SARDAR PATEL UNIVERSITY, BALAGHAT

School of Engineering and Technology

Syllabus

Course: B.Tech **Semester: I**

Branch: CSE (Artificial Intelligence & Machine Learning) **w.e.f. Academic Session: 2024-25**

AIML101 – Mathematics I

Course Objectives:

1. To provide a solid understanding of mathematical principles essential for engineering and computer science.
2. To cover differential and integral calculus, focusing on functions, limits, continuity, differentiation and integration and their applications in solving real-world problems.
3. To foster critical thinking and reasoning skills through mathematical proofs and problem-solving strategies.

Unit I: Numerical Methods I:

Solution of polynomial and transcendental equations – Bisection method, Newton- Raphson method and Regula - Falsi method. Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae.

Unit II: Numerical Methods II:

Numerical Differentiation, Numerical Integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules. Solution of Simultaneous Linear Algebraic Equations by Gauss's Elimination, Gauss's Jordan, Crout's methods, Jacobi's, Gauss- seidal, and Relaxation method.

Unit III: Numerical Methods III:

Ordinary differential equations: Taylor's series, Euler and modified Euler's methods. Runge-Kutta method of fourth order for solving first and second order equations. Milne's and Adam's predicator-corrector methods. Partial Differential Equations: Finite difference solution two dimensional Laplace equation and Poission equation, Implicit and explicit methods for one dimensional heat equation (Bender- Schmidt and Crank-Nicholson methods), Finite difference explicit method for wave equation.

Unit IV: Transform Calculus:

Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs by Laplace Transform method, Fourier transforms.

Unit V: Concept of Probability:

Probability Mass function, Probability Density Function, Discrete Distribution: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Exponential Distribution.

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Reference Books:

1. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint 2012.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
3. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

Course Outcome:

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

1. Demonstrate a solid grasp of fundamental concepts in calculus, linear algebra, and discrete mathematics.
2. Apply mathematical techniques to solve complex engineering problems and perform calculations involving limits, derivatives, and integrals.
3. Exhibit strong analytical and logical reasoning skills, enabling them to construct proofs and approach problems methodically.

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AIML102 – Foundations of Computing

Course Objectives:

1. To introduce students to fundamental concepts of computing, including hardware, software, and networking.
2. To enhance students' analytical and critical thinking skills for solving complex problems using computational techniques.

Unit I: Basic Components of Digital Computers:

Block Diagram. CPU: Functions of Each Unit: Primary Memory, ALU and CU: Fetch and Execution cycle, Execution of Instructions in Single Address CPU.

Memory: RAM, ROM, PROM, EPROM, EEPROM and Cache. Bus, Data, Control and Address Bus, Bus Organization.

Unit II: Generation of Languages:

Machine, Assembly, High Level Languages. Characteristics of Good Language Translators: Compiler, Interpreter and Assembler. Source and Object Program.

Storage Devices: Hard Disk and Optical Disk. Pen Drive, SD Card, Cloud as storage.

Unit III: Input and Output Devices:

Input Devices: Keyboard, Mouse, Light Pen, Touch Screen, Voice Input, MICR, OCR, OMR, Barcode Reader and Flatbed Scanner.

Output Devices: VDU, Printers: Dot Matrix, Laser and Inkjet. Plotters: Drum, Flat-Bed and Inkjet.

Logic development Tool: Algorithms, Flow Charts, Psudo Code.

Unit IV: Basics of Number Systems and Logic Gates:

Number Systems: Binary, Octal, Decimal, Hexa-Decimal, Their Conversions, Binary Arithmetic. ASCII, BCD, EBCDIC.

Logic Gates: Truth table, properties and symbolic representation of NOT, AND, OR, NOR, NAND, EXOR, EXNOR gates. NOR and NAND gates as a universal gates.

Binary Arithmetic: Binary addition, binary subtraction using 1’s and 2’s compliment.

Unit V: Introduction to Networking:

Network: Network terminology, Topologies: Linear, Circular, Tree and Mesh. Types of Networks: LAN, WAN, MAN.

Networking Devices: Repeaters, Bridges, Routers and Gateway. Modem for Communication between pc’s, Wi-Fi network, Introduction of Bluetooth and Infrared devices.

Network Architecture: Peer-to-Peer, Client/Server Internet Protocols: TCP/IP, FTP, HTTP, HTTPS, Internet Addressing: IP Address, Domain Name, URL.

Reference Books:

1. Information Technology Concepts by Dr. Madhulika Jain, Shashank& Satish Jain, [BPB Publication, New Delhi.]
2. Fundamentals of Information Technology By Alexis And Mathews Leon [Leon Press, Chennai & Vikas Publishing House Pvt. Ltd, New Delhi]
3. Fundamental of Micropocessor by B Ram.
4. Basic Computer Engineering by Sanjay Silakari, Rajesh K. Shukla [Willey]

Course Outcome:

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

1. Explain key concepts of computer systems, including hardware, software, and networks.
2. Employ systematic approaches to analyze and solve computational problems.

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AIML103 – Applied Electronics

Course Objectives:

1. To provide students with a solid foundation in electronic components and circuits, including diodes, transistors, operational amplifiers, and digital logic.
2. To facilitate hands-on experience through laboratory sessions, enabling students to build and test electronic circuits and work with microcontrollers and sensors.

Unit I: Electronic Devices:

Theory of P-N Junction Diode, Junction Transistors Theory of Operation, Static Characteristics, Break Down Voltages, Current Voltage Power Limitations, Field Effect Transistor & MOSFET, Principle of Operation & Characteristics.

Unit II: Applications of Electronic Devices:

Rectifiers, Zener Diode as Regulators, Biasing of BJT Different Biasing Arrangements, Stability Factor, Small Signal Analysis & High Frequency Analysis of BJT, Power Amplifiers, Push Pull Configuration, Complimentary Symmetry, Feedback Amplifiers, RC, LC & Crystal Oscillators.

Unit III: Combinational and Sequential Logic:

Logic minimization using K-map method, multiplexers, de-multiplexers, decoders, encoders, Arithmetic circuits, Adders, Combinational multiplier and code converters. Basic latches, master-slave latch, Flip flops, Registers, Counters.

Unit IV: Memories:

Introduction to PLA, PAL, and ROM, Programmable Logic Devices and FPGAs

Unit V: Microprocessors:

Introduction to Microprocessor, 8080 Family, Microprocessor Architecture, Addressing Modes, Types of Addressing Modes, Instruction Set, Types of Instruction Sets, Block Diagram of 8086.

Reference Books:

1. Electronic devices and circuit theory / Robert L. Boylestad, Louis Nashelsky
2. Milman and Halkias, “Integrated Electronics”, Second Edition, 2011, McGraw Hill.
3. Digital Design by M. Morris Mano and Michael D. Ciletti
4. Microprocessor Architecture, Programming, and Applications with the 8085 by Ramesh Gaonkar

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Course Outcome:

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

1. Demonstrate the ability to analyze and design basic electronic circuits using appropriate mathematical and simulation tools.
2. Effectively interface electronic hardware with software, including programming microcontrollers for data acquisition and control.

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AIML104 – Communication Skills

Course Objectives:

1. To develop effective verbal communication skills through practice in speaking, listening, and presenting ideas clearly and confidently.
2. To encourage teamwork and collaboration through group discussions, presentations, and peer feedback.

Unit I: Basics of Communication:

Introduction, Definition, Importance of Communication, Modes of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context.

Barriers to Communication: Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers Perspectives in Communication: Introduction, Visual Perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment.

Unit II: Elements of Communication:

Introduction, Face to Face Communication – Tone of voice, Body Language (Non-Verbal Communication), Verbal Communication Physical Communication

Communication Styles: Introduction, The Communication styles Matrix with example for each, Direct Communication style, Spirited Communication style, Systematic Communication style, Considerate Communication style.

Unit III: Basic Listening Skills:

Introduction, Self-awareness, Active Listening, Becoming an Active Listener, Listening in Difficult Situations

Unit IV: Identifying Common Errors in Writing:

Articles, Subject-Verb Agreement, Prepositions, Active and Passive Voice, Reported Speech: Direct and Indirect, Sentence Structure.

Unit V: Vocabulary Building and Comprehension:

Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives, synonyms, antonyms, Reading comprehension.

Text Books:

1. “Communication Skill”, Sanjay Kumar and Pushp Lata , OUP2011.
2. “Communication Skills And Soft Skills: An Integrated Approach” by Suresh Kumar, Sreehari, Savithri

[Pearson].
3. "Communication Skill" by Dr. Gajanan Malviya, Prof. R.N. Shukla, [S. Chand.].

Course Outcome:

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

1. Exhibit professionalism in all forms of communication, understanding the impact of body language, tone, and cultural differences.
2. Participate effectively in discussions and team projects, demonstrating active listening and respect for diverse viewpoints.

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AIML105 – Object Oriented Programming & Methodology

Course Objectives:

1. To introduce the core concepts of object-oriented programming (OOP), including classes, objects, inheritance, polymorphism, encapsulation, and abstraction.
2. To develop proficiency in a major OOP language (e.g., Java, Python, C++) through practical coding exercises and projects.
3. To enhance problem-solving abilities by applying OOP concepts to develop solutions for real-world problems.

Unit I: **Introduction to OOP:**

Introduction to Object Oriented Thinking & Object Oriented Programming: Comparison with Procedural Programming, features of Object oriented paradigm– Merits and demerits of OO methodology; Object model; Elements of OOPS, IO processing, Emphasize on Programs.

Unit II: **Encapsulation & Data Abstraction:**

Encapsulation and Data Abstraction- Concept of Objects: State, Behavior & Identity of an object; Classes: identifying classes and candidates for Classes Attributes and Services, Access modifiers, Static members of a Class, Instances, Message passing, and Construction and destruction of Objects, Emphasize on Programs.

Unit III: **Inheritance:**

Relationships – Inheritance: Purpose and its types, 'is a' relationship; Association, Aggregation. Concept of interfaces and abstract Classes, Emphasize on Programs.

Unit IV: **Polymorphism and Exception Handling:**

Introduction, Method Overriding & Overloading, Static and Run time polymorphism. Strings, Exceptional Handling, Introduction of Multi - threading and Data Collections. Case study like: ATM, Library management system, Emphasize on Programs.

Unit V: **File Handling:**

Introduction of Files, File Opening Modes, Manipulators, Input-Output Streams, Creation of Files, Retrieval of Files, Updation of files, Deletion of Records from Files, File Unlinking, Emphasize on Programs.

Text Books/ Reference Books:

1. Timothy Budd, "An Introduction to Object-Oriented Programming", Addison Wesley Publication, 3rd Edition.
2. Cay S. Horstmann and Gary Cornell, "Core Java: Volume I, Fundamentals", Prentice Hall

Publication.
3. G. Booch, "Object Oriented Analysis & Design", Addison Wesley.
4. James Martin, "Principles of Object Oriented Analysis and Design", Prentice Hall/PTR.
5. Peter Coad and Edward Yourdon, "Object Oriented Design", Prentice Hall/PTR.
6. Herbert Schildt, "Java 2: The Complete Reference", McGraw-Hill Osborne Media, 7th Edition.

Course Outcome:

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

1. Demonstrate a solid understanding of and ability to implement the fundamental concepts of object- oriented programming in code.
2. Design and develop functional software applications using an object-oriented programming language.
3. Identify and apply common design patterns to solve programming challenges and improve software architecture.

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AIML106P – Computer Workshop (C and C++)

Course Objectives:

1. To provide students with a strong foundation in programming concepts using C and C++
2. To develop problem-solving skills and logical thinking through hands-on programming practices
3. To familiarize students with essential data structures and algorithms and their implementation in C and C++
4. To enable students to design and implement software applications using C and C++

Unit I:

Data Types, Operators and some statements: Identifiers and keywords, Constants, C Operators, Type Conversion. **Write a Program in C:** Variable declaration, Statements, Simple C Programs, Simple Input Statements, Simple Output Statements, and Features of stdio.h. **Control Statements:** Conditional Expressions, Loop Statements, Breaking control statements.

Unit II:

Function and Array: Introduction, Defining a Function, Return Statement, Types of Functions, Actual & Formal Arguments, Local & Global Variables, Multifunction Program, and The Scope of Variables, Recursive Function. **Arrays:** Array Notation, Array Declaration, Array Initialization, Processing with Arrays, Arrays and Functions, Multidimensional Array, Character Array.

Unit III:

Pointers, Structure and Union: Pointer Declaration, Pointer Arithmetic, Pointers and Functions, Pointers and Arrays, Pointer and Strings, Array of Pointers, Pointers to Pointers. **Structures, Unions and Bit Fields:** Declaration of Structure, Initializing a Structure, Functions and Structures, Array of Structure, Arrays within Structure, Structure within structure, Pointer and Structure, Union, Bit Fields, Typedef Enumerations.

Unit IV:

Introduction to C++: Basics of C++, OOP, Class, Object, Data Types, Structure, Static Members, Public/Global member.

C++Function and Overloading: Creating functions with the same name but different parameters.

Classes & Objects: Specifying a Class, Creating Objects, Accessing Class members, Defining member function, Outside Member Functions as inline, Accessing Member Functions within the class, Static data member, Access Specifiers: Private, Protected and Public Members.

Constructors & Destructors: Introduction, Parameterized Constructors, Constructor Overloading,

Constructors with Default Arguments, Copy Constructor ,Destructor, Order of Construction and Destruction, Static data members with Constructor and Destructors.

Unit V:

Operator Overloading: Definition, Over-loadable Operators, Unary Operator Overloading, Unary & Binary overloading, Rules for Operators Overloading.

Inheritance: Defining, Abstract classes, Single, Multilevel, Multiple, Hierarchical, Hybrid Inheritance, Constructor and Destructor in Derived Classes.

Virtual Functions: Need for Virtual Functions, definition, Pure Virtual Functions, Abstract Classes, Rules for Virtual Functions.

File Handling:

I/O Stream, Reading and Writing to files.

Exception Handling: Error handling, Try-catch blocks and error handling exceptions.

Project Development: Work with Mini Project, Implementing a small applications using C/C++

Course Outcome:

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

1. Write, compile, and debug programs in C and C++ effectively.
2. Demonstrate a clear understanding of programming concepts such as variables, data types, control structures, functions, and pointers.
3. Use and implement essential data structures and algorithms.
4. Design and develop software applications, applying best practices in coding and documentation.