
CO4. Demonstrate the implementation of various flip-flops and their applications

Course Content:

1. Implementation of AND, OR and NOT gate
2. Implement NAND and NOR gate, and show these are universal gates
3. To study and perform about logic gates.
4. To study and perform about De'Morgan's Theorem.
5. To study and perform about NAND and NOR as a universal gate.
6. To design and implement circuit that converts binary code to gray code.
7. To study and perform about Half Adder and full Adder.
8. To study and perform about Half substractor and full substractor.
9. To design 3-bit odd/even parity generator and checker.
10. To study and perform about R-S and D flip flop.
11. To study and perform about J-K and T flip flop.
12. To study and perform about Master slave JK flip flop.
13. To realize Boolean functions using multiplexer.
14. To study and perform about Decoder and Demultiplexer.
15. To study the use of decoder for BCD to seven segment LED display.

ETCS106- Data Structure							
B. Tech. CSE (AI/ML) Semester – II							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	30
3	0	0	3		**External Examination**	**:**	70
Effective from Session:				**w.e.f. 2022-2023**	**Total**	**:**	100
Date of BoS approval:				13/03/2020	**Duration of Exam**	**:**	3 Hrs
Prerequisite							

Instruction for Paper Setter:

1. There should be 11 questions in the end term examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 20 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 5 units as per the syllabus. Every unit shall have two questions each of 10 marks each. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain sub-parts / sub-questions.
4. Each Unit shall have a marks weightage of 14.
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives:

1. To impart the basic concepts of data structures and algorithms.
2. To understand concepts about searching and sorting techniques
3. To understand basic concepts about stacks, queues, lists, trees and graphs.
4. To enable them to write algorithms for solving problems with the help of fundamental data structures

Course Outcomes:

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

CO1. Recall all the data structures and their operations
CO2. Understand the fundamental difference among different data structures
CO3. Analyse the algorithms to determine the time and computation complexity and justify the correctness.
CO4. Implement suitable representation (in form of a data structure) of given data for a given problem.
CO5. Differentiate among the various data structure and their time and space requirements

Course Content:

Unit 1: Introduction: Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off.
Searching: Linear Search and Binary Search Techniques and their complexity analysis.

Unit 2: Stacks and Queues: ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.

Unit 3: **Linked Lists:** Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.

Unit 4: **Trees:** Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis.

Unit 5: Sorting and Hashing: Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing.

Graph: Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

Textbook:

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

References:

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

ETCS156- Data Structure Lab							
B. Tech. CSE (AI/ML) Semester- II							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	60
0	0	2	1		**External Examination**	**:**	40
Effective from Session:				**w.e.f. 2022-2023**	**Total**	**:**	100
Date of BoS approval:				13/03/2020	**Duration of Exam**	**:**	0hrs
Prerequisite							

Course Objective:

To write and execute programs in C to solve problems using data structures such as arrays, linked lists, stacks, queues, trees, graphs, hash tables and search trees

Course Outcome:

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

CO1. Recall the basic theory concepts
CO2. Implement basic data structure and its various operations to represent given data
CO3. Differentiate among the use of data structure
CO4. Provide an algorithm with suitable data structure to solve a given problem

Course Content:

1. Write a program to search an element in an array using: linear search and binary search
2. Write a menu-driven program to perform array operations: search, insert at beginning, insertion at end, insertion after a given number, insertion before a given number, deletion from beginning, deletion from t end, deletion after a given number, deletion before a given number,
3. Write a Program to implement the operations of Singly Linked Lists.
4. Write a Program to implement the operations of doubly Linked Lists.
5. Write a Program to implement the operations of Circular Linked Lists.
6. Write a C program that uses stack operations to convert a given infix expression into Its Postfix
7. Write a Program to Implement Queue Operations by using Array and Linked Lists.
8. Write a Program to implement factorial of n using stack.
9. Write a Program to Implement Circular Queue operations by using array and linked list.
10. Write a Program to Sort the set of elements: (i.e., numbers or strings) i). Quick Sort ii). Heap Sort. iii). Merge Sort
11. Write a Program to Implement the Binary Search Tree Operations.

12. Write a Program to Perform the Tree Traversal Techniques by using the Iterative Method
13. Write C programs for implementing the following graph traversal algorithms: a) Depth first traversal b) Breadth first traversal

Textbook:

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

References:

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

E ETHS108- Entrepreneurship Development							
B. Tech. CSE (AI/ML) **Semester – II**							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	30
3	0	0	3		**External Examination**	**:**	70
Effective from Session:				**w.e.f. 2022-2023**	**Total**	**:**	100
Date of BoS approval:				13/03/2020	**Duration of Exam**	**:**	3 Hrs
Prerequisite							

Instruction for Paper Setter:

1. There should be 11 questions in the end term examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 20 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 5 units as per the syllabus. Every unit shall have two questions each of 10 marks each. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain sub-parts / sub-questions.
4. Each Unit shall have a marks weightage of 14.
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objective:

The objective of the section is to develop conceptual understanding of the topic among the students and comprehend the environment of making of an Entrepreneur.

Course Outcome:

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

CO1. Recall the basic theories of Entrepreneurship
CO2. Basic understanding of types of Enterprises and Ownership Structure
CO3. Design strategies for successful implementation of ideas
CO4. Understand the systematic process to select and screen a business idea.

Course Content:

Unit I: Entrepreneurship: Definition, requirements to be an entrepreneur, entrepreneur and intrapreneur, entrepreneur and manager, growth of entrepreneurship in India, women entrepreneurship, rural and urban entrepreneurship.

Unit II: Entrepreneurial Motivation: Motivating factors, motivation theories-Maslow's Need Hierarchy Theory, McClelland' s Acquired Need Theory, government's policy actions towards entrepreneurial motivation, entrepreneurship development programmes.

Unit III: Types of Enterprises and Ownership Structure: Small scale, medium scale and large-scale enterprises, role of small enterprises in economic development; proprietorship, partnership, Ltd. companies and co-operatives: their formation, capital structure and source of finance.

Unit IV: Projects: Identification and selection of projects; project report: contents and formulation, concept of project evaluation, methods of project evaluation: internal rate of return method and net present value method.

Unit V: Management of Enterprises: Objectives and functions of management, scientific management, general and strategic management; introduction to human resource management: planning, job analysis, training, recruitment and selection, etc.; marketing and organizational dimension of enterprises; enterprise financing: raising and managing capital, shares, debentures and bonds, cost of capital; break- even analysis, balance sheet its analysis.

Unit VI: Institutional Support and Policies: Institutional support towards the development of entrepreneurship in India, technical consultancy organizations, government policies for small scale enterprises.

Textbook:

1. Ram Chandran, 'Entrepreneurial Development', Tata McGraw Hill, New Delhi
2. Saini, J. S., 'Entrepreneurial Development Programmes and Practices' , Deep & Deep Publications (P), Ltd.
3. Khanka, S S. 'Entrepreneurial Development', S Chand & Company Ltd. New Delhi

References:

1. Badhai, B 'Entrepreneurship for Engineers', Dhanpat Rai & co. (p) Ltd.
2. Desai, Vasant, 'Project Management and Entrepreneurship', Himalayan Publishing House, Mumbai, 2002.
3. Gupta and Srinivasan, 'Entrepreneurial Development', S Chand & Sons, New Delhi.

ETME158- Engineering Graphics and Design							
B. Tech. CSE (AI/ML) Semester- II							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	60
1	0	4	3		**External Examination**	**:**	40
Effective from Session:				**w.e.f. 2022-2023**	**Total**	**:**	100
Date of BoS approval:				13/03/2020	**Duration of Exam**	**:**	0hrs
Prerequisite							

Course Objective:

- Introduction to engineering design and its place in society
- Exposure to the visual aspects of engineering design
- Exposure to engineering graphics standards
- Exposure to solid modelling
- Exposure to computer-aided geometric design

Course Outcome:

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

CO1. Recall the basics of engineering drawing and projection
CO2. Understand different types of projections
CO3. Differentiate between different types of projection and its applications
CO4. Understand application of isometric projection
CO5. Familiarize with the 2D and 3D projections of various figure

Course Content:

Unit 1: Introduction of Engineering Drawing: Scope and Importance of Engineering Drawing; Drawing instruments and their uses; Indian standards for drawing. Sheet layout, technical lettering and conventions for lines and materials. Introduction to general principles of dimensioning. Scales: plain diagonal and vernier.

Unit 2: Projections: Principles of Projection; Introduction to planes of projection (reference planes) and auxiliary planes. Projection of point in all the four quadrants, calculation of shortest distance.

Projection of lines: Projection of lines in different quadrants according to its orientation/position with horizontal, vertical and profile plane; true and apparent lengths; traces of lines; finding out the true length and true inclinations of the line inclined to both the reference planes using rotating line method and rotating trapezoidal plane method.

Unit 3: Projection of Planes: Projections of plane surfaces-triangle, square, rectangle, pentagon, hexagon and circular planes in different positions when plane is parallel to one of the reference planes, inclined to one of the reference planes and perpendicular to other and inclined to both reference planes.

Projection of Solids: Solids and their classification; right and oblique solids, projections of right regular- prisms, pyramids, cylinders and cones in different positions when their axis is parallel to one of the reference planes, inclined to one or both of the reference planes.

Unit 4: Sections of Solids: Introduction to sectioning and its importance; methods of sectioning, apparent shape and true shape of sections of right regular prisms, pyramids, cylinders and cones resting on horizontal plane on their base.

Development of Surfaces: Development of lateral surface of right regular prism, pyramid, cylinder and cone resting on their base on horizontal plane with their frustum and truncation.

Unit 5: Isometric Projection: Introduction, isometric scale, isometric projection of simple plane figures, isometric projection of cube, square block, right regular prisms, pyramids, cylinders and cones and their combinations.

Orthographic Projection: Orthographic projections of simple solids from the given 3D/isometric view.

AUTOCAD: Management of screen menus commands, Introduction to drawing entities Co-ordinate systems: Cartesian, polar and relative coordinates, drawing limits, units of measurement and scale, layering: organizing and maintaining the integrity of drawings, Design of prototype drawings as templates, Editing/modifying drawing entities: selection of objects, object snap modes, editing commands, dimensioning: use of annotations, dimension types, properties and placement, adding text to drawing.

Textbook:

1. Rhodes R.S, Cook L.B; Basic Engineering Drawing, 1st Edition, Pitman Publishers,
2. Rana B.C and Shah M.B, Engineering Drawing and computer graphics, 2nd Edition, Pearson Education India Publishers. (2009).
3. Jolhe D.A; Engineering Drawing: With an Introduction to AutoCAD, 2nd Edition, Tata McGraw Hill (2007)

References:

1. Ostrowsky. O; Engineering Drawing with CAD application 2nd Edition, Routledge Publishers 2007.
2. Aggarwal B; Engineering Drawing, 1st Edition, Tata McGraw Hill Publications,2008.
3. Gill P.S; Engineering Drawing ,5th Edition, S.K. Kataria and Sons Publications, 2011.
4. Dhawan R. K; Engineering Drawing, 7th Edition, S. Chand and Sons Publishers.
5. Bhatt N.D; Engineering Drawing,50th Edition, Charotar Publication,2011

ETCS110- Foundations of Data Analytics							
B. Tech. CSE (AI/ML) **Semester – II**							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	30
3	0	0	3		**External Examination**	**:**	70
Effective from Session:				**w.e.f. 2022-2023**	**Total**	**:**	100
Date of BoS approval:				13/03/2020	**Duration of Exam**	**:**	3 Hrs
Prerequisite							

Instruction for Paper Setter:

1. There should be 11 questions in the end term examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 20 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 5 units as per the syllabus. Every unit shall have two questions each of 10 marks each. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain sub-parts / sub-questions.
4. Each Unit shall have a marks weightage of 14.
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objective:

- An overview of basic probability and statistics
- Basics of Python Programming
- To understand various data structures
- To visualize data in 2D
- To read files and handle exceptions

Course Outcome:

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

CO1. Recall the fundamental of probability and statistics
CO2. Understand basics of probability and various distributions
CO3. Understand basics of Python Programming
CO4. Implement scripts in Python to solve problems
CO5. Formulate and calculate the probability distribution of given dataset

Course Content:

Unit-1: **Basic Probability:** Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.

Unit-2: Continuous Probability Distributions: Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities.

Unit-3: Introduction to Programming using Python: Structure of a Python Program, Installation of Python, Control flow, Functions, Interpreter shell, Indentation, Identifiers and keywords, Literals,

Strings, Basic operators

Unit-4: Object Oriented Concepts and Data Structures: Standard libraries in Python, notion of class, object and method, Control statements- branching, looping, exit function, break, continue and pass.
Strings, lists, Sets, Tuples and Dictionary and associated operations, Basic searching and sorting methods using iteration and recursion, mutable and immutable structures.

Unit-5: File Handling and data visualization: Reading and writing text and structured files including CSV, JSON, XML, Errors and Exceptions.
Visualization using graphical objects like Point, Line, Histogram, Sine and Cosine Curve, 3D objects.

Textbooks:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).
3. Downey, A.B., (2015), *Think Python–How to think like a Computer Scientist*, 3rd edition. O'Reilly Media.
4. Taneja, S. & Kumar, N., (2017), *Python Programming- A Modular Approach*. Pearson Education.

References:

1. Brown, M. C. (2001). *The Complete Reference: Python*, McGraw Hill Education.
2. Dromey, R. G. (2006), *How to Solve it by Computer*, Pearson Education.
3. Guttag, J.V.(2016), *Introduction to computation and programming using Python*. MIT Press.
4. Liang, Y.D. (2013), *Introduction to programming using Python*. Pearson Education

ETCS160- Foundations of Data Analytics Lab							
B. Tech. CSE (AI/ML) Semester- II							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	60
0	0	4	2		**External Examination**	**:**	40
Effective from Session:				**w.e.f. 2022-2023**	**Total**	**:**	100
Date of BoS approval:				13/03/2020	**Duration of Exam**	**:**	0hrs
Prerequisite							

Course Objective:

The objective is to make student learn about programming in Python so that the

- An overview of basic probability and statistics
- Basics of Python Programming
- To understand various data structures
- To visualize data in 2D
- To read files and handle exceptions

Course Outcome:

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

CO1. Recall the syntax and semantics of Python language
CO2. Understand a given problem and identify the logical solution of the problem
CO3. Implement programming solution for a given problem
CO4. Differentiate among the different type of data structure and its usage in Python

Course Content:

List of Practical's:

1. Write a Python program to illustrate the various functions of the "Math" module.
2. Write a menu-driven Python program to calculate area of a triangle, rectangle and a square, here take input from the user.
3. Write a function to compute grade of a student, grade is computed as:

   A: marks>=90%
   A- : 80%<=marks<90%
   B: 70%<=marks<80%
   B-: 60%<=marks<70%
   C: 50%<=marks<60%
   D: 40%<=marks<50%
   E: otherwise
4. Write a Python function to return nth terms of Fibonacci sequence.
5. Write a Python function to return factorial of a number.
6. Write a Python function to find all prime numbers between a given range, take range from user as an input.
7. Write a Python function to return sum of first n terms of the following series, **where n is taken from user**:

a. **1+x+** $x^2 + x^4 +$**…** x^n
b. **1-x+** $x^2 - x^4 +$**…** x^n
c. $1 + x^2/2! + x^4/4! + x^6/6! + \ldots x^n/n!$**,**
d. $1 - x^2/2! + x^4/4! - x^6/6! + \ldots x^n/n!$**,**

8. Write a menu-driven Python function to perform string operations:
    a. Count the number of vowels in a string
    b. Reverse of a string
    c. Palindrome of a string
    d. Takes two strings as an input from the user and counts the number of matching characters in the given pair of strings.
    e. Sort a list of strings
    f. Frequency of each letter in a string, create dictionary of count
9. Write a Python function to perform matrix manipulation:
    a. **Sum of two matrix**
    b. **Product of two matrix**
    c. **Multiplication of two matrix**
10. **Write** a program to perform Linear and binary search.
11. **Write** a program to perform sorting including selection sort, insertion sort, and bubble sort.
12. Plot histogram and cumulative frequency of n input numbers.
13. Write a menu-driven program to create mathematical 3D objects Curve, Sphere, Cone, Arrow, Ring, Cylinder
14. **Display different curves like, log(), exp(), sin(), cos()**
15. Write a Python functions to perform file operations:
    a. Display content of a file
    b. Number of words in a file
    c. Copies the content of one file to another.

Text Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).
3. Downey, A.B., (2015), *Think Python–How to think like a Computer Scientist*, 3rd edition. O'Reilly Media.
4. Taneja, S. & Kumar, N., (2017), *Python Programming- A Modular Approach*. Pearson Education.

Reference:

1. Brown, M. C. (2001). *The Complete Reference: Python*, McGraw Hill Education.
2. Dromey, R. G. (2006), *How to Solve it by Computer*, Pearson Education.
3. Guttag, J.V.(2016), *Introduction to computation and programming using Python*. MIT Press.
4. Liang, Y.D. (2013), *Introduction to programming using Python*. Pearson Education

ETME162- Engineering Design Project-I							
B. Tech. CSE (AI/ML) Semester- II							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	60
0	0	6	3		**External Examination**	**:**	40
Effective from Session:				**w.e.f. 2022-2023**	**Total**	**:**	100
Date of BoS approval:				13/03/2020	**Duration of Exam**	**:**	0hrs
Prerequisite							

Course Objective:

- To develop design skills according to a Conceive-Design-Implement-Operate (CDIO) compliant methodology.
- To apply engineering sciences through learning-by-doing project work.
- To provide a framework to encourage creativity and innovation.
- To develop team work and communication skills through group-based activity.

Course Outcome:

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

CO1. Recall all the engineering science concepts
CO2. Understand the team-work and importance of learning-by-doing
CO3. Demonstrate critical and logical thinking skills
CO4. Identify a real-life problem and present a feasible solution for the same

Course Content:

Lectures are incorporated in the project to provide a basis for the technical aspects of the project. The lecture series include subject areas such as Materials, Structures, Dynamics and Digital Electronics delivered by experts in the field.

This module is delivered using a combination of introductory lectures and participation by the students in different activities. They assemble and operate a शिलाप्रक्षेपक, based on the lectures and tutorials assignments of mechanical engineering they experiment with the working and implement the final project in a competition. Presentation of the group assembly and individual reflection of the project is assessed in the end. Students work in groups throughout the semester to encourage teamwork,

Project: The Project will facilitate the design, construction and analysis of a "शिलाप्रक्षेपक". In addition to some introductory lectures, the content of the students' work during the semester will consist of:

1. The assembly of a "शिलाप्रक्षेपक" from a Bill of Materials (BOM), detailed engineering drawings of parts, assembly instructions, and few prefabricated parts.
2. The development of a software tool to allow the trajectory of a "missile" to be studied as a

function of various operating parameters in conditions of no-drag and drag due to air.

3. A Structural analysis of certain key components of the शिलाप्रक्षेपक for static and dynamic stresses using values of material properties which will be experimentally determined.
4. The development of a micro-electronic system to allow the angular velocity of the throwing arm to be determined.
5. Testing the शिलाप्रक्षेपक.
6. An inter-group competition at the end of the semester with evaluation of the group redesign strategies

Textbook:

1. Michael McRoberts, Beginning Arduino, Technology in action publications.
2. Alan G. Smith, Introduction to Arduino: A piece of cake, CreateSpace Independent Publishing Platform (2011)

References:

1. John Boxall, Arduino Workshop - A Hands-On Introduction with 65 Projects, No Starch Press (2013)

Semester 3

ETCS201: Discrete Mathematics							
B. Tech CSE(AI/ML) Semester – III							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	30
2	0	0	2		**External Examination**	**:**	70
To be effect from:				**w.e.f. 2023-2024**	**Total**	**:**	100
BoS approval Date:				24-06-2023	**Duration of Exam**	**:**	3 Hours
Prerequisite							

Instruction for Paper Setter:

1. There should be 11 questions in the end term examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 20 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 5 units as per the syllabus. Every unit shall have two questions each of 10 marks each. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain sub-parts / sub-questions.
4. Each Unit shall have a marks weightage of 14.
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives:

The Students will try to learn:

1. To introduce the concept of Mathematical Logic, concepts of sets, relation and functions
2. to understand the induction principle and counting technique
3. To introduce the concept of propositional logic
4. To understand Group theory and related examples
5. To use Graph theory for solving problems

Course Outcomes:

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

CO1. Ability for constructing mathematical logic to solve problems
CO2. Ability to analyse/ quantify the efficiency of a developed solution (algorithm) of a computational problem
CO3. Ability to understand mathematical preliminaries to be used in the subsequent courses of the curriculum. This includes Boolean algebra, number theory, group theory, and combinatorics.
CO4. Ability to understand diverse relevant topics in discrete mathematics and computation theory with an emphasis on their applicability as mathematical tools in computer science.

Course Content:

Unit 1: Sets, Relation and Function

Operations and Laws of Sets, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets Cartesian Products, Disjunctive and Conjunctive Normal Form Binary Relation : representation of relations, Partial Ordering Relation, Equivalence Relation, Image of a Set, Function: Sum and Product of Functions, Bijective functions, Inverse and Composite.

Unit -2: Principles of Mathematical Induction

The Well-Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem of Arithmetic
Basic counting techniques-inclusion and exclusion, pigeon-hole principle, permutation and combination. Introduction to recurrence relations and generating functions.

Unit-3: Propositional Logic

Syntax, Semantics, Validity and Satisfiability, Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Rules of Inference, The use of Quantifiers. Proof Techniques: Some Terminology, Proof, Methods and Strategies, Forward Proof, Proof by Contradiction, Proof by Contraposition, Proof of Necessity and Sufficiency.

Unit 4: Algebraic Structures and Morphism

Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Free and Cyclic Monoids and Groups, Permutation Groups, Substructures, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields. Boolean algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function.

Unit 5: Graph Theory

Graph Terminology, Planar graphs, Euler's formula (proof), Euler and Hamiltonian path/circuit. Chromatic number of a graph, five color theorem (proof), Shortest path and minimal spanning trees and algorithms, Depth-first and breadth first search, trees associated with DFS & BFS, Connected components. Complexity Analysis of the graph MST.

Text Books:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw – Hill
2. Susanna S. Epp, Discrete Mathematics with Applications,4th edition, Wadsworth Publishing Co. Inc.
3. C L Liu and D P Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, 3rd Edition by, Tata McGraw – Hill.

Reference Books:

1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structure and It's Application to Computer Science" , TMG Edition, TataMcgraw-Hill
2. Norman L. Biggs, Discrete Mathematics, 2nd Edition, Oxford University Press.
3. Schaum's Outlines Series, Seymour Lipschutz, Marc Lipson, Discrete Mathematics, Tata McGraw - Hill

ETCS 203: Computer organization and Architecture							
B. Tech. CSE(AI/ML) Semester – III							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	30
2	0	0	2		**External Examination**	**:**	70
To be effect from:				w.e.f. 2023-2024	**Total**	**:**	100
BoS approval Date:				24-06-2023	**Duration of Exam**	**:**	3 Hrs.

Instruction for Paper Setter:

1. There should be 11 questions in the end term examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type questions of total 20 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 5 units as per the syllabus. Every unit shall have two questions each of 10 marks each. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain sub-parts / sub-questions.
4. Each Unit shall have a marks weightage of 14.
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives:

The students will try to learn:

1. Understand the organization and architecture of computer systems and electronic computers.
2. Study the assembly language program execution, instruction format and instruction cycle.
3. Design a simple computer using hardwired and micro-programmed control methods.
4. Study the basic components of computer systems besides the computer arithmetic.
5. Understand input-output organization, memory organization and management, and pipelining.

Course Outcome:

After completion of the course the students are able to:

CO1. To understand the functional blocks of a computer and their working.
CO2. Analyse the CPU organization along with Instruction Level Architecture, different addressing modes
CO3. Apply and analyse the pipelining for speed-up processing
CO4. Understand the working principles of I/O devices.
CO5. Understand and the current state of art in memory system design.
CO6. Analyse the suitable computer architecture for the real life application.

Course Content:

Unit 1: Functional blocks of a Computer

CPU, Memory, input/output subsystems, control unit, Multilevel viewpoint of a machine: digital logic, micro architecture, ISA, operating systems, high level language , RTL Computer Buses (basic design using multiplexers), Bus width, Bus clocking(synchronous , asynchronous), bus arbitration, Bus examples(ISA bus, PCI bus, Universal serial bus) . Data representation: signed number representation, fixed and floating point representations.

Unit 2: CPU Organization:

Instruction set architecture of a CPU, interpretation of instructions, Instruction set based classification of processors (RISC, CISC, and their comparison), CPU Architecture types (accumulator, register, stack, memory/ register) Instruction cycle (Fetch-Decode-Execute)
Addressing modes (register, immediate, direct, indirect, indexed); Operations in the instruction set; Arithmetic and Logical, Data Transfer, Control Flow; Instruction set formats (fixed, variable, hybrid)

Unit 3: Pipelining

Basic concepts, throughput and speedup, hazards, Arithmetic Pipeline, Instruction Pipeline, Pipeline conflicts: Resource conflict, Data dependency, Branch Instructions. Solution for the data dependency: hardware interlock, operand forwarding, delayed load. Solution for branch instruction: prefetch target instruction, branch target buffer, loop buffer, branch prediction, delayed branch

Unit 4: Input /Output & Control Unit

Input Output Interface, Asynchronous data transfer (Strobe control, handshaking, serial transfer); Serial Vs parallel data transmission; Modes of data transfer, Programmed I/O, Interrupt driven, Direct Memory access (DMA). **Control Unit design:** Control unit design methods (hardwired & microprogrammed) Control Memory, Address Sequencing, Micro instructions.

Unit 5: Memory Organization:

Memory device characteristics (access/ cycle time, cost per bit, volatility, storage density); Memory hierarchy; Main memory Design (Semiconductor RAM & ROM organization, memory expansion, Static & dynamic memory types, their comparison); Associative memory Design, Match logic, Locality of reference principle (Temporal & Spatial) Cache mapping (Direct, associative, set associative); Cache writing policies (Copy-Back, Write-through); Virtual Memory (Address space, memory space, Address mapping using pages, Page replacement)

Text Books:

1. Computer System Architecture by M. Mano, Prentice-Hall.
2. Structured Computer Organisation by A.S. Tanenbaum, 6th edition, Prentice-Hall of India, Eastern Economic Edition

Reference Books:

1. Computer Organization, 5th Edi, by Carl Hamacher, Zvonko Vranesic,2002, SafwatZaky.
2. Computer Organization and Design, 2nd Ed., by David A. Patterson and John L. Hennessy, Morgan 1997, Kauffmann.
3. Computer Architecture and Organization, 3rd Edi, by John P. Hayes, 1998, TMH
4. Computer Organisation& Architecture: Designing for performance by W. Stallings, 4th edition, 1996, Prentice-Hall International edition.

ETCS 205: Database Management Systems							
B. Tech. CSE(AI/ML) Semester – III							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	30
1.5	**0**	**0**	**1.5**		**External Examination**	**:**	70
To be effect from:				w.e.f. 2023-2024	**Total**	**:**	100
BoS approval Date:				24-06-2023	**Duration of Exam**	**:**	3 Hrs.

Instruction for Paper Setter:

1. There should be 11 questions in the end term examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type questions of total 20 marks.
3. Apart from question 1 which is compulsory, the rest of the paper shall consist of 5 units as per the syllabus. Every unit shall have two questions each of 10 marks each. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain sub-parts / sub-questions.
4. Each Unit shall have a marks weightage of 14.
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objective:

The objectives are:

- To inculcate the basic understanding of the basic concepts and applications of database systems
- To inculcate understanding of the relational database design principles

Course Outcome:

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

CO1. Recite the fundamental concepts of database management system
CO2. Understand basics of database systems, need of normalization
CO3. Demonstrate the basic elements of a relational database management system
CO4. Identify a suitable data model for a given problem
CO5. Explain the main issues related to transaction and data storage with probable solution

Course Content:

Unit 1

Database system architecture: - Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML). Data models: - Entity-relationship model, network model, relational and object-oriented data models, integrity constraints, data manipulation operations.

Unit 2

Relational query languages:- Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server. Relational database design: - Domain and data dependency, Armstrong's axiom, Normal forms, Dependency preservation, Lossless design. Query processing and optimization: - Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.

Unit 3

Entity Relationship Modelling: Entity Type, Entity Set, Attributes, Keys, Relationship Degree, Role Names, and Recursive Relationships, weak Entity Sets, ER Modelling, subclasses, Superclass, inheritance. ER to Relational Mapping

Unit 4

Disk Storage: Secondary Storage Device, Buffering of Blocks, Records and Record Types, Allocating File Blocks on Disk, and its operations, Hashing Techniques: Internal and External Hashing Techniques, Parallelizing Disk Access Using RAID Technology

File structure: Indexing structure for files, Primary Indexes, Clustering Indexes, Secondary Indexes, Mutilevel Indexes, Indexes on Multiple Keys

Unit 5

Concurrency control Techniques: Two-Phase Locking Techniques for Concurrency Control- Basic, Conservative, Strict, and Rigorous Two-Phase Locking. Deadlock Prevention Protocol, Deadlock Detection, Concurrency Control Based on Timestamp Ordering

Text Books:

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

REFERENCES BOOKS:

1. "Database System Concepts", 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.2.
2. "Principles of Database and Knowledge – Base Systems", Vol 1 by J. D. Ullman, Computer Science Press.
3. "Foundations of Databases", Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley

ETCS 251: Database Management System lab							
B. Tech. CSE(AI/ML) Semester – III							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	70
0	**0**	4	4		**External Examination**	**:**	30
To be effect from:				w.e.f. 2023-2024	**Total**	**:**	100
BoS approval Date:				24-06-2023	**Duration of Exam**	**:**	3 Hrs.

Course Objective:

The students will try to learn:

- To create a database and query it using SQL, design forms and generate reports
- Understand the significance of integrity constraints, referential integrity constraints, triggers, assertions.

Course Outcome:

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

CO1. Recite the syntax of different type of query languages like, data manipulation language, data control language and data definition language
CO2. Understand the database creation and imposing different constraints on the database
CO3. Fetch the required data from the database by writing appropriate query
CO4. Differentiate among the different types of normalization and join operations

Course Content:

Tentative list of practical's:

Create the following schemas:

EMPLOYEE Schema

Field	Type	NULL	KEY
Empno	char(3)	NO	PK
Ename	VARCHAR(10)	NO	NIL
Job	VARCHAR(9)	NO	NIL
Mgr	INT	YES	FK
Hiredate	DATE	NO	NIL
Salary	NUMERIC(7,2)	NO	NIL
Commission	NUMERIC(7,2)	YES	NIL
Deptno	INT	YES	FK

DEPARTMENT Schema

Field	**Type**	**NULL**	**KEY**
deptno	INT	NO	PK
deptName	VARCHAR(50)	YES	NIL
Location	VARCHAR(30)	YES	NIL

Perform the following queries:

1. Query to display Employee Name, Job, Hire Date, Employee Number; for each employee with the Employee Number appearing first.

2. Query to display unique Jobs from the Employee Table.
3. Query to display the Employee Name concatenated by a Job separated by a comma.
4. Query to display all the data from the Employee Table. Separate each Column by a comma and name the said column as THE_OUTPUT.
5. Query to display the Employee Name and Salary of all the employees earning more than $2850.
6. Query to display Employee Name and Department Number for the Employee No= 7900.
7. Query to display Employee Name and Salary for all employees whose salary is not in the range of $1500 and $2850.
8. Query to display Employee Name and Department No. of all the employees in Dept 10 and Dept 30 in the alphabetical order by name.
9. Query to display Name and Hire Date of every Employee who was hired in 1981.
10. Query to display Name and Job of all employees who don't have a current Manager.
11. Query to display the Name, Salary and Commission for all the employees who earn commission.
12. Sort the data in descending order of Salary and Commission.
13. Query to display Name of all the employees where the third letter of their name is 'A'.
14. Query to display Name of all employees either have two 'R's or have two 'A's in their name and are either in Dept No = 30 or their Manger's Employee No = 7788.
15. Query to display Name, Salary and Commission for all employees whose Commission amount is 14 greater than their Salary increased by 5%.
16. Query to display the Current Date.
17. Query to display Name, Hire Date and Salary Review Date which is the 1st Monday after six months of employment.
18. Query to display Name and calculate the number of months between today and the date each employee was hired.
19. Query to display the following for each employee <E-Name> earns < Salary> monthly but wants < 3 * Current Salary >. Label the Column as Dream Salary.
20. Query to display Name with the 1st letter capitalized and all other letter lower case and length of their name of all the employees whose name starts with 'J', 'A' and 'M'.
21. Query to display Name, Hire Date and Day of the week on which the employee started.
22. Query to display Name, Department Name and Department No for all the employees.
23. Query to display Unique Listing of all Jobs that are in Department # 30.
24. Query to display Name, Dept Name of all employees who have an 'A' in their name.
25. Query to display Name, Job, Department No. And Department Name for all the employees working at the Dallas location.
26. Query to display Name and Employee no. Along with their Manger's Name and the Manager's employee no; along with the Employees' Name who do not have a Manager.
27. Query to display Name, Dept No. And Salary of any employee whose department No. and salary matches both the department no. And the salary of any employee who earns a commission.
28. Query to display Name and Salaries represented by asterisks, where each asterisk (*) signifies $100.
29. Query to display the Highest, Lowest, Sum and Average Salaries of all the employees
30. Query to display the number of employees performing the same Job type functions.
31. Query to display the no. of managers without listing their names.
32. Query to display the Department Name, Location Name, No. of Employees and the average salary for all employees in that department.
33. Query to display Name and Hire Date for all employees in the same dept. as Blake.
34. Query to display the Employee No. And Name for all employees who earn more than the average salary.
35. Query to display Employee Number and Name for all employees who work in a department with any employee whose name contains a 'T'.
36. Query to display the names and salaries of all employees who report to King.
37. Query to display the department no, name and job for all employees in the Sales department

Text Book:

1. Elmasri, R., & Navathe, S.B. (2015). *Fundamentals of Database Systems.* 7th edition. Pearson Education.

References:

1. Date, C. J. (2004). *An Introduction to database systems*. 8th edition. Pearson Education.
2. Silberschatz, A., Korth, H. F., & Sudarshan, S. (2010). *Database System Concepts*. 6th edition. McGrawHill

ETCS 207: Design and Analysis of Algorithms							
B. Tech. CSE(AI/ML) Semester – III							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	30
1.5	0	0	1.5		**External Examination**	**:**	70
To be effect from:				w.e.f. 2023-24	**Total**	**:**	100
BoS approval Date:				24-06-2023	**Duration of Exam**	**:**	3 Hours

Instruction for Paper Setter:

1. There should be 11 questions in the end term examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type questions of total 20 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 5 units as per the syllabus. Every unit shall have two questions each of 10 marks each. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain sub-parts / sub-questions.
4. Each Unit shall have a marks weightage of 14.
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objective:

The objective of this paper is to teach the students various problem solving strategies like divide and conquer, Greedy method, Dynamic programming and also the mathematical background for various algorithms. After doing this course, students will be able to select an appropriate problem solving strategies for real world problems. This will also help them to calculate the time, complexity and space complexity of various algorithms.

Course Outcome:

After Completion of the course students will be able to:

CO1. To be able to analyse a problem in terms of processing steps, time and space complexity.
CO2. To be able to design and implement the algorithms for any given application.
CO3. To be able to develop software applications using various programming languages in collaborative groups.
CO4. To apply the principles learnt in solving problems encountered in career or real-life situations.

Course Content:

Unit-I

Brief Review of Graphs, Sets and disjoint sets, union, sorting and searching algorithms and their analysis in terms of space and time complexity. Divide and Conquer: General method, binary search, merge sort, quick sort, selection sort, Strassen's matrix multiplication algorithms and analysis of algorithms for these problems.

Unit-II

Greedy Method: General method, knapsack problem, job sequencing with deadlines, minimum spanning trees, single source paths and analysis of these problems.

Dynamic Programming: General method, optimal binary search trees, O/I knapsack, the traveling salesperson problem.

Unit-III

Back Tracking: General method, 8 queen's problem, graph colouring, Hamiltonian cycles, analysis of these problems.

Unit-IV

Branch and Bound: Method, O/I knapsack and traveling salesperson problem, efficiency considerations. Techniques for algebraic problems, some lower bounds on parallel computations.

Unit-V

NP Hard and NP Complete Problems: Basic concepts, Cook's theorem, NP hard graph and NP scheduling problems some simplified NP hard problems.

Text books:

1. Fundamental of Computer algorithms, Ellis Horowitz and Sartaj Sahni, 1978, Galgotia Publ.,
2. Introduction to Algorithms, Thomas H Cormen, Charles E Leiserson And Ronald L Rivest: 1990, TMH

Reference books:

1. The Design and Analysis of Computer Algorithm, Aho A.V. Hopcroft J.E., 1974, Addison Wesley.
2. Algorithms-The Construction, Proof and Analysis of Programs, Berlion, P.Bizard, P., 1986. Johan Wiley & Sons,
3. Introduction to Design and Analysis of Algorithm, Goodman, S.E. & Hedetnieni, 1997, MGH.
4. Introduction to Computers Science- An algorithms approach, Jean Paul Trembley, Richard B.Bunt, 2002, T.M.H. .

ETCS 253: Design and Analysis of Algorithms Lab							
B. Tech. CSE(AI/ML) Semester – III							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	**70**
0	0	2	2		**External Examination**	**:**	**30**
To be effect from:				**w.e.f. 2023-2024**	**Total**	**:**	**100**
BoS approval Date:				24-06-2023	**Duration of Exam**	**:**	-

List of Practical's:

1. Sort a given set of elements using the Quicksort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.
2. Using OpenMP, implement a parallelized Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.
3. Obtain the Topological ordering of vertices in a given digraph.
4. Compute the transitive closure of a given directed graph using Warshall's algorithm
5. Implement 0/1 Knapsack problem using Dynamic Programming.
6. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.
7. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.
8. i) Print all the nodes reachable from a given starting node in a digraph using BFS method.
   ii) Check whether a given graph is connected or not using DFS method.
9. Find a subset of a given set S = {sl, s2, ... ,sn} of n positive integers whose sum is equal to a given positive integer d. For example, if S= {1, 2, 5, 6, 8} and d = 9 there are two solutions {1, 2, 6} and {1, 8}.A suitable message is to be displayed if the given problem instance doesn't have a solution.
10. Implement any scheme to find the optimal solution for the Traveling Salesperson problem and then solve the same problem instance using any approximation algorithm and determine the error in the approximation.
11. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.
12. Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.
13. Implement N Queen's problem using Back Tracking

Text books:

1. Fundamental of Computer algorithms, Ellis Horowitz and Sartaj Sahni, 1978, Galgotia Publ.,
2. Introduction to Algorithms, Thomas H Cormen, Charles E Leiserson And Ronald L Rivest: 1990, TMH

Reference books:

1. The Design and Analysis of Computer Algorithm, Aho A.V. Hopcroft J.E., 1974, Addison Wesley.
2. Algorithms-The Construction, Proof and Analysis of Programs, Berlion, P.Bizard, P., 1986. Johan Wiley & Sons,
3. Introduction to Design and Analysis of Algorithm, Goodman, S.E. & Hedetnieni, 1997, MGH.
4. Introduction to Computers Science- An algorithms approach, Jean Paul Trembley, Richard B.Bunt, 2002, T.M.H

ETCS 209: Artificial Intelligence							
B. Tech. CSE(AI/ML) Semester – III							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	30
1.5	0	0	1.5		**External Examination**	**:**	70
To be effect from:				w.e.f. 2023-2024	**Total**	**:**	100
BoS approval Date:				24-06-2023	**Duration of Exam**	**:**	3 Hrs.

Instruction for Paper Setter:

1. There should be 11 questions in the end term examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 20 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 5 units as per the syllabus. Every unit shall have two questions each of 10 marks each. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain sub-parts / sub-questions.
4. Each Unit shall have a marks weightage of 14.
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objective:

This course will give an opportunity to gain expertise in one of the most fascinating and fastest growing areas of Computer Science. This course will give the students a rigorous, advanced and professional graduate-level foundation in Artificial Intelligence (AI).

Course Outcome:

After undergoing this course, the students will be able to:

CO1. Recognize the basic concept of AI
CO2. Understand different searching algorithms and the difference among their working principal. Also, basic understanding of probability theory
CO3. Identify a search algorithm for a given problem and estimate its time and space complexities
CO4. Learn optimization and inference algorithms for model learning
CO5. Model a given scenario in the form of knowledge representation and frames
CO6. Implement basics AI programming in python

Course Content:

Unit-1

Introduction: Concept of AI, history, current status, scope, agents, environments, Problem Formulations, Review of tree and graph structures, State space representation, Search graph and Search tree.

Unit-2

Search Algorithms: Random search, Search with closed and open list, Depth first and Breadth first search, Heuristic search, Best first search, A* algorithm, Game Search.

Unit-3

Probabilistic Reasoning: Probability, conditional probability, Bayes Rule, Bayesian Networks- representation, construction and inference, temporal model, hidden Markov model.

Unit-4

Knowledge Representation and Reasoning

First Order Logic, building knowledge-bases, Logic based Reasoning Systems, Semantic Networks, Frames.

Unit-5

Prolog Programming Prolog Programming: Introduction to Programming in Logic (PROLOG), Lists, Operators, basic Input and Output.

Text Books:

1. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill
2. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach" , 3rd Edition, Prentice Hall
3. Bratko, I. (2011). *Prolog Programming for Artificial Intelligence*. 4th edition. Pearson Education

References:

1. Trivedi, M.C., "A Classical Approach to Artificial Intelligence", Khanna Publishing House, Delhi.
2. Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, 2011
3. David Poole and Alan Mackworth, "Artificial Intelligence: Foundations for Computational Agents", Cambridge University Press.

ETCS 255 : Artificial Intelligence Lab							
B. Tech. Semester – III AI/ML w.e.f. 2023-2024							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	**70**
0	0	2	2		**External Examination**	**:**	**30**
To be effect from:				w.e.f 2023-24	**Total**	**:**	**100**
BoS approval Date:				24-06-2023	**Duration of Exam**	**:**	-

Course Objective:

This course will give an opportunity to learn programming in PROLOG.

Course Outcome:

After undergoing this course, the students will be able to:

CO1. Recall the basic syntax and semantics of PROLOG
CO2. Understand the knowledge representation in PROLOG
CO3. Implement small programs in PROLOG
CO4. Differentiate the basic difference between AI programming and programming in other languages

List of Practicals:

1. Write a prolog program to calculate the sum of two numbers.
2. Write a Prolog program to implement max(X, Y, M) so that M is the maximum of two numbers X and Y.
3. Write a program in PROLOG to implement factorial (N, F) where F represents the factorial of a number N
4. Write a Prolog program to implement member(A, S): to check whether A is a member of S or not.
5. Write a Prolog program to implement multiply(X1, X2, M) : where X1 and X2 denotes the numbers to be multiplied and M represents the result.
6. Write a Prolog program to implement GCD of two numbers
7. Write a program in PROLOG to implement palindrome (S) which checks whether a list S is a palindrome or not
8. Write a Prolog program to implement maxlist(S, M); minList(S, M) so that M is the maximum/minimum number in the list.
9. Write a Prolog program to merge two lists.
10. Write a prolog program to implement insert_nth (I, N, S, R) that inserts an item I into Nth position of list S to generate a list R
11. Write a prolog program to implement delete_nth (N, S, R) that removes Nth position item of list S to generate a list R.

Text Books:

1. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill
2. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", 3rd Edition, Prentice Hall
3. Bratko, I. (2011). *Prolog Programming for Artificial Intelligence*. 4th edition. Pearson Education

References books:

1. Trivedi, M.C., "A Classical Approach to Artificial Intelligence", Khanna Publishing House, Delhi.
2. Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, 2011
3. David Poole and Alan Mackworth, "Artificial Intelligence: Foundations for Computational Agents", Cambridge University Press 2010.

ETCS211: Signal & Systems							
B. Tech. CSE(AI/ML) Semester – III							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	30
1.5	0	0	1.5		**External Examination**	**:**	70
To be effect from:				w.e.f. 2023-2024	**Total**	**:**	100
BoS approval Date:				24-06-2023	**Duration of Exam**	**:**	3 Hrs

Instruction for Paper Setter:

1. There should be 11 questions in the end term examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 20 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 5 units as per the syllabus. Every unit shall have two questions each of 10 marks each. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain sub-parts / sub-questions.
4. Each Unit shall have a marks weightage of 14.
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives:

The objective of this course is to make the students understand the basic properties of signal & systems. Also, give insight about the various transformations and difference between these transformations.

Course Outcomes:

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

CO1. Recite the basic concepts related to signals and different series
CO2. Understand the role of signals and its type in daily life. Also, the student will be able to describe different transformations like Fourier Transform, Laplace Transform, and Z-transform
CO3. Calculate the transformation of a given signal and the properties of the transformed signals. Also, the students will be capable of determining the frequency components present in a deterministic signal
CO4. Classify the different type of signals and applicability of a transformation for a given scenario.
CO5. Determine if a given system is linear/causal/stable

Course Content:

Unit 1: Standard signals- Step, Ramp, Pulse, Impulse, Real and complex exponentials and Sinusoids_ Classification of signals – Continuous time (CT) and Discrete Time (DT) signals, Periodic & Aperiodic signals, Deterministic & Random signals, Energy & Power signals – Classification of systems- CT systems and DT systems- – Linear & Nonlinear, Time-variant & Time-invariant, Causal & Non-causal, Stable & Unstable.
Unit 2: Fourier series for periodic signals – Fourier Transform – properties- Laplace transforms and properties
Unit 3: Impulse response – convolution integrals- Differential Equation- Fourier and Laplace transforms in Analysis of CT systems – Systems connected in series / parallel.
Unit 4: Base band signal Sampling – Fourier Transform of discrete time signals (DTFT) – Properties of DTFT – Z Transform & Properties
Unit 5: Impulse response – Difference Equations-Convolution sum- Discrete Fourier Transform and Z Transform Analysis of Recursive & Non-Recursive systems-DT systems connected in series and parallel.

Text Book:

1. Allan V.Oppenheim, S.Wilsky and S.H.Nawab, ―Signals and Systems‖, Pearson, 2015.

Reference Books:

1. B. P. Lathi, ―Principles of Linear Systems and Signals‖, Second Edition, Oxford, 2009.
2. R.E.Zeimer, W.H.Tranter and R.D.Fannin, ―Signals & Systems – Continuous and Discrete‖, Pearson, 2007.
3. John Alan Stuller, ―An Introduction to Signals and Systems, Thomson, 2007.

ETCS257: Signal and Systems Lab							
B. Tech. CSE (AI/ML) Semester-IV							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	70
0	0	2	2		**External Examination**	**:**	30
Effective from Session:				**w.e.f. 2023-2024**	**Total**	**:**	100
Date of BoS approval:				24-06-2023	**Duration of Exam**	**:**	-
Prerequisite							

Course Objective:

The objective is to carry out hands-on in MATLAB. MATLB is commonly used platform to carry out simulation and popular tool used in the research. This course will inculcate basics of MATLAB

Course Outcome:

After completion of the course, the student will be:

- **CO1.** Able to recall basics of MATLAB programming
- **CO2.** Able to understand basic programming in MATLAB,
- **CO3.** Able to implement of Laplace Transforms, Analog Filters, and DFT & FFT algorithm
- **CO4.** Able to analyse and study the relation between different parameters and change in nature of signals

Course Content:

1. Familiarization with MATLAB
2. Matrix Operations & Plotting using MATLAB
3. Relational Operators, Loops & Functions using MATLAB
4. Generation of Signals & Signal Operations
5. Synthesis of signals using Fourier Series
6. Advanced MATLAB Problems related to signals & systems
7. Convolution on Continuous Time Signals
8. Study of Laplace Transforms using MATLAB
9. Study of Analog Filters Using MATLAB
10. DFT & FFT algorithms using MATLAB

ETAU213: Sports and Yoga							
B. Tech. CSE(AI/ML) Semester – III							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	0
1	0	0	0		**External Examination**	**:**	0
To be effect from:				w.e.f. 2023-2024	**Total**	**:**	0
BoS approval Date:				24-06-2023	**Duration of Exam**	**:**	-

Instruction for Paper Setter:

7. There should be 11 questions in the end term examinations question paper.
8. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 20 marks.
9. Apart from question 1 which is compulsory, rest of the paper shall consist of 5 units as per the syllabus. Every unit shall have two questions each of 10 marks each. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain sub-parts / sub-questions.
10. Each Unit shall have a marks weightage of 14.
11. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
12. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objective:

1. To maintain their mental and physical wellness upright and develop ability in them to cope up with the stress arising in the life.
2. To create space in the curriculum to nurture the potential of the students in sports/games/yoga etc.
3. To introduce a practice oriented introductory course on the subject. More involved / advanced course may come up in subsequent years of study

Course Outcomes:

On successful completion of the course the students will be able to:

1. Understand basic skills associated with yoga and physical activities including strength and flexibility, balance and coordination.
2. Perform yoga movements in various combination and forms.
3. Assess current personal fitness levels.
4. Identify opportunities for participation in yoga and sports activities.
5. Develop understanding of health-related fitness components: cardiorespiratory endurance, flexibility and body composition etc.
6. Improve personal fitness through participation in sports and yogic activities.
7. Develop understanding of psychological problems associated with the age and lifestyle.
8. Demonstrate an understanding of sound nutritional practices as related to health and physical performance.
9. Assess yoga activities in terms of fitness value.
10. Identify and apply injury prevention principles related to yoga and physical fitness activities.
11. Understand and correctly apply biomechanical and physiological principles elated to exercise and training.

Course Contents:

Unit 1

Introduction to Physical Education o Meaning & definition of Physical Education, Aims & Objectives of Physical Education, Changing trends in Physical Education, Olympic Movement, Ancient & Modern Olympics (Summer & Winter), Olympic Symbols, Ideals, Objectives & Values, Awards and Honours in the field of Sports

in India (Dronacharya Award, Arjuna Award, Dhayanchand Award, Rajiv Gandhi Khel Ratna Award etc.)

Unit 2

Physical Fitness, Wellness & Lifestyle, Meaning & Importance of Physical Fitness & Wellness, Components of Physical fitness, Components of Health related fitness, Components of wellness, Preventing Health Threats through Lifestyle Change, Concept of Positive Lifestyle,
Fundamentals of Anatomy & Physiology in Physical Education, Sports and Yoga, Define Anatomy, Physiology & Its Importance Effect of exercise on the functioning of Various Body Systems. (Circulatory System, Respiratory System, Neuro-Muscular System etc.)

Unit 3

Kinesiology, Biomechanics & Sports o Meaning & Importance of Kinesiology & Biomechanics in Physical Edu. & Sports, Newton's Law of Motion & its application in sports. Friction and its effects in Sports. Postures: Meaning and Concept of Postures. Causes of Bad Posture Advantages & disadvantages of weight training. Concept & advantages of Correct Posture. Common Postural Deformities – Knock Knee; Flat Foot; Round Shoulders; Lordosis, Kyphosis, Bow Legs and Scoliosis. Corrective Measures for Postural Deformities

Unit 4

Yoga, Meaning & Importance of Yoga, Elements of Yoga, Introduction - Asanas, Pranayama, Meditation & Yogic Kriyas. Yoga for concentration & related Asanas (Sukhasana; Tadasana; Padmasana & Shashankasana), Relaxation Techniques for improving concentration - Yog-nidra, Yoga & Lifestyle. Asanas as preventive measures. Hypertension: Tadasana, Vajrasana, Pavan Muktasana, Ardha Chakrasana, Bhujangasana, Sharasana.

Unit 5

Sports Medicine: First Aid – Definition, Aims & Objectives. Sports injuries: Classification, Causes & Prevention. Management of Injuries: Soft Tissue Injuries and Bone & Joint Injuries Sports / Games Following subtopics related to any one Game/Sport of choice of student out of: Athletics, Badminton, Basketball, Chess, Cricket, Kabaddi, Lawn Tennis, Swimming, Table Tennis, Volleyball, Yoga etc. History of the Game/Sport. Latest General Rules of the Game/Sport. Specifications of Play Fields and Related Sports Equipment. Important Tournaments and Venues. Sports Personalities. Proper Sports Gear and its Importance.

Text Books:

1. Modern Trends and Physical Education by Prof. Ajmer Singh.

References Book

1. Light On Yoga by B.K.S. Iyengar.
2. Health and Physical Education – NCERT (11th and 12th Classes).

Semester- 4

ETCS202: Operating system							
B. Tech. CSE (AI/ML) Semester – IV							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	30
1.5	0	0	1.5		**External Examination**	**:**	70
Effective from Session:				w.e.f. 2023-2024	**Total**	**:**	100
Date of BoS approval:				24-06-2023	**Duration of Exam**	**:**	3 Hrs
Prerequisite							

Instruction for Paper Setter:

1. There should be 11 questions in the end term examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 20 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 5 units as per the syllabus. Every unit shall have two questions each of 10 marks each. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain sub-parts / sub-questions.
4. Each Unit shall have a marks weightage of 14.
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objective:

The students will try to learn:

1. Problem-solving through programming
2. Programming language, programming, reading a set of Data, stepwise refinement, concepts of Loops, Functions, Control structure, Arrays, Structure, Pointer and File concept.
3. To build efficient programs in 'C' language essential for future programming and software engineering courses.

Course Outcome:

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

CO1. Understand how an operating system manages all the resources in a computer system efficiently.
CO2. Learn algorithms for CPU scheduling, deadlock handling, page replacement and disk scheduling used by an operating system.
CO3. Use shell commands to efficiently operate a computer system.
CO4. Learn and use system calls for process creation and termination, inter-process communication, process synchronization, memory management and file system management.
CO5. analyses segmentation and paging techniques.
CO6. Compare file naming in Linux and Windows

Course Content:

Unit-I

Introduction: Introduction to Operating System Concepts (including Multitasking, multiprogramming, multi user, Multithreading etc)., Types of Operating Systems: Batch operating system, Time-sharing systems, Distributed OS, Network OS, Real Time OS; Various Operating system services, architecture, System programs and calls.

Unit–II

Process Management: Process concept, process scheduling, operation on processes; CPU scheduling, scheduling criteria, scheduling algorithms -First Come First Serve (FCFS), Shortest-Job-First (SJF), Priority Scheduling, Round Robin(RR), Multilevel Queue Scheduling.

Unit–III

Memory Management: Logical & Physical Address Space, swapping, contiguous memory allocation, non-contiguous memory allocation paging and segmentation techniques, segmentation with paging; virtual memory management - Demand Paging & Page-Replacement Algorithms; Demand Segmentation.

Unit–IV

Process-Synchronization & Deadlocks: Critical Section Problems, semaphores; methods for handling deadlocks-deadlock prevention, avoidance & detection; deadlock recovery.
File System: Different types of files and their access methods, directory structures, various allocation methods, disk scheduling and management and its associated algorithms, Introduction to distributed file system.

Unit V

I/O Systems: I/O Hardware, Application I/O Interface, Kernel, Transforming I/O requests, Performance Issues. Unix System And Windows NT Overview: Unix system call for processes and file system management, Shell interpreter, Windows NT architecture overview, Windows NT file system.

Text Books:

1. Operating System Concepts by Silberchatz et al, 5th edition, 1998, Addison-Wesley.
2. Modern Operating Systems by A. Tanenbaum, 1992, Prentice-Hall.
3. Operating Systems Internals and Design Principles by William Stallings,4thedition, 2001, Prentice Hall

Reference Books:

1. Operating System by Peterson, 1985, AW.
2. Operating System by Milankovic, 1990, TMH.
3. Operating System Incorporating With Unix& Windows By Colin Ritche, 1974, TMH.
4. Operating Systems by Mandrik & Donovan, TMH
5. Operating Systems – Advanced Concepts By MukeshSinghal , N.G. Shivaratri, 2003, T.M.H

ETCS252: Operating System Lab							
B. Tech. CSE (AI/ML) Semester-IV							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	70
0	0	2	2		**External Examination**	**:**	30
Effective from Session:				w.e.f. 2023-2024	**Total**	**:**	100
Date of BoS approval:				24-06-2023	**Duration of Exam**	**:**	-
Prerequisite							

Course Objective:

The students will try to learn:

Simulate and implement operating system concepts such as scheduling, deadlock management, file management and memory management.

Course Outcome:

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

CO1. Understand how an operating system manages all the resources in a computer system efficiently.
CO2. Learn algorithms for CPU scheduling, deadlock handling, page replacement and disk scheduling used by an operating system.
CO3. Use shell commands to efficiently operate a computer system.
CO4. Learn and use system calls for process creation and termination, inter-process communication, process synchronization, memory management and file system management.

List of Practical's

1. Write a program to implement CPU scheduling for first come first serve.
2. Write a program to implement CPU scheduling for shortest job first.
3. Write a program to perform priority scheduling.
4. Write a program to implement CPU scheduling for Round Robin.
5. Write a program for page replacement policy using a) LRU b) FIFO c) Optimal.
6. Write a program to implement first fit, best fit and worst fit algorithm for memory management.
7. Write a program to implement reader/writer problem using semaphore.
8. Write a program to implement Banker's algorithm for deadlock avoidance

Text Books:

1. Operating System Concepts by Silberchatz et al, 5th edition, 1998, Addison-Wesley.
2. Modern Operating Systems by A. Tanenbaum, 1992, Prentice-Hall.
3. Operating Systems Internals and Design Principles by William Stallings,4thedition, 2001, PrenticeHall

Reference Books:

1. Operating System by Peterson, 1985, AW.
2. Operating System by Milankovic, 1990, TMH.
3. Operating System Incorporating With Unix& Windows By Colin Ritche, 1974, TMH.
4. Operating Systems by Mandrik & Donovan, TMH
5. Operating Systems – Advanced Concepts By MukeshSinghal , N.G. Shivaratri, 2003, T.M.H

ETCS204: Object Oriented Programming using C++							
B. Tech. CSE (AI/ML) Semester – IV							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	30
1.5	0	0	1.5		**External Examination**	**:**	70
Effective from Session:				w.e.f. 2023-2024	**Total**	**:**	100
Date of BoS approval:				24-06-2023	**Duration of Exam**	**:**	3 Hrs.
Prerequisite				Programing with C			

Instruction for Paper Setter:

1. There should be 11 questions in the end term examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 20 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 5 units as per the syllabus. Every unit shall have two questions each of 10 marks each. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain sub-parts / sub-questions.
4. Each Unit shall have a marks weightage of 14.
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives:

The students will try to learn:

1. To introduce the basic Concepts of Object Oriented Programming (data types, operators and functions) using C++
2. To introduce concepts of Classes and Objects with the examples of C++ programming
3. To understand object oriented features such as Inheritance and Polymorphism
4. To use various object oriented concepts (exceptional handling) to solve different problems

Course Outcomes:

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

CO1: Ability to have an in-depth knowledge of object-oriented programming paradigm
CO2: To be able to develop basic C++ programming skills
CO3: To be able to apply various object-oriented features using C++
CO4: Ability to understand generic programming & standard templates

Course Contents:

Unit 1: Basic Concepts of Object Oriented Programming

Procedural Vs. Object oriented Programming, C++ Standard Library, Pre-processor Directives, illustrative Simple C++ Programs. Header Files and Namespaces, library files. Object Oriented Concepts: Introduction to Objects and Classes, Data Abstraction, Encapsulation (Information Hiding), Access Modifiers: Controlling access to a class, method, or variable (public, protected, private), Polymorphism, Inheritance, and Reusability Classes: - Introduction, Structure Vs. Class, Class Scope and Accessing Class Members

Unit 2: Constructors in a class

Specifying a class, Member Functions, Encapsulation, information hiding, abstract data types, objects & classes, Arrays of Objects, Constructors & Destructors, Parameterized Constructors, Copy Constructors, Dynamic

Constructors, Destructors, identity and behaviour of an object, C++ garbage collection, dynamic memory allocation, Explicit Type Conversions.

Unit 3: Function and Overloading

Static Member function: Friend Function and Friend Classes, Using This Pointer, Container Classes and Iterators, Function overloading, Fundamentals of Operator Overloading, Restrictions on Operators Overloading, Operator Functions as Class Members vs. as Friend Functions, Overloading Binary Operators (+,-,*, /,=),Overloading Unary Operators(-,++,--,)

Unit 4: Inheritance and Virtual Functions

Introduction, Types of Inheritance, Base Classes and Derived Classes, Virtual Base class, Casting Base Class Pointers to Derived- Class Pointers, Using Member Functions, Overriding Base - Class Members in a Derived Class, Public, Protected and Private Inheritance, Using Constructors and Destructors in derived Classes, Composition Vs. Inheritance, Overloading Vs. Overriding. Run Time Polymorphism, Introduction to Virtual Functions, Pure Virtual Functions, Abstract Base Classes and Concrete Classes, Dynamic Binding, Virtual Destructors, Dynamic Binding.

Unit 5: Files, Templates and Exception Handling

Files and I/O Streams and various operation on files. Stream Input/output Classes and Objects, Stream Output, Stream Input, Unformatted I/O (with read and write), Stream Manipulators, Stream Format States, Stream Error States.

Templates & Exception Handling: - Function Templates, Overloading Template Functions, Class Template, Class Templates and Non-Type Parameters, Templates and Inheritance, Templates and Friends.

Basics of C++ Exception Handling: - Try Throwing, Catch, and Throwing an Exception; - Catching an Exception, Re-throwing an Exception, Processing Unexpected Exceptions, Constructors, Destructors and Exception Handling.

Text Books:

1. Object Oriented Programming in Turbo C++ by Robert Lafore ,1994, The WAITE Group Press.
2. Programming with C++ By D Ravichandran, 2003, T.M.H 3. Object oriented Programming with C++ by E Balagurusamy, 2001, Tata McGraw-Hill.

Reference Books:

1. C++ How to Program by H M Deitel and P J Deitel, 1998, Prentice Hall
2. Computing Concepts with C++ Essentials by Horstmann, 2003, John Wiley,
3. The Complete Reference in C++ By Herbert Schildt, 2002, TMH.
4. C++ Programming Fundamentals by Chuck Easttom, Firewall Media

ETCS254- Object Oriented Programming using C++ Lab							
B. Tech. CSE (AI/ML) Semester-II							
L	**T**	**P**	**Credits**	Core Course	**Internal Examination**	**:**	70
0	0	2	2		**External Examination**	**:**	30
Effective from Session:				**w.e.f. 2023-2024**	**Total**	**:**	100
Date of BoS approval:				24-06-2023	**Duration of Exam**	**:**	
Prerequisite							

Course Objectives:

The students will try to learn:

1. To introduce the basic Concepts of Object-oriented Programming (data types, operators and functions) using C++
2. To introduce concepts of Classes and Objects with the examples of C++ programming
3. To understand object-oriented features such as Inheritance and Polymorphism
4. To use various object-oriented concepts (exceptional handling) to solve different problems

Course Outcomes:

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

CO1. understand an in-depth knowledge of object-oriented programming paradigm
CO2. Develop basic C++ programming skills
CO3. Apply various object-oriented features using C++
CO4. Understand generic programming & standard templates
CO5. Understand and implement Function and Operator Overloading

List of Practical's:

1. Write a program for multiplication of two matrices using OOP.
2. Write a program to perform addition of two complex numbers using constructor overloading. The first constructor which takes no argument is used to create objects which are not initialized, second which takes one argument is used to initialize real and imag parts to equal values and third which takes two argument is used to initialized real and imag to two different values.
3. Write a program to find the greatest of two given numbers in two different classes using friend function.
4. Implement a class string containing the following functions: - Overload + operator to carry out the concatenation of strings. - Overload = operator to carry out string copy. - Overload <= operator to carry out the comparison of strings. - Function to display the length of a string. - Function tolower( ) to convert upper case letters to lower case. - Function toupper( ) to convert lower case letters to upper case.
5. Create a class called LIST with two pure virtual function store() and retrieve().To store a value call store and to retrieve call retrieve function. Derive two classes stack and queue from it and override store and retrieve.
6. Write a program to define the function template for calculating the square of given numbers with different data types.
7. Write a program to demonstrate the use of special functions, constructor and destructor in the class template. The program is used to find the bigger of two entered numbers.
8. Write a program to perform the deletion of white spaces such as horizontal tab, vertical tab, space, line feed, new line and carriage return from a text file and store the contents of the file without the white spaces on another file.

9. Write a program to read the class object of student info such as name , age ,sex ,height and weight from the keyboard and to store them on a specified file using read() and write() functions. Again the same file is opened for reading and displaying the contents of the file on the screen.
10. Write a program to raise an exception if any attempt is made to refer to an element whose index is beyond the array size.

ETCS206: Machine Learning							
B. Tech. CSE (AI/ML) Semester – IV							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	30
1.5	0	0	1.5		**External Examination**	**:**	70
Effective from Session:				w.e.f. 2023-2024	**Total**	**:**	100
Date of BoS approval:				24-06-2023	**Duration of Exam**	**:**	3 Hrs
Prerequisite							

Instruction for Paper Setter:

1. There should be 11 questions in the end term examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 20 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 5 units as per the syllabus. Every unit shall have two questions each of 10 marks each. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain sub-parts / sub-questions.
4. Each Unit shall have a marks weightage of 14.
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives:

The students will try to learn:

1. Learn the concept of how to learn patterns and concepts from data without being explicitly programmed.
2. Design and analyze various machine learning algorithms and techniques with a modern outlook focusing on recent advances.
3. Explore supervised and unsupervised learning paradigms of machine learning.
4. Explore Deep learning technique and various feature extraction strategies

Course Outcomes:

After Completion of this course the students will be able to:

CO1. Understand use of the basic methods of supervised learning with linear models and binary classification included in multi-class outputs.
CO2. Understand decision trees, support vector machines in optimizing basic methods of regression
CO3. Apply the key issues and applications in clustering and dimensionality reduction.
CO4. Apply matrix factorization used to process reduction in unsupervised learning.
CO5. Apply algorithms in optimizing statistical learning theory and methods in machine learning.

Detailed Contents:

UNIT-1: Supervised Learning (Regression/Classification)

Basic methods: Distance-based methods, Nearest-Neighbors, Decision Trees, Naive Bayes

Linear models: Linear Regression, Logistic Regression, Generalized Linear Models

Support Vector Machines, Nonlinearity and Kernel Methods

Beyond Binary Classification: Multi-class/Structured Outputs, Ranking

UNIT-2: Unsupervised Learning

Clustering: K-means/Kernel K-means

Dimensionality Reduction: PCA and kernel PCA

Matrix Factorization and Matrix Completion

Generative Models (mixture models and latent factor models)

UNIT-3: Machine Learning

Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical LearningTheory, Ensemble Methods (Boosting, Bagging, Random Forests)

UNIT-4: Modelling Techniques

Sparse Modeling and Estimation, Modeling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning.

UNIT-5: Scalable Machine Learning

Scalable Machine Learning (Online and Distributed Learning)

A selection from some other advanced topics, e.g., Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference

Recent trends in various learning techniques of machine learning and classification methods for IOT applications, various models for IOT applications.

Text Books:

1. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012.

Reference Books:

2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning,Springer 2009 (freely available online)
3. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.

ETCS256: Machine Learning Lab							
B. Tech. CSE (AI/ML) Semester-IV							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	70
0	0	2	2		**External Examination**	**:**	30
Effective from Session:				**w.e.f. 2023-2024**	**Total**	**:**	100
Date of BoS approval:				24-06-2023	**Duration of Exam**	**:**	
Prerequisite							

Course Objectives:

The students will try to learn:

1. Learn the concept of how to learn patterns and concepts from data without being explicitly programmed.
2. Design and analyze various machine learning algorithms and techniques with a modern outlook focusing on recent advances.
3. Explore supervised and unsupervised learning paradigms of machine learning.
4. Explore Deep learning technique and various feature extraction strategies

Course Outcomes:

After Completion of this course the students will be able to:

CO1. Understand use of the basic methods of supervised learning with linear models and binary classification included in multi-class outputs.
CO2. Understand decision trees, support vector machines in optimizing basic methods of regression
CO3. Apply the key issues and applications in clustering and dimensionality reduction.
CO4. Apply matrix factorization used to process reduction in unsupervised learning.
CO5. Apply algorithms in optimizing statistical learning theory and methods in machine learning.

List of Practical's:

1. Study and Implement the Naive Bayes learner. (The datasets taken can be: Breast Cancer data file or Reuters data set).
2. Study and Implement the Decision Tree learners. (The datasets taken can be: Breast Cancer data file or Reuter‟s data set).
3. Estimate the accuracy of decision classifier on breast cancer dataset using 5-fold cross-validation. (You need to choose the appropriate options for missing values).
4. Estimate the precision, recall, accuracy, and F-measure of the decision tree classifier on the text classification task for each of the 10 categories using 10-fold cross-validation.
5. Develop a machine learning method to classifying your incoming mail.
6. Develop a machine learning method to Predict stock prices based on past price variation.
7. Develop a machine learning method to predict how people would rate movies, books, etc.
8. Develop a machine learning method to Cluster gene expression data, how to modify existing methods to solve the problem better
9. Select two datasets Each dataset should contain examples from multiple classes. For training purposes assume that the class label of each example is unknown (if it is known, ignore it). Implement the Kmeans algorithm and apply it to the data you selected. Evaluate performance by measuring the sum of Euclidean distance of each example from its class centre. Test the performance of the algorithm as a function of the parameter k.

10. Implement the EM algorithm assuming a Gaussian mixture. Apply the algorithm to your datasets and report the parameters you obtain. Evaluate performance by measuring the sum of Mahalanobis distance of each example from its class centre. Test performance as a function of the number of clusters.
11. Suggest and test a method for automatically determining the number of clusters. Using a dataset with known class labels compare the labelling error of the K-means and EM algorithms. Measure the error by assigning a class label to each example. Assume that the number of clusters is known.

Text book/Reference Books:

1. Stephen Marsland, Machine Learning: An Algorithmic Perspective, Chapman and Hall/CRC; 2nd edition (8 October 2014)
2. Bishop, C.M., Pattern recognition and machine learning. Springer; 1st ed. 2006. Corr. 2nd printing 2011 edition (15 February 2010)
3. Tom Mitchell, Machine Learning, McGraw Hill Education; First edition (1 July 2017)

ETCS208: Computer Networks							
B. Tech. CSE (AI/ML) Semester – IV							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	30
1.5	0	0	1.5		**External Examination**	**:**	70
Effective from Session:				w.e.f. 2023-2024	**Total**	**:**	100
Date of BoS approval:				24-06-2023	**Duration of Exam**	**:**	3 Hrs
Prerequisite							

Instruction for Paper Setter:

1. There should be 11 questions in the end term examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 20 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 5 units as per the syllabus. Every unit shall have two questions each of 10 marks each. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain sub-parts / sub-questions.
4. Each Unit shall have a marks weightage of 14.
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives:

The students will try to learn:

1. The modern network architectures from a design and performance irrespective.
2. The basics and challenges of network communication.
3. Provide an opportunity to do network programming using TCP/IP.
4. The operation of the protocols that are used inside the Internet.

Course outcomes:

After Completion of this course students will be able to:

CO1. Acquire a thorough understanding of the state-of-the-art in modern network architecture, protocols, networked systems and applications
CO2. Understand proficient to develop software for modern networking devices
CO3. To have sufficient background knowledge to conduct networking research and develop innovative ideas.
CO4. Analyze Congestion Control Techniques LAN
CO5. Understand and Implement Protocols of Application Layers

Course Content:

Unit 1: Introduction

Fundamentals of Digital Communication, Network Classification, Protocol Architecture: Design Issues for the Layers, The TCP/IP Protocol Architecture, The ISO/OSI Model, Other protocols such as SNA, Appletalk, Netware etc.
Physical Layer: Data Transmission Concepts, Transmission Media, Signal Encoding Techniques, Digital Data Communication Techniques - Asynchronous and Synchronous Transmission, Error Detection, Error Correction, Multiplexing – FDM, TDM, ADSL, xDSL

Unit 2: Data Link Layer

Main Functions, Framing, Error Control, Flow Control, Error Correcting Codes, Error-Detecting Codes, Data Link Protocols: Stop-and-Wait Protocol, One-Bit Sliding Window Protocol, Go Back N, Selective Repeat, HDLC Queuing Models: Poisson Process, Markov Chain, M/M/1 Queue- delay and little's formula. M/M/S/K, Queues – average queue length, delay and waiting times. M/G/1 Queues
Medium Access Control Sublayer: Channel Allocation: Static, Dynamic, MAC PROTOCOLS – ALOHA, CSMA, Collision-Free Protocols, Limited-Contention Protocols, Detailed Study of Ethernet, 802.11 WIRELESS LANS

Unit 3: Network Layer

Functions, Design Issues, Internetworks: Principle, Protocols and Operations, IP Protocol: IPv4 Header, Addresses, Operation, Subnetting, Classless Interdomain Routing, Network Address Translation, Internet Control Protocol - ARP, RARP, BOOTP, DHCP, OSPF, BGP, IGMP; Problems of IPv4, IPv6, Routing Algorithms.

Unit 4: Congestion Control Techniques LAN

Topologies and Transmission Media, Protocol Architecture, Bridges, Switches WAN: Switched Communications Networks, ATM Communication
Transport Layer: Functions, Design Issues, TCP, UDP

Unit 5: Application Layer

Internet Applications: FTP, Telnet, DNS, HTTP, SMTP, SNMP Security in Computer Networks: Fundamentals of Network Security, Encryption, Cryptography, Securing E-mail, Securing TCP Connections: SSL
Network-Layer Security: IPsec, Securing Wireless LANs, Operational Security: Firewalls and Intrusion Detection Systems.

Text Books:

1. Andrew S. Tanenbaum, "Computer Networks", 5th Edition, Pearson Education

Reference Books

1. William Stallings, "Data and Computer Communication", 10th Edition, Pearson Education
2. James F. Kurose & Keith W. Ross, "Computer Networking: A Top –down approach", 6th Edition, Pearson Education
3. Behrouz A. Forouzan, "Data Communications and Networking", 5th Edition, McGraw-Hill Education.

ETCS210: Software Engineering							
B. Tech. CSE (AI/ML) Semester – IV							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	30
1.5	0	0	1.5		**External Examination**	**:**	70
Effective from Session:				w.e.f. 2023-2024	**Total**	**:**	100
Date of BoS approval:				24-06-2023	**Duration of Exam**	**:**	3 Hrs
Prerequisite							

Instruction for Paper Setter:

1. There should be 11 questions in the end term examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 20 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 5 units as per the syllabus. Every unit shall have two questions each of 10 marks each. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain sub-parts / sub-questions.
4. Each Unit shall have a marks weightage of 14.
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives

1. The aim of the course is to provide an understanding of the working knowledge of the techniques for estimation, design, testing and quality management of large software development projects.
2. Topics include process models, software requirements, software design, software testing, software process/product metrics, risk management, quality management and UML diagrams

Course Outcomes:

After Completion of this course students will be able to**:**

CO1. Understand the basic principles of Software engineering and its development processes.
CO2. Analyze the software requirement in terms of functional and non-functional
CO3. Create and apply appropriate software architectures and patterns to carry out high level design of a system and be able to critically compare alternative choices.
CO4. Evaluate and experience and/or awareness of testing problems and will be able to develop a simple testing report
CO5. Apply and evaluate the metrics for the assessment of the software quality

Course Contents:

UNIT – I: Introduction to Software Engineering

The evolving role of software, changing nature of software, Software myths. A Generic view of process: Software engineering- a layered technology, a process framework, the capability maturity model integration (CMMI), process patterns, process assessment, personal and team process models. Process models: The waterfall model, incremental process models, evolutionary process models, the unified process.

UNIT – II: Software Requirements

Functional and non-functional requirements, user requirements, system Requirements, interface specification, the software requirements document. Requirements engineering process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management. System models: Context models, behavioral models, data models, object models, structured methods.

UNIT – III: Design Engineering

Design process and design quality, design concepts, the design model. Creating an architectural design: software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modelling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.

UNIT – IV: Testing Strategies

A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging.
Product metrics: Software quality, metrics for analysis model, metrics for design model, metrics for source code, metrics for testing, metrics for maintenance.

UNIT – V: Metrics for Process and Products

Software measurement, metrics for software quality. Risk management: Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM, RMMM plan. Quality Management: Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.

Text Books:

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, Mc Graw Hill International Edition.
2. K. K. Aggarwal & Yogesh Singh, "Software Engineering", 2ndEd., New Age International,2005
3. Software Engineering- Sommerville, 7th edition, Pearson Education.
4. The unified modelling language user guide Grady Booch, James Rambaugh, Ivar Jacobson, Pearson Education.

Reference Books:

1. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiley.
2. Software Engineering principles and practice- Waman S Jawadekar, The Mc Graw-Hill Companies.
3. Fundamentals of object-oriented design using UML Meiler page-Jones: Pearson

ETHS212: Universal Human Values and Professional Ethics							
B. Tech. CSE (AI/ML) Semester – IV							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	30
1.5	0	0	1.5		**External Examination**	**:**	70
Effective from Session:				w.e.f. 2023-2024	**Total**	**:**	100
Date of BoS approval:				24-06-2023	**Duration of Exam**	**:**	3 Hrs
Prerequisite							

Instruction for Paper Setter:

1. There should be 11 questions in the end term examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 20 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 5 units as per the syllabus. Every unit shall have two questions each of 10 marks each. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain sub-parts / sub-questions.
4. Each Unit shall have a marks weightage of 14.
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objective:

The objective of this course is to introduce to planners' professional skills related to conflict resolution and negotiations, professional ethics, code of conduct and values.

1. To train the students for skills for professional engagement
2. To train the students for skills related to conflict resolution and negotiations, ethics and code of conduct, and values.

Course Outcome:

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

- **CO1.** Understand the role of Planner & leadership
- **CO2.** Understand and implement Decision Making & Professional Ethics
- **CO3.** Implement a good Communication
- **CO4.** Contract Documents and Project Formulation
- **CO5.** Understand conflicts and resolutions

Course Content:

Unit 1: Role of Planner & Leadership

Planner's input as professional at various levels and organizations, his role in decision making processes, relevant issues: generalists vs. specialists, professionals vs. technocrats, planner as decision maker vs. advisor to decision maker, relationship with client, developers, institutions and contractors; relationship with other experts such as engineers, architects, sociologists, economist, lawyers; functions as a leader, urban development manager, public bureaucrat, policy analyst and social reformer; approaches to study leadership — trait-approach, behavioral approach and situational approach; role of the planner in the decision making process; generalists vs. specialist

Aims and objectives of professional institutes, sister bodies; professional roles and responsibilities of planning consultants; professional ethics; responsibilities towards clients, fellow professionals and general public

Unit 2: Decision Making & Professional Ethics

Decision-making; definition, features, factors, essentials and hindrances in sound decision making; structure of decisions and types of decisions; decision makers and decision-making bodies related to urban and regional planning at national, state and local level. Canons of ethics; ethics of virtue; ethics of duty; ethics of responsibility; Work ethics; Professional ethics; Ethics in planning profession, research and education.

Unit 3: Communication

Importance of communications; elements, types, features and essentials of effective communications; hindrances to effective communication; theories of motivation; carrot and stick approach, need based theory, motivational system; integration versus disintegration; co-ordination and co-operation; centralization and decentralization; single versus plural supervision; elements and types of organization; theories of organization — scientific management theory, bureaucratic theory, classis theory, human relations theory; behavioral approach and systems approach

Unit 4: Contract Documents and Project Formulation

Scope of services for different projects like master plan for urban area, zonal / district plan, sector /Neighborhood; layout, group housing schemes, commercial centers, industrial estates; Consultancy agreements and safeguards; Fees and scales of professional charges, competitions and copyrights. Tenders, contracts, arbitration, schedule of rates for construction; Materials, labor and equipment for land development, unit and mode of measurements, rate analysis; Formulations of project proposals and outline; Preparation of and response to Notice Inviting Tenders, Expression of Interest, Terms of Reference, Penalty clauses.

Unit 5: Conflicts and Resolutions

Nature and mode of resolution of conflicts; public participation in planning as an aid to better understanding planning and implementation; political nature of planning and implementation problems in India; Case studies; examples from the other parts of the world highlighting situations where such problems have been minimized.

Textbook:

1. Frada Burstein, Clyde W. Holsapple, Handbook on Decision Support Systems 2, 2008, Springer
2. Harry Timmermans, Decision Support Systems in Urban Planning, 2011, E&FN Spon

References Books:

1. Peter Guy Northouse, Leadership: Theory and Practice, 2012, Sage Publications
2. Dr. B. L. Fadia, Indian Government and Politics, Sahitya Bhawan Publication

Semester 5

ETCS301: Theory of Computation							
B. Tech. CSE (AI/ML) Semester – IV							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	30
2	0	0	2		**External Examination**	**:**	70
Effective from Session:				w.e.f. 2023-2024	**Total**	**:**	100
Date of BoS approval:				24-06-2023	**Duration of Exam**	**:**	3 Hrs
Prerequisite							

Instruction for Paper Setter:

1. There should be 11 questions in the end term examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 20 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 5 units as per the syllabus. Every unit shall have two questions each of 10 marks each. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain sub-parts / sub-questions.
4. Each Unit shall have a marks weightage of 14.
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objective:

The students will try to learn:

1. To give an overview of the theoretical foundations of computer science from the perspective of formal languages
2. To illustrate finite state machines to solve problems in computing
3. To explain the hierarchy of problems arising in the computer sciences.
4. To familiarize Regular grammars, context frees grammar.

Course Outcome:

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

CO1. Demonstrate advanced knowledge of formal computation and its relationship to languages.
CO2. Distinguish different computing languages and classify their respective types.
CO3. Recognize and comprehend formal reasoning about languages.
CO4. Understand operation and application of Turing Machine
CO5. Apply the Recursive and recursively enumerable languages

Course Content:

Unit-I

Basic Computational Constructs: Finite State Systems, Basic Definitions Non-Deterministic finite automata (NDFA), Deterministic finite automata (DFA), Equivalence of DFA and NDFA Finite automata with E-moves, Regular Expressions, Equivalence of finite automata and Regular
Expressions, Regular expression conversion and vice versa. Conversion of NFA to DFA by Arden's Method Concept of basic Machine, Properties and limitations of FSM, Moore and Mealy Machines, Equivalence of Moore and Mealy machines.

Unit-II

Regular Sets& Grammars: The Pumping Lemma for Regular Sets, Applications of the pumping lemma, Closure properties of regular sets, Myhill-Nerode Theorem and minimization of finite Automata, Minimization Algorithm.
Context free and Context sensitive grammar, Ambiguity regular grammar, Reduced forms, Removal of useless Symbols and unit production, Chomsky Normal Form (CNF), Griebach Normal Form (GNF).

Unit-III

Pushdown Automata &Turing Machines: Introduction to Pushdown Machines, Applications of Pushdown Machines Deterministic and Non-Deterministic

Unit IV: Turing Machines

Definitions of Turing machines, Computable languages and functions, Techniques for Turing machine construction, Multi head and Multi tape Turing Machines, The Halting problem, Partial Solvability, Problems about Turing machine- Chomsky hierarchy of languages.

Unit-V

Unsolvable Problems and Computable Functions, Primitive recursive functions, Recursive and recursively enumerable languages, Universal Turing machine, Measuring and classifying complexity - Tractable and Intractable problems, Tractable and possibly intractable problems, P and NP completeness, Polynomial time reductions, NP-complete problems from other domains: graphs (clique, vertex cover, independent sets, Hamiltonian cycle), number problem (partition), set cover.

Text book:

1. Introduction to automata theory, language & computations- Hopcroaft & O. D. Ullman, R Mothwani, Addison Wesley Publishers

Reference books:

1. Theory of Computer Sc.(Automata, Languages and computation): K. L. P. Mishra & N. Chandrasekaran, 2000, PHI.
2. Introduction to formal Languages & Automata-Peter Linz, 2001, NarosaPubl.
3. Fundamentals of the Theory of Computation- Principles and Practice by Ramond Greenlaw and H. James Hoover, 1998, Harcourt India Pvt. Ltd.

ETCS303: Deep Learning							
B. Tech. CSE (AI/ML) Semester – V							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	30
1.5	0	0	1.5		**External Examination**	**:**	70
Effective from Session:				w.e.f. 2023-2024	**Total**	**:**	100
Date of BoS approval:				24-06-2023	**Duration of Exam**	**:**	3 Hrs
Prerequisite				**Machine Learning**			

Instruction for Paper Setter:

1. There should be 11 questions in the end term examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 20 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 5 units as per the syllabus. Every unit shall have two questions each of 10 marks each. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain sub-parts / sub-questions.
4. Each Unit shall have a marks weightage of 14.
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objective:

The objective of this course is to cover the fundamentals of neural networks as well as some advanced topics such as recurrent neural networks, long short term memory cells and convolutional neural networks. The course also requires students to implement programming assignments related to these topics.

Course Outcome:

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

CO1. Understand the fundamental principles of deep learning.
CO2. Analyse the deep learning algorithms for various types of learning tasks in various domains.
CO3. Apply deep learning algorithms and solve real-world problems
CO4. Evaluate the performance of different optimization techniques.
CO5. Analyse the uses of CNNS and RNN
CO6. Create an application using Deep Learning Models.

Course Content:

UNIT - I

Basics: Biological Neuron, Idea of computational units, McCulloch–Pitts unit and Thresholding logic, Linear Perceptron, Perceptron Learning Algorithm, Linear separability. Convergence theorem for Perceptron Learning Algorithm.
Feedforward Networks: Multilayer Perceptron, Gradient Descent, Backpropagation, Empirical Risk Minimization, regularization, autoencoders.

UNIT – II

Deep Neural Networks: Difficulty of training deep neural networks, Greedy layer wise training.
Better Training of Neural Networks: Newer optimization methods for neural networks (Adagrad, adadelta, rmsprop, adam, NAG), second order methods for training, Saddle point problem in neural networks, Regularization methods (dropout, drop connect, batch normalization).

UNIT - III

Recurrent Neural Networks: Back propagation through time, Long Short Term Memory, Gated Recurrent Units, Bidirectional LSTMs, Bidirectional RNNs
Convolutional Neural Networks: LeNet, AlexNet.

UNIT - IV

Generative models: Restrictive Boltzmann Machines (RBMs), Introduction to MCMC and Gibbs Sampling, gradient computations in RBMs, Deep Boltzmann Machines.
Recent trends: Variational Autoencoders, Generative Adversarial Networks, Multi-task Deep Learning, Multi-view Deep Learning

UNIT - V

Applications: Vision, NLP, Speech (just an overview of different applications in 2-3 lectures)

Textbooks

1. Deep Learning, Ian Goodfellow and Yoshua Bengio and Aaron Courville, MIT Press, 2016.

References Books:

1. Neural Networks: A Systematic Introduction, Raúl Rojas, 1996
2. Pattern Recognition and Machine Learning, Christopher Bishop, 2007

ETCS305: Optimization Technique							
B. Tech. CSE (AI/ML) Semester – V							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	30
2	0	0	2		**External Examination**	**:**	70
Effective from Session:				w.e.f. 2023-2024	**Total**	**:**	100
Date of BoS approval:				24-06-2023	**Duration of Exam**	**:**	3 Hrs
Prerequisite				**Machine Learning**			

Instruction for Paper Setter:

1. There should be 11 questions in the end term examination question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 20 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 5 units as per the syllabus. Every unit shall have two questions each of 10 marks each. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain sub-parts / sub-questions.
4. Each Unit shall have a marks weightage of 14.
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objective:

1. Operation research models using optimization techniques based upon the fundamentals of engineering mathematics (minimization and Maximization of objective function).
2. The problem formulation by using linear, dynamic programming, game theory and queuing models.
3. The stochastic models for discrete and continuous variables to control inventory and simulation of manufacturing models for the production decision making.
4. Formulation of mathematical models for quantitative analysis of managerial problems in industry.

Course Outcome:

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

CO1. Understand the overview of optimization techniques, concepts of design space, constraint surfaces and objective function.
CO2. Analyse differential calculus in finding the maxima and minima of functions of several variables.
CO3. Evaluate real-life problems with Linear Programming.
CO4. Apply the Linear Programming models using graphical and simplex methods.
CO5. apply real-life transportation, assignment and travelling salesman problems to find the optimum solution using transportation algorithms
CO6. Analyse the Queuing model for effective customer satisfaction
CO7. Apply dynamic programming to optimize multi stage decision problems.

Course Content:

UNIT - I

Introduction to Classical Optimization Techniques: Statement of an Optimization problem – design vector – design constraints – constraint surface – objective function – objective function surfaces – classification of Optimization problems.
Classical Optimization Techniques: Single variable Optimization, Multi variable Optimization with and without constraints, Multivariable Optimization with equality constraints - solution by method of Lagrange multipliers, Multivariable Optimization with inequality constraints - Kuhn – Tucker conditions.

UNIT – II

Linear Programming: Various definitions, statements of basic theorems and properties, Advantages, Limitations and Application areas of Linear Programming, Graphical method of Linear Programming problem.
Simplex Method : Phase I and Phase II of the Simplex Method, The Revised Simplex method, Primal and Dual Simplex Method, Big –M method.

UNIT - III

Transportation Problem: Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel's approximation method – testing for optimality of balanced transportation problems. (Including assignment and travelling salesman problems) (No degeneracy problems)
Queuing: Queuing Models : Essential features of queuing systems, operating characteristics of queuing system, probability distribution in queuing systems, classification of queuing models, solution of queuing M/M/1 : ¥ /FCFS,M/M/1 : N/FCFS, M/M/C : ¥/FCFS, M/M/C : N/FCFS.

UNIT - IV

Dynamic Programming: Dynamic programming multistage decision processes – types – concept of sub optimization and the principle of optimality – computational procedure in dynamic programming – examples illustrating the calculus method of solution - examples illustrating the tabular method of solution.
Integer Programming: Pure and mixed integer programming problems, Solution of Integer programming problems – Gomory's all integer cutting plane method and mixed integer method, branch and bound method, Zero-one programming.

UNIT - V

Simulation Modeling: Introduction, Definition and types, Limitations, Various phases of modeling, Monte Carlo method, Applications, advantages and limitations of simulation

Text Books:

1. Engineering optimization: Theory and practice"-by S.S.Rao, New Age International (P) Limited.
2. Operations Research: An Introduction" by H A Taha, 5th Edition, Macmillan, New York.
3. Operations Research by NVR Naidu, G Rajendra, T Krishna Rao, I K International Publishing house, New Delhi.

Reference Books:

1. Optimization Methods in Operations Research and systems Analysis" – by K.V. Mittal and C. Mohan, New Age, International (P) Limited, Publishers
2. Operations Research – by S.D.Sharma, Kedarnath Ramanath & Co
3. Linear programming, G. Hadley, Narosa Publishing House, New Delhi.
4. Industrial Engineering and Production Management, M. Mahajan, DhanpatRai & co

ETCS309: Natural Language Processing							
B. Tech. CSE (AI/ML) Semester – V							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	30
1.5	0	0	1.5		**External Examination**	**:**	70
Effective from Session:				w.e.f. 2023-2024	**Total**	**:**	100
Date of BoS approval:				24-05-2023	**Duration of Exam**	**:**	3 Hrs
Prerequisite				**Machine Learning**			

Instruction for Paper Setter:

1. There should be 11 questions in the end term examination question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 20 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 5 units as per the syllabus. Every unit shall have two questions each of 10 marks each. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain sub-parts / sub-questions.
4. Each Unit shall have a marks weightage of 14.
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objective:

The students should be able to study language and the tools that are available to efficiently study and analyse large collections of text. They should learn about and discuss the effects of electronic communication on our language.

Course Outcome:

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

CO1. Understand language and the tools that are available to efficiently study and analyse large collections of text.
CO2. Analyse and discuss the effects of electronic communication on our language
CO3. Analyse natural language processing with manual and automated approaches.
CO4. Apply computational frameworks for natural language processing.

Course Content:

UNIT I

A computational framework for natural language, description of English or an Indian language in the frame work, lexicon, algorithms and data structures for implementation of the framework, Finite state automata, the different analysis levels used for NLP (morphological, syntactic, semantic, pragmatic, Recursive and augmented transition networks. Applications like machine translations.

UNIT II

Word level and syntactic analysis Word Level Analysis: Regular Expressions, Finite-State Automata, Morphological Parsing, Spelling Error Detection and correction, Words and Word classes, Part-of Speech Tagging. Syntactic Analysis: Context-free Grammar, Constituency, Parsing-Probabilistic Parsing. Machine-readable dictionaries and lexical databases, RTN, ATN.

UNIT III

Semantic analysis: Meaning Representation, Lexical Semantics, Ambiguity, Word Sense Disambiguation. Discourse Processing: cohesion, Reference Resolution, Discourse Coherence and

Structure. Knowledge Representation, reasoning.

UNIT IV

Natural Language Generation (NLG): Architecture of NLG Systems, Generation Tasks and Representations, Application of NLG. Machine Translation: Problems in Machine Translation, Characteristics of Indian Languages, Machine Translation Approaches, Translation involving Indian Languages.

UNIT V

Information Retrieval: Design features of Information Retrieval Systems, Classical, Non-classical, Alternative Models of Information Retrieval, valuation Lexical Resources: World Net, Frame Net, Stemmer.

Text Books:

1. Natural Language understanding by James Allen, Pearson Education, 2002.
2. NLP: A Paninian Perspective by Akshar Bharati, Vineet Chaitanya, and Rajeev Sangal, Prentice Hall, 2016.

Suggested References:

3. Meaning and Grammar by G. Chirchia and S. McConnell Ginet, MIT Press, 1990.
4. An Introduction to Natural Language Processing, Computational Linguistics, and Speech
5. Recognition by Daniel Jurafsky and James H. Martin, Pearson Education, 2006.
6. Natural language processing in Prolog by Gazdar, & Mellish, Addison-Wesley
7. https://www.coursera.org/specializations/natural-language-processing

ETCS311: Web Technologies							
B. Tech. CSE (AI/ML) Semester – V							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	30
1.5	0	0	1.5		**External Examination**	**:**	70
Effective from Session:				w.e.f. 2023-2024	**Total**	**:**	100
Date of BoS approval:				24-06-2023	**Duration of Exam**	**:**	3 Hrs
Prerequisite				**Programming with C**			

Instruction for Paper Setter:

1. There should be 11 questions in the end term examination question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 20 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 5 units as per the syllabus. Every unit shall have two questions each of 10 marks each. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain sub-parts / sub-questions.
4. Each Unit shall have a marks weightage of 14.
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives:

The Students will try to learn:

- To create a fully functional website with mvc architecture.
- To develop an online retail store to sell items like amazon.com

Course Outcomes:

The course will enable the student to:

CO1. Design web pages using HTML, CSS and JavaScript and validate web pages at client-side.
CO2. Design and validate XML documents.
CO3. Access and Validate form data using JavaScript and PHP
CO4. Understand and apply server- side scripting.
CO5. Connect to the database using JSP and JDBC and perform various operations.
CO6. Connect to MySQL using PHP and perform various operations.
CO7. Develop a business application using STRUTS.

Course Content:

Unit – I: Introduction to Web Application and Hypertext Modelling

Introduction to web application, Basics of hypertext modeling, hypertext structure modeling concepts, access modeling concepts, relation to content modeling, presentation modeling, relation to hypertext modeling, customization modeling, relation to content, hypertext, and presentation modeling. Basics of HTML5 and web design, creating tables, HTML forms, styles and classes to your web pages, web page layouts with CSS, introduction to responsive web design with CSS3 and HTML5.

Unit– II: Build Interfaces using Bootstarp

Introduction to web design from an evolutionary perspective, user interface design through bootstrap, containers, tables, jumptrons, list, cards, carousal, navigation, modals, flex and forms, responsive web page design, basic UI grid structure.

Unit– III: Interactive User Interface and Web Application Development

JavaScript variable naming rules, data types, expressions and operators, pattern matching with regular expressions, managing web page styles using JavaScript and CSS, script forms, introduction to AJAX. Introduction to web design from an evolutionary perspective, create a native and web app, JSX, class and function components, props, state, lifecycle methods, and hooks.

Unit – IV: UI Binding Library for React

Introduction to client-side routing using React Router, global state management and transitions using REDUX, serverside rendering and testing using Jest, Enzyme and more. Web Development Using REACT is delivered both in a blended learning and self-paced mode.

Unit – V: Connect To an External API REDUX

Store using the official create store function, REDUX toolkit has a configure store API, loading state for that particular API, adding an API service as a middleware, example uses create REACT App.

Text Books:

1. HTML Black Book – Steve Holzner.
2. The complete Reference Java 2 Fifth Edition by Patrick Naughton and Herbert Schildt. TMH.
3. Java Server Pages –Hans Bergsten, SPD O'Reilly.
4. Programming world wide web-Sebesta, Pearson Education, 2007.
5. Internet and World Wide Web – How to program by Dietel and Nieto PHI/ Pearson Education Asia.

References Books:

6. Jakarta Struts Cookbook, Bill Siggelkow, S P D O' Reilly.
7. March's beginning JAVA JDK 5, Murach,SPD.
8. An Introduction to WEB Design and Programming –Wang-Thomson.
9. PHP: The Complete Reference Steven Holzner TataMcGraw-Hill.

ETCS351: Web Technologies Lab							
B. Tech. CSE (AI/ML) Semester-IV							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	70
0	0	2	2		**External Examination**	**:**	30
Effective from Session:				**w.e.f. 2023-2024**	**Total**	**:**	100
Date of BoS approval:				24-06-2023	**Duration of Exam**	**:**	
Prerequisite							

Course Objectives:

The Students will try to learn:

- To create a fully functional website with mvc architecture.
- To develop an online retail store to sell items like amazon.com

Course Outcomes:

The course will enable the student to:

CO1. Design web pages using HTML, CSS and JavaScript and validate web pages at client-side.
CO2. Design and validate XML documents.
CO3. Access and Validate form data using JavaScript and PHP
CO4. Understand and apply server- side scripting.
CO5. Connect to the database using JSP and JDBC and perform various operations.
CO6. Connect to MySQL using PHP and perform various operations.
CO7. Develop a business application using STRUTS.

Course Content:

1. Write a HTML program for the demonstration of Lists.
   a) Unordered List
   b) Ordered List
   c) Definition List
   d) Nested List
2. Design the following static web pages required for an online commercial retail website using frames:
   a) Home Page
   b) Registration Page
   c) Login Page
   d) Catalogue Page
   e) Shopping Cart Page
3. Write a HTML program for time-table using tables.
4. Write HTML for demonstration of cascading stylesheets:
   a) Embedded stylesheets
   b) External stylesheets
   c) Inline styles.
5. Design a web page using CSS which includes the following:
   a) Use different font and text styles
   b) Set a background image for both the page and single element on the page.
   c) Define styles for links
   d) Working with layers
   e) Adding a customized cursor
6. Write a JavaScript to validate the fields of the:

a) Login page
b) Registration page.

7. Write an XML file which will display the Book information which includes the following:
   a) Title of the book, Author Name, ISBN number, Publisher name, Edition and Price.
   b) Validate the above document using internal/external Document Type Definition (DTD) and XML Schema.
8. Write a simple servlet that reads parameters from the customer login page and displays a message.
9. Write a servlet for creating a cookie, retrieving it and for session tracking.
10. Write a servlet that connects to the database and retrieves the data and displays it.
11. Write a PHP program to validate the fields of the registration and login page from the customer website.
12. Write a JSP to connect to the database and extract data from the tables and display them to the user.
13. Design a JSP to insert the details of the users who register through the registration page and store the details into the database.
14. Write a PHP program to connect to a MySQL database which retrieves the data from the tables and displays them to the user.
15. Write a PHP program to insert the details entered by the user in the Registration form into MySQL database.

Text Books:

1. HTML Black Book – Steve Holzner.
2. The complete Reference Java 2 Fifth Edition by Patrick Naughton and Herbert Schildt. TMH.
3. Java Server Pages –Hans Bergsten, SPD O'Reilly.
4. Programming world wide web-Sebesta, Pearson Education, 2007.
5. Internet and World Wide Web – How to program by Dietel and Nieto PHI/ Pearson EducationAsia.

References Books:

1. Jakarta Struts Cookbook, Bill Siggelkow, S P D O' Reilly.
2. March's beginning JAVA JDK 5, Murach,SPD.
3. An Introduction to WEB Design and Programming –Wang-Thomson.
4. PHP: The Complete Reference Steven Holzner TataMcGraw-Hill

Semester 6

ETCS302- Advanced ML							
B. Tech. CSE (AI/ML) Semester – VI							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	30
1.5	0	0	1.		**External Examination**	**:**	70
Effective from Session:				w.e.f. 2023-2024	**Total**	**:**	100
Date of BoS approval:				24-06-2023	**Duration of Exam**	**:**	3 Hrs
Prerequisite							

Instruction for Paper Setter:

1. There should be 11 questions in the end term examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 20 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 5 units as per the syllabus. Every unit shall have two questions each of 10 marks each. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain sub-parts / sub-questions.
4. Each Unit shall have a marks weightage of 14.
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objective:

To introduce advanced concepts and methods of machine learning and to develop an understanding of the role of machine learning in massive scale automation. To design and implement various machine learning algorithms in a range of real-world applications.

Course Outcomes:

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

CO1. Understand advanced concepts and methods of machine learning and to develop an understanding of the role of machine learning in massive scale automation.
CO2. Apply various machine learning algorithms in a range of real-world applications.
CO3. Integrate and apply their expertise to produce solutions for real-world problems.
CO4. Interpret and Analyze results with reasoning using different ML techniques.
CO5. Apply Ensemble Methods

Course Contents:

Unit 1: Artificial Neural Network

Introduction to ANN, Perceptron, Cost Function, Gradient Checking, multi-layer perceptron and backpropagation algorithm that is used to help learn parameters for a neural network, Random Initialization

Unit II: Bayesian Learning

Probability theory and Bayes rule, Naive Bayes learning algorithm, Bayes nets.

Unit III: Decision Trees

Representing concepts as decision trees, Recursive induction of decision trees, best splitting attribute: entropy and information gain. Searching for simple trees and computational complexity, Overfitting, noisy data, and pruning.

Unit V: Reinforcement Learning

Reinforcement earning through feedback network, function approximation.

Unit V: Ensemble Methods

Bagging, boosting, stacking and learning with ensembles. Random Forest.

Text Book:

1. Tom Mitchell, Machine Learning, McGraw Hill, 1997.

Reference Books:

1. Jeeva Jose, Introduction to Machine Learning, Khanna Book Publishing 2020.
2. Rajiv Chopra, Machine Learning, Khanna Book Publishing 2021
3. Ethem Apaydin, Introduction to Machine Learning, 2e. The MIT Press, 2010.
4. Kevin P. Murphy, Machine Learning: a Probabilistic Perspective, The MIT Press, 2012.

ETCS352: Advanced ML Lab							
B. Tech. CSE (AI/ML) Semester-VI							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	70
0	0	2	2		**External Examination**	**:**	30
Effective from Session:				**w.e.f. 2023-2024**	**Total**	**:**	100
Date of BoS approval:				24-06-2023	**Duration of Exam**	**:**	
Prerequisite				**Machine Learning**			

Course Objective:

To introduce advanced concepts and methods of machine learning and to develop an understanding of the role of machine learning in massive scale automation. To design and implement various machine learning algorithms in a range of real-world applications.

Course Outcomes:

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

CO1. Understand advanced concepts and methods of machine learning and to develop an understanding of the role of machine learning in massive scale automation.
CO2. Apply various machine learning algorithms in a range of real-world applications.
CO3. Integrate and apply their expertise to produce solutions for real-world problems.
CO4. Interpret and Analyze results with reasoning using different ML techniques.

List of Experiments:

Implementation of following machine learning algorithms in various projects using Python:

1. Classification and regression algorithms.
2. K-Means Clustering.
3. Artificial Neural Network (with back-propagation).
4. Decision Trees.
5. Random Forest.

*****The experiments may be added at the time of implementing.

Text Book:

1. Tom Mitchell, Machine Learning, McGraw Hill, 1997.

Reference Books:

1. Jeeva Jose, Introduction to Machine Learning, Khanna Book Publishing 2020.
2. Rajiv Chopra, Machine Learning, Khanna Book Publishing 2021
3. Ethem Apaydin, Introduction to Machine Learning, 2e. The MIT Press, 2010.

ETCS304: Compiler Design							
B. Tech. CSE (AI/ML) Semester – VI							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	30
2	0	0	2		**External Examination**	**:**	70
Effective from Session:				w.e.f. 2023-2024	**Total**	**:**	100
Date of BoS approval:				24-06-2023	**Duration of Exam**	**:**	3 Hrs
Prerequisite				Theory of Computation			

Instruction for Paper Setter:

1. There should be 11 questions in the end term examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 20 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 5 units as per the syllabus. Every unit shall have two questions each of 10 marks each. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain sub-parts / sub-questions.
4. Each Unit shall have a marks weightage of 14.
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objective:

1. To teach concepts of language translation and phases of compiler design
2. To describe the common forms of parsers
3. To inculcate knowledge of parser by parsing LL parser and LR parser
4. To demonstrate intermediate code using technique of syntax directed translation
5. To Illustrate the various optimization techniques for designing various optimizing compilers

Course Outcome:

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

CO1. Understand the compiler construction tools and describes the Functionality of each stage of compilation process

CO2. Apply Grammars for Natural Languages and find the Syntactical Errors/Semantic errors during the compilations using parsing techniques

CO3. Analyse different representations of intermediate code.

CO4. Create new compiler for new languages.

CO5. Apply and evaluate code generation and code optimization techniques

Course Content:

UNIT - I

Introduction to compilers: Definition of compiler, interpreter and its differences, the phases of a compiler, role of lexical analyser, regular expressions, finite automata, from regular expressions to finite automata, pass and phases of translation, bootstrapping, LEX-lexical analyser generator.

Parsing: Parsing, role of parser, context free grammar, derivations, parse trees, ambiguity, elimination of left recursion, left factoring, eliminating ambiguity from dangling-else grammar, classes of parsing, top down parsing - backtracking, recursive descent parsing, predictive parsers, LL(1) grammars.

UNIT - II

Bottom up parsing: Definition of bottom up parsing, handles, handle pruning, stack implementation of shift-reduce parsing, conflicts during shift-reduce parsing, LR grammars, LR parsers-simple LR, canonical LR(CLR)

and Look Ahead LR (LALR) parsers, error recovery in parsing, parsing ambiguous grammars, YACC-automatic parser generator.

UNIT - III

Syntax directed translation: Syntax directed definition, construction of syntax trees, S-attributed and L-attributed definitions, translation schemes, emitting a translation.

Intermediate code generation: intermediate forms of source programs– abstract syntax tree, polish notation and three address code, types of three address statements and its implementation, syntax directed translation into three-address code, translation of simple statements, Boolean expressions and flow-of-control statements.

UNIT - IV

Type checking: Definition of type checking, type expressions, type systems, static and dynamic checking of types, specification of a simple type checker, equivalence of type expressions, type conversions, overloading of functions and operators.

Run time environments: Source language issues, Storage organization, storage-allocation strategies, access to non-local names, parameter passing, symbol tables and language facilities for dynamic storage allocation.

UNIT - V

Code optimization: Organization of code optimizer, basic blocks and flow graphs, optimization of basic blocks, the principal sources of optimization, the directed acyclic graph (DAG) representation of basic block, global data flow analysis.

Code generation: Machine dependent code generation, object code forms, the target machine, a simple code generator, register allocation and assignment, peephole optimization.

Text Books:

1. Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman (2007), Compilers Principles, Techniques and Tools, 2nd edition, Pearson Education, New Delhi, India.

Reference Books:

1. Alfred V. Aho, Jeffrey D. Ullman (2001), Principles of compiler design, Indian student edition,
2. Pearson Education, New Delhi, India.
3. Kenneth C. Louden (1997), Compiler Construction– Principles and Practice, 1st edition, PWS
4. Publishing.
5. K. L. P Mishra, N. Chandrashekaran (2003), Theory of computer science- Automata Languages
6. and computation, 2nd edition, Prentice Hall of India, New Delhi, India.
7. Andrew W. Appel (2004), Modern Compiler Implementation C, Cambridge University Press,
8. UK.

Semester 7

ETCS401- Soft Computing							
B. Tech. CSE (AI/ML) Semester – VII							
L	**T**	**P**	**Credits**	**Core Course**	**Internal Examination**	**:**	30
1.5	0	0	1.5		**External Examination**	**:**	70
Effective from Session:				w.e.f. 2023-2024	**Total**	**:**	100
Date of BoS approval:				24-06-2023	**Duration of Exam**	**:**	3 Hrs
Prerequisite							

Instruction for Paper Setter:

1. There should be 11 questions in the end term examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 20 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 5 units as per the syllabus. Every unit shall have two questions each of 10 marks each. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain sub-parts / sub-questions.
4. Each Unit shall have a marks weightage of 14.
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives:

The students will try to learn:

1. The fuzzy logic and reasoning for handling uncertainty in problem solving
2. Introduce the ideas of neural networks, fuzzy logic.
3. The basics of intelligence techniques and methodologies of soft computing
4. The design and analysis of problem-solving using concepts of neural networks, neuro modeling, several neural networks paradigms.

Course Outcomes:

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

CO1. Apply the importance of knowledge representation and processing in intelligent system
CO2. Understand the characteristics and constitutes of soft computing for decision making systems.
CO3. Apply the models of artificial neural systems for classification problems.
CO4. Apply the learning rules and its working principle for computer vision and image processing applications.
CO5. Apply the importance of auto and hetero associative memories for distinct cases of neural network systems.

Course Contents:

UNIT-1: Introduction to Neural Networks

Introduction: Fundamental concept, evolution of neural networks, models of artificial neural networks, important technologies, applications, McCulloch, Pitts Neuron, linear separability, Hebb network; Supervised learning network: Perception networks, adaptive linear neuron, multiple adaptive linear neurons, back propagation network, radial basis function network.

UNIT-2: Associative Memory and Unsupervised Learning Networks & Fuzzy Logic

Associative memory networks: Training algorithms for pattern association, auto associative memory network, hetero associative memory network, bidirectional associative memory, Hopfield networks, iterative auto associative memory network, temporal associative memory network; Unsupervised learning networks: Kohonen self-organizing feature maps, learning vector quantization, counter propagation networks, adaptive resonance theory network. Fuzzy logic: Introduction to classical/crisp sets and fuzzy sets, classical/crisp relations and fuzzy relations, tolerance and equivalence relations, non-iterative fuzzysets. Membership functions: Fuzzification, methods of membership value assignments, defuzzification, and Lambda cuts for fuzzy sets and fuzzy relations, defuzzification methods.

UNIT-3: Neural Networks

Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks: Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance architectures, Advances in Neural networks

UNIT-4: Genetic Algorithms

Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning: Machine Learning Approach to Knowledge Acquisition

UNIT-5: Matlab/Python Lib

Introduction to Matlab/Python, Arrays and array operations, Functions and Files, Study of neural network toolbox and fuzzy logic toolbox, Simple implementation of Artificial Neural Network and Fuzzy Logic
Recent Trends in deep learning, various classifiers, neural networks and genetic algorithm, Implementation of recently proposed soft computing techniques

Text Books:

1. Jyh: Shing Roger Jang, Chuen: Tsai Sun, Eiji Mizutani, Neuro: Fuzzy and Soft Computing, Prentice: Hall of India, 2003.
2. J.S.R .Jang, C. T. Sun, E. Mizutani, Neuro, “Fuzzy and Soft Computing”, PHI, Pearson Education, 1st Edition, 2004.
3. S. N. Sivanandan, S. N. Deepa, “Principles of Soft Computing”, Wiley India, 2nd Edition, 2007.

Reference Books:

1. George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic:Theory and Applications, Prentice Hall, 1995.
2. MATLAB Toolkit Manual
3. 1. S. Rajasekaran, G.A.V.Pai,“Neural Networks, Fuzzy Logic and Genetic Algorithms”, PHI, 1st Edition,2003.
4. Timothy J. Ross, “Fuzzy Logic with Engineering Applications”, McGraw Hill, 3rd Edition, 1997.
5. Stamatios V. Kartalopoulos “Understanding Neural Networks and Fuzzy Logic Basic Concepts and Applications”, IEEE Press, PHI, New Delhi, 2004.