Chaudhary Ranbir Singh University, Jind

Scheme of Examination for Under Graduate Programme

Bachelor of Technology (Computer Science - Artificial Intelligence and Machine Learning)

Semester	Course Code	Nomenclature of course	Credits		Contact hours per week L: Lecture P: Practical T: Tutorial				Internal Assessment Marks	External Examination Marks	Total Marks	Min Pass Marks
			Course	Sem. Total	L	T	P	Contact Hours				
2	24-BTHS-201	Design Thinking	1	27	0	0	2	2	25	0	25	10
	24-BTBS-201	Mathematics - II	4		3	1	0	4	20	80	100	40
	24-BTBS-202	Chemistry	4		3	0	2	5	20	80	100	40
	24-BTES-201	Problem Solving and Programming	4		3	0	2	5	20	80	100	40
	24-BTES-202	Modern Computer Architecture	3		3	0	0	3	15	60	75	30
	24-BTCS-201	Discrete Mathematical Structures	4		3	1	0	4	20	80	100	40
	24-BTCS-202	Software Engineering	4		3	0	2	4	20	80	100	40

In addition to above said courses, student need to undergo mandatory induction programme as per AICTE norms.

Chaudhary Ranbir Singh University

(Established by the Haryana State Legislature Act 28 of 2014)
(Recognised u/s 2(f) and 12(B) of UGC Act, 1956)

Syllabus
for

Under Graduate Programme

Bachelor of Technology (Artificial Intelligence and Machine Learning)
(B.Tech. (AI&ML))

with effect from the session 2024-25 (in phased manner)

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
FACULTY OF PHYSICAL SCIENCES

CHAUDHARY RANBIR SINGH UNIVERSITY
JIND – HARYANA – INDIA - 126102

With effect from the Session: 2024-25	
Part A - Introduction	
Name of the Programme	B.Tech. (Computer Science – AI & ML)
Semester	2nd
Name of the Course	Design Thinking
Course Code	24-BTHS-101
Course Type	Humanities and Social Science
Course Objectives	The objective of this Course is to provide the new ways of creative thinking and Learn the innovation cycle of Design Thinking process for developing innovative products which useful for a student in preparing for an engineering career.
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1. Compare and classify the various learning styles and memory techniques and Apply them in their engineering education. CLO-2 Analyze emotional experience and Inspect emotional expressions to better understand users while designing innovative products. CLO-3 Develop new ways of creative thinking and Learn the innovation cycle of Design Thinking process for developing innovative products. CLO-4 Propose real-time innovative engineering product designs and Choose appropriate frameworks, strategies, techniques during prototype development. CLO-5 Perceive individual differences and its impact on everyday decisions and further Create a better customer experience
Max. Marks	**Pr. 25**
Internal Assessment Max Marks	Pr. 25
End Term Exam Max Marks	Pr. 0
Internal Min Pass Marks	Pr. 10
External Min Pass Marks	Pr. 0
Examination Time	**Pr. 3 Hrs**

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics
I	An Insight to Learning Understanding the Learning Process, Kolb's Learning Styles, Assessing and Interpreting Remembering Memory: Understanding the Memory process, Problems in retention, Memory enhancement techniques Emotions: Experience & Expression Understanding Emotions: Experience & Expression, Assessing Empathy, Application with Peers
II	Basics of Design Thinking: Definition of Design Thinking, Need for Design Thinking, Objective of Design Thinking, Concepts & Brainstorming, Stages of Design Thinking Process (explain with examples) – Empathize, Define, Ideate, Prototype, Test Being Ingenious & Fixing Problem: Understanding Creative thinking process, Understanding Problem Solving, Testing Creative Problem Solving

	Prototyping & Testing: What is Prototype? Why Prototype? Rapid Prototype Development process, Testing, Sample Example, Test Group Marketing Celebrating the Difference: Understanding Individual differences & Uniqueness, Group Discussion and Activities to encourage the understanding, acceptance and appreciation of Individual differences
IV	Design Thinking & Customer Centricity: Practical Examples of Customer Challenges, Use of Design Thinking to Enhance Customer Experience, Parameters of Product experience, Alignment of Customer Expectations with Product Design Feedback, Re-Design & Re-Create Feedback loop, Focus on User Experience, Address "ergonomic challenges, User focused design, rapid prototyping & testing, final product, Final Presentation – "Solving Practical Engineering Problem through Innovative Product Design & Creative Solution".

Part C-Learning Resources

Reference Books:

1) Experiential Learning , David A. Colb, Prentice Hall, 2013
2) Why we Remember, Charan Rangnathan, Random House, 2024
3) Design Your Thinking, Pavan Soni, 2020
4) Design Thinking, E Balagurusamy, McGraw Hill, 2024
5) Master Your Thinking, Thibaut Meurisse, Wisdom Tree, 2022
6) Rapid Prototyping, Chua Chee Kai, World Scientific Publishing Co., 3rd Edition
7) Innovative Engineering Product Design, Diana Starovoytova, LAP Lambert, 2019

	Part A - Introduction	
Name of the Programme	B.Tech. (Computer Science – AI & ML)	
Semester	2nd	
Name of the Course	Mathematics - II	
Course Code	24-BTBS-201	
Course Type	Basic Science	
Course Objectives	To make the students understand the behaviour of various series. They should also be able to calculate probabilities and statistics of different datasets.	
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1. Understand the behavior of series and their applications. CLO-2. Understand number system and its applications. CLO-3. Understand the concept of probability and apply in real life. CLO-4. Understand and apply the concept of statistics.	
Max. Marks	**Th. 75**	**Pr. 25**
Internal Assessment Max Marks	Th. 15	Pr. 5
End Term Exam Max Marks	Th. 60	Pr. 20
Internal Min Pass Marks	Th. 6	Pr. 2
External Min Pass Marks	Th. 24	Pr. 8
Examination Time	**Th. 3 Hrs**	**Pr. 3 Hrs**

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics
I	Sequences and Series Limit of a sequence, monotone and Cauchy sequences and properties of convergent sequences, examples. Infinite series, positive series, tests for convergence and divergence, integral test, alternating series, Leibnitz test.
II	Functional Series Pointwise and uniform convergence, basic aspects of Power series, Fourier series Math Foundation Statements, Quantifiers, Operation on sets and functions, Relations, Proofs.
III	Number System Countability of algebraic numbers, Transcendental numbers and construction of Liouville's number, Equivalence classes, construction of real numbers (using Cauchy sequences), Fermat's little theorem and using it for Miller-Rabin primality test, Wilson's theorem and Primitive root theorem.
IV	Probability Sample space and events, definitions of probability, properties of probability, conditional probability. Random variables: distribution functions, discrete and continuous random variables, moments of random variables, conditional expectation, Chebyshev inequality, functions of random variables. Special Distributions: Bernoulli, Binomial, Geometric, Pascal, Poisson, Exponential, Uniform, Normal distributions, Limit Theorems: Law of large numbers

Part C-Learning Resources

Reference Books:

1) Probability and statistics for Engineers and Scientists, Walpole, Myers, Myers and Ye, Pearson Education, 2012
2) Advanced Engineering Mathematics, Reena Garg, Khanna Book Publishing Co., Delhi.
3) Advanced Engineering Mathematics, Wylie and Barrett, McGraw Hill, 1995
4) Advanced Engineering Mathematics, M.D. Greenberg, Pearson Education Asia, 2002

Part A - Introduction	
Name of the Programme	B.Tech. (Computer Science – AI & ML)
Semester	2nd
Name of the Course	Chemistry
Course Code	24-BTBS-202
Course Type	Basic Science
Course Objectives	This course will help the students to familiarize with Atomic and Molecular Structure, Intermolecular Forces and Potential Energy Surfaces, Periodic Properties, Stereochemistry concepts.
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1. Understand latest developments in certain areas of Chemistry which have important applications for societal needs. CLO-2 Understand Potential Energy Surfaces and Stereochemistry which have important applications for societal needs. CLO-3 Understand latest developments in certain areas of Chemistry which have important applications for societal needs. CLO-4 Develop capability to tackle problems in general and in the various areas covered in the course.

Max. Marks	**Th. 75**	**Pr. 25**
Internal Assessment Max Marks	Th. 15	Pr. 5
End Term Exam Max Marks	Th. 60	Pr. 20
Internal Min Pass Marks	Th. 6	Pr. 2
External Min Pass Marks	Th. 24	Pr. 8
Examination Time	**Th. 3 Hrs**	**Pr. 3 Hrs**

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics
I	Atomic and Molecular Structure Schrodinger equation. Particle in a box solutions and their applications for conjugated molecules and nanoparticles. Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations. Molecular orbitals of diatomic molecules and plots of the multicentre orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.
II	Intermolecular forces and potential energy surfaces Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H3, H2F and HCN and trajectories on these surfaces.
III	Periodic properties Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries.

tereochemistry Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds.

Laboratory/ Practicals:

1. To determine the optical rotation of optically active compounds using polarimetry.
2. To determine the strength of a given acid/ base using a titration method.
3. To prepare tetraamminecopper (II) sulphate monohydrate.
4. To prepare the solution of various concentrations.
5. Explore the molecular orbitals of simple diatomic molecules (e.g., O_2, N_2) and visualize bonding and antibonding orbitals using molecular modeling software (like Avogadro or Chem3D
6. Study the effect of ligands on the d-orbitals of transition metals and observe color changes using a spectrophotometer.
7. Identifying and constructing chiral molecules and stereoisomers using molecular model kits.

Part C-Learning Resources

Reference Books:

1) University Chemistry, by B. H. Mahan
2) Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
3) Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan

Part A - Introduction	
of the Programme	B.Tech. (Computer Science – AI & ML)
ster	2nd
Name of the Course	Problem Solving and Programming
Course Code	24-BTES-201
Course Type	Engineering Science
Course Objectives	To develop logical skills and basic technical skills so that students should be able to solve basic computing problems. The students should be able to learn the basic of any computer programming language.
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1. Understand real world problems and developing computer solutions for those. CLO-2. Understand the basics of programming languages. CLO-3. Apply C for basic programming solutions CLO-4. Create algorithms using learnt programming skills

Max. Marks	**Th. 75**	**Pr. 25**
Internal Assessment Max Marks	Th. 15	Pr. 5
End Term Exam Max Marks	Th. 60	Pr. 20
Internal Min Pass Marks	Th. 6	Pr. 2
External Min Pass Marks	Th. 24	Pr. 8
Examination Time	**Th. 3 Hrs**	**Pr. 3 Hrs**

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics
I	Introduction to Programming Evolution of languages: Machine languages, Assembly languages, High-level languages. Software requirements for programming: System Softwares like operating system, compiler, linker, loader; Application programs like editor. Algorithm, specification of algorithm. Flowcharts. Different types of Data types, Expressions, Precedence Rules, Operators-Operators: arithmetic operators, relational operators, logical operations, bitwise operators, miscellaneous operators, Local Variables, Global Variables, List, String.
II	If-else statement, For loop, While Loop, Nested Iteration, Concept and use of arrays, declaration and usage of arrays, 2-dimensional arrays, different types of user defined data types
III	Advantage of modularizing program into functions, function definition and function invocation. Positional Parameter Passing, Passing arrays to functions, Recursion, Library functions.
IV	Concepts of files and basic file operations, Writing/ Reading Data to/from a File, Memory Management Operations

Laboratory/ Practicals:

1. Write a program that asks the user for their name and greets them with their name.
2. Write a program that asks the user for a number n and gives them the possibility to choose between computing the sum and computing the product of 1,…,n.
3. Write a function that checks whether an element occurs in a list.
4. Write three functions that compute the sum of the numbers in a list: using a for-loop, a while-loop and recursion.
5. Given two strings, write a program that efficiently finds the longest common subsequence.

Part C-Learning Resources

Reference Books:

1) Programming for Problem Solving, R.S. Salaria, Khanna Book Publishing Co., 2021
2) Let Us C, Yashvant Kanetkar, BPB Publications, 19th Edition
3) ANSI C Programming, Gary J Bronson, Cengage Publiction, 2016.
4) C Programming Language, Brian W. Kernighan, Dennis M. Ritchi, Prentice Hall, 1988

Part A - Introduction	
of the Programme	B.Tech. (Computer Science – AI & ML)
ter	2nd
Name of the Course	Modern Computer Architecture
Course Code	24-BTES-202
Course Type	Engineering Science
Course Objectives	Students should be able to understand basic principles of Computer Systems. They should be able to understand various logic design techniques and their applications. They should be capable of using high performance computing architecture.
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1. Understand the organization of the Control unit, Arithmetic and Logical unit, Memory unit and the I/O unit. CLO-2. Analyse different computer architectures and their applications. CLO-3. Understand modern design structures of Pipelined and Multiprocessors systems. CLO-4. Understand distributed computing architecture and high-performance computing.
Max. Marks	**Th. 75**
Internal Assessment Max Marks	Th. 15
End Term Exam Max Marks	Th. 60
Internal Min Pass Marks	Th. 6
External Min Pass Marks	Th. 24
Examination Time	**Th. 3 Hrs**

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics
I	Designing combinational and sequential logic, computers registers and instructions, timing, and control, instructions cycle, memory reference instruction, I/O interruption, Adder and Subtractor circuits, Booth Multiplication Algorithm, Pipelining Review, control hazards and the motivation for caches, cache characteristics and basic superscalar architecture basics.
II	Memory technologies, hierarchical memory systems, the locality principle and caching, direct mapped caches, block size, cache conflicts, associative caches, write strategies, advanced optimisations, performance improvement techniques, DRAM – organisation, access techniques, scheduling algorithms and signal systems. Tiled Chip Multicore Processors (TCMP), Network on Chips (NoC), NoC router – architecture, design, routing algorithms and flow control techniques, Advanced topics in NoC and storage – compression, prefetching, QoS.
III	Relation to Parallel Multiprocessors/multicomputer Systems, Distributed and Concurrent Programs, Message Passing vs. Shared Memory Systems, Synchronous vs. Asynchronous Executions, Design Issues and Challenges, Distributed Computing Technologies, Clocks and Synchronization, Coordination and Agreement Algorithms, Global State and Distributed Transactions.

High Performance Computing (HPC): HPC Architecture, Parallel Processing, Parallel Memory Models, Data vs. Task Parallelism, High Throughput Computing, Vectorization, Multithreading.
CUDA programming model, Basic principles of CUDA programming, Concepts of threads and blocks, GPU and CPU data exchange

Part C-Learning Resources

Reference Books:

1) M. Morris Mano, Computer System & Architecture, Prentice Hall of India, 2002.
2) John L. Hennessy and David A Patterson, Computer Architecture-A quantitative approach, Morgan Kaufmann/ Elsevier, 4th Edition, 2007.
3) Hayes. J.P, Computer architecture and organization by McGraw-Hill Companies, 1998
4) Parallel Computer Architecture: A Hardware/Software Approach David Culler and J.P. Singh with Anoop Gupta, Morgan Kaufmann, 1998.

Part A - Introduction	
Name of the Programme	B.Tech. (Computer Science – AI & ML)
Semester	2nd
Name of the Course	Discrete Mathematical Structures
Course Code	24-BTCS-201
Course Type	Computer Science
Course Objectives	Students should be able to understand Discrete Mathematical Structures (DMS) for the development of theoretical computer science, problem solving in programming language using Discrete Structure and importance of discrete structures towards simulation of a problem in computer science and engineering.
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1. Understand the basics of various discrete structures. CLO-2. Apply applications of discrete structures in Computer Science and Engineering.
Max. Marks	**Th. 100**
Internal Assessment Max Marks	Th. 20
End Term Exam Max Marks	Th. 80
Internal Min Pass Marks	Th. 8
External Min Pass Marks	Th. 32
Examination Time	**Th. 3 Hrs**

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics
I	Mathematical reasoning, Propositions, Negation, disjunction and conjunction, Implication and Equivalence, Truth tables, Predicates, Quantifiers, Natural deduction, Rules of Inference, Methods of proofs, Resolution principle
II	Paradoxes in set theory, Inductive definition of sets and proof by induction, Peano postulates, Relations, Properties of relations, Equivalence Relations and partitions, Partial orderings, Posets, Linear and well-ordered sets. Hasse Diagram and Lattice
III	Elementary Combinatorics, counting techniques, Recurrence relation, Generating functions, Functions; mappings, Injection and Surjections, Composition of functions, Inverse functions, Special functions, Pigeonhole principle, Recursive function theory.
IV	Elements of graph theory, Euler graph, Hamiltonian path, trees, Tree traversals, Spanning trees, Representation of relations by graphs. Definition and elementary properties of groups, Semigroups, Monoids, Rings, Fields, Vector spaces and lattices

Part C-Learning Resources

Reference Books:

1) Discrete Mathematics and applications, K. H. Rosen, 6th Edition, Tata McGraw Hill 2007.
2) Discrete Structures, S.B. Singh, 3rd Edition, Khanna Book Publishing, 2019.
3) Combinatorics and Graph Theory,S.B. Singh, 3rd Edition, Khanna Book Publishing, 2018.
4) Elements of Discrete Mathematics, C. L. Liu, 2nd Edn., Tata McGraw-Hill 2000.
5) Discrete Mathematics for Computer Scientists and Mathematicians, J .L. Mott, A. Kandel, T.P .Baker, Second edition, Prentice Hall of India 1986.

Part A - Introduction	
Name of the Programme	B.Tech. (Computer Science – AI & ML)
Semester	2nd
Name of the Course	Software Engineering
Course Code	24-BTCS-202
Course Type	Computer Science
Course Objectives	Students should learn the concept and importance of Software Engineering. They should be able to construct software that is reasonably easy to understand, modify, maintain and reliable. They should learn strengths and weaknesses of various Software Engineering Techniques used in industrial applications.
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1. Understand the process of designing, creating and maintaining software. CLO-2. Create softwares for various application domains. CLO-3. Understand the challenges of large scale software development. CLO-4. Understand the importance of software design and development practices.
Max. Marks	**Th. 100**
Internal Assessment Max Marks	Th. 20
End Term Exam Max Marks	Th. 80
Internal Min Pass Marks	Th. 8
External Min Pass Marks	Th. 32
Examination Time	**Th. 3 Hrs**

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics
I	Software, Software Engineering, Myths, Software Process, Work Products, Importance of Software Engineering, Standard for Software Process, Waterfall Model, Prototyping Model, Iterative Enhancement Model, Spiral Model, RAD model, 4th Generation models, Formal Methods, Agile Development Software Requirements, Types of Requirements, Requirement Engineering Cycle, Requirements Specification document, Characteristics of Requirements, Requirement verification and validation
II	Role of Management in Software Development, Project Estimation Techniques, Staffing, Scheduling, Earned Value Analysis, Software Risks, Software Configuration Management, Software Process and Project metrics. Process, Data and Behavioural Modelling, Design Concepts, Modularity, Architectural design, Coupling and Cohesion, Top-down and bottom-up design, Object-oriented Analysis, Function oriented and Object-Oriented Design approach, Software Design Document, Coding styles and documentation,
III	Testing principles, testing strategies, Black-box and White-box Testing Techniques, Levels of testing -unit, integration, system, regression, Test Plan, Test Cases Specification, Software debugging, Software Maintenance, Software Quality Assurance (SQA), SQA tasks, Software amplification and removal, Formal Technical Reviews, Software Quality Factors, ISO 9126, SEI CMM, CMMI, Software Reliability. Software Availability.

Computer Aided Software Engineering (CASE) and its Scope, CASE support in Software Life Cycle, Architecture of CASE Environment, Upper CASE and Lower CASE, Exposure to CASE tools. Software Process Improvement, Component Based Software Engineering, Web Engineering, Reverse Engineering, Software Engineering challenges of Big Data, Mobile Applications.

Part C-Learning Resources

Reference Books:

1) Software Engineering-A Practitioners Approach, By R. Pressman, McGraw Hill International edition, 2004
2) Software Engineering, N.S. Gill, Khanna Publishing Co., Delhi 2018.
3) Software Engineering, Ian Sommerville, Addison-Wesley, 2010
4) An Integrated Approach to Software Engineering, Pankaj Jalote, Narosa, 2014
5) Fundamentals of Software Engineering, By Rajib Mall, PHI Learning Pvt. Ltd, 2014
6) Software Engineering (3rd ed.), By K.K Aggarwal & Yogesh Singh, New Age International Publishers, 2007

With effect from the Session: 2024-25		
Part A - Introduction		
Name of the Programme	B.Tech. (Computer Science – AI & ML)	
Semester	1st	
Name of the Course	Communication Skills	
Course Code	24-BTHS-101	
Course Type	Humanities and Social Science	
Course Objectives	The main aim of the course is to build competence in English grammar and vocabulary and to enhance effective communication by developing Reading, Writing, Listening and Speaking skills of students.	
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1. Understand various technical writing skills. CLO-2 Apply the technical writing and communication skills in their academic and professional life. CLO-3 Gain self-confidence with improved command over English. CLO-4 Understand the technical aspects of communication for better performance in extracurricular activities, recruitment process and prospective jobs.	
Max. Marks	**Th. 75**	**Pr. 25**
Internal Assessment Max Marks	Th. 15	Pr. 5
End Term Exam Max Marks	Th. 60	Pr. 20
Internal Min Pass Marks	Th. 6	Pr. 2
External Min Pass Marks	Th. 24	Pr. 8
Examination Time	**Th. 3 Hrs**	**Pr. 3 Hrs**

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics
I	Scope and Significance of Communication Skills, Listening, Speaking, Reading and Writing, Technical Communication, Tools of Effective Communication.
II	Basics of Grammar – Placing of Subject and Verb, Parts of Speech, Uses of Tenses, Active Passive, Narration. Word Formation & Synonyms, Antonyms, Words Often Confused, One-Word Substitutes, Idioms and Phrasal Verbs, Abbreviations of Scientific and Technical Words.
III	Introduction to Phonetic Sounds & Articulation, Word Accent, Rhythm and Intonation, Interpersonal Communication, Oral Presentation, Body Language and Voice Modulation (Para linguistics and Non- Verbal), Negotiation and Persuasion, Group Discussion, Interview Techniques (Telephonic and Video Conferencing).
IV	Job Application, CV Writing, Business Letters, Memos, Minutes, Notices, Report Writing & Structure, E-mail Etiquette, Blog Writing.

Part A - Introduction	
Name of the Programme	B.Tech. (Computer Science – AI & ML)
Semester	1st
Name of the Course	Mathematics - I
Course Code	24-BTBS-101
Course Type	Basic Science
Course Objectives	To make the students well versed with the concepts of linear algebra. The students should also be able to solve calculus and vector calculus-based problems.
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1. Understand basic algebra CLO-2. Understand and apply calculus CLO-3. Understand and apply vector calculus CLO-4. Understand and apply differential equations CLO-5. Understand and apply multivariate calculus

Max. Marks	**Th. 100**
Internal Assessment Max Marks	Th. 20
End Term Exam Max Marks	Th. 80
Internal Min Pass Marks	Th. 8
External Min Pass Marks	Th. 32
Examination Time	**Th. 3 Hrs**

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics
I	Linear Algebra Vector spaces, Subspaces, basis and dimension, linear transformations, representation of transformations by Matrices, linear functionals, transpose of linear transformations, canonical forms. Linear functionals and adjoints, Bilinear forms, symmetric bilinear forms, skew symmetric bilinear forms
II	Calculus Continuity and differentiability of a function of single variable, statement of Rolle's Theorem, Lagrange's mean value theorem and applications. Double and Triple Integrals: Calculations, Areas, Volumes, change of variables
III	Differential Equations Ordinary Differential Equations: First order linear equations, Bernoulli's equations, Exact equations and integrating factor, Second order and Higher order linear differential equations with constant coefficients
IV	Multivariate Calculus Integral Calculus: Definite Integrals as a limit of sums, Applications of integration to area, volume, surface area, Improper integrals. Functions of several variables: Continuity and differentiability, mixed partial derivatives, local maxima and minima for function of two variables, Lagrange multipliers.

Part C-Learning Resources

Part A - Introduction	
Name of the Programme	B.Tech. (Computer Science – AI & ML)
Semester	1st
Name of the Course	Physics
Course Code	24-BTBS-102
Course Type	Basic Science
Course Objectives	This course will help the students to familiarize with Ultrasonics, SHM, Oscillations, Wave motion, diffraction, polarization, laser, fiber optics and holography concepts.
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1. Understand latest developments in certain areas of Physics which have important applications for societal needs. CLO - 2Understand lasers and fibre optics which have important applications for societal needs. CLO - 3. Understand latest developments in certain areas of Physics which have important applications for societal needs. CLO - 4. Develop capability to tackle problems in general and in the various areas covered in the course.

Max. Marks	**Th. 75**	**Pr. 25**
Internal Assessment Max Marks	Th. 15	Pr. 5
End Term Exam Max Marks	Th. 60	Pr. 20
Internal Min Pass Marks	Th. 6	Pr. 2
External Min Pass Marks	Th. 24	Pr. 8
Examination Time	**Th. 3 Hrs**	**Pr. 3 Hrs**

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics
I	Ultrasonics & SHM Production, detection and uses of ultrasonics, reverberation, Sabine's formula (no derivation), Review of basic kinematics (displacement, velocity, acceleration, time period and phase of vibration) and dynamics (restoring force and energetics) of simple harmonic motion, differential equation of SHM, superposition of two SHM in one dimension, charge oscillations in LC circuits
II	Wave Motion and interference Wave equation and its solution, characteristic impedance of a string, reflection and transmission of waves on a string at a boundary, reflection and transmission of energy, the matching of impedances, Division of wave front and amplitude; Fresnel's biprism, Newton's rings, Michelson interferometer and its applications for determination of λ and $d\lambda$.
III	Diffraction & Polarization Fresnel and Fraunhofer diffraction, qualitative changes in diffraction pattern on moving from single slit to double slit, plane transmission grating, dispersive power & resolving power of a grating, Methods of polarization, analysis of polarized light, quarter and half wave plates, double refraction.

Part A - Introduction	
e of the Programme	B.Tech. (Computer Science – AI & ML)
emester	1st
Name of the Course	Mathematical Concepts for AI
Course Code	24-BTES-101
Course Type	Engineering Science
Course Objectives	This course should help the students understand the basic mathematical background of AI. Also, the students should be able to apply statistics and probability to analyse various datasets.
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1. To understand the mathematical background of AI. CLO-2. Use statistical methods to analyze and collect data. CLO-3. Use probability and statistics to analyze data CLO-4. Use and apply hypothesis testing on different datasets
Max. Marks	**Th. 100**
Internal Assessment Max Marks	Th. 20
End Term Exam Max Marks	Th. 80
Internal Min Pass Marks	Th. 8
External Min Pass Marks	Th. 32
Examination Time	**Th. 3 Hrs**

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics
I	Equations. Functions and Graphs Introduction to linear equations, Intercepts and slopes, System of equations, Exponentials, radicals and logarithms, Polynomials, Polynomial operations, Factorizations, Introduction to quadratic equations, Functions
II	Vectors and Matrices Introduction to vectors, Vector addition, vector multiplication, Introduction to matrices, matric multiplication, properties of matrices, types of matrices, Matrix division, solving system of equations with matrices, Matrix transformations, Eigen values and eigen vectors, rank of matrix
III	Probability Basic rules and axioms events, sample space, dependent and independent events, conditional probability, Random variables- continuous and discrete, expectation, variance, distributions- joint and conditional, Bayes' Theorem, Popular distributions- binomial, Bernoulli, poisson, exponential, Gaussian
IV	Statistics Fundamentals of Data: Collection, Summarization, and Visualization; Sampling and Sampling Distributions, Central Limit Theorem; Methods of Estimation, Unbiased estimators; Confidence Interval Estimation: Z-interval, t-interval; Hypothesis Testing, Types of Errors, Rejection Region Approach and p-value Approach.