SHIVAJI UNIVERSITY KOLHAPUR

SYLLABUS AND STRUCTURE

SECOND YEAR BACHELOR OF TECHNOLOGY

IN

CSE (Artificial Intelligence & Machine Learning)

To be introduced from the academic year 2022-23

(W.e.f. June 2022) onwards

	SECOND YEAR ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING - CBCS PATTERN																
	SEMESTER - III																
		TEACHING SCHEME							EXAMINATION SCHEME								
Sr. No.	Course Subject / Title	THEORY			TUTORIAL		PRACTICAL		THEORY				ORAL / PRACTICAL		TERMWORK		
		Credits	No. of Lectures	Hours	Credits	No. of Hours	Credits	No. of Hours	mode	marks	Total Marks	MIN.	MAX	MIN.	MAX	MIN.	
1	BSC-AIML301 Probability & Statistics	3	3	3	1	1			CIE	30	100	40			25	10	
									ESE	70							
2	PCC-AIML302 Discrete Mathematical Structures	3	3	3	1	2			CIE	30	100	40			25	10	
									ESE	70							
3	PCC-AIML303 Data Structures using C	3	3	3			1	2	CIE	30	100	40			25	10	
									ESE	70							
4	PCC-AIML304 Computer Networks	3	3	3			1	2	CIE	30	100	40	50	20	25	10	
									ESE	70							
5	PCC-AIML305 Computer Organization and Architecture	3	3	3	1	1			CIE	30	100	40			25	10	
									ESE	70							
6	PCC-AIML306 Programming Fundamentals using C++	3	3	3			1	2					50	20	25	10	
7	HM-AIML307 Soft Skills						1	2					25	10	25	10	
	Total (SEM –III)	***18***	***18***	***18***	***3***	***4***	***4***	***8***			***500***		***125***		***175***		

	SECOND YEAR ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING - CBCS PATTERN																	
	SEMESTER - IV																	
		TEACHING SCHEME							**EXAMINATION SCHEME**									
Sr. No.	**Course Subject / Title**	**THEORY**			**TUTORIAL**		**PRACTICAL**		**THEORY**				**ORAL / PRACTICAL**		**TERMWORK**			
		Credits	No. of Lectures	No. of Hours	Credits	No. of Hours	Credits	No. of Hours	mode	marks	Total Marks	MIN.	MAX	MIN.	MAX	MIN.		
1	PCC-AIML401 Automata Theory	3	3	3	1	2			CIE	30	100	40			25	10		
									ESE	70								
2	PCC-AIML402 Fundamentals of AI	3	3	3			1	2	CIE	30	100	40	50	20	25	10		
									ESE	70								
3	PCC-AIML403 Advanced Computer Graphics	3	3	3			1	2	CIE	30	100	40			25	10		
									ESE	70								
4	PCC-AIML404 Operating Systems	3	3	3					CIE	30	100	40			25	10		
									ESE	70								
5	PCC-AIML405 Software Engineering	3	3	3					CIE	30	100	40						
									ESE	70								
6	PCC-AIML406 Python Programming	2	2	2			1	2					50	20	25	10		
7	PW-AIML407 Mini Project						1	2					50	20	25	10		
8	MC-AIML408 Environmental Studies	2	2	2	1	1			CIE	30	100	40						
									ESE	70								
	Total (SEM –IV)	***19***	***19***	***19***	***2***	***3***	***4***	***8***			***600***		***150***		***150***			
	Total	**37**	**37**	**37**	**5**	**7**	**8**	**16**			**1100**		**275**		**325**			

CIE- Continuous Internal Evaluation

ESE – End Semester Examination

• Candidate contact hours per week : 30 Hours(Minimum)	• Total Marks for S.E. Sem III & IV : **800 + 900 =1700**
• Theory and Practical Lectures : 60 Minutes Each	• Total Credits for S.E. Sem III & IV : **50 (SEM-III: 25 + SEM IV:25)**
• In theory examination there will be a passing based on separate head of passing for examination of CIE and ESE.	
• There shall be separate passing for theory and practical (term work) courses.	

Note:

1. **BSC-CS**: Basic Science Course – Computer Science and Engineering are compulsory.
2. **ESC-CS**: Engineering Science Course - Computer Science and Engineering are compulsory.
3. **PCC-CS**: Professional Core Course – Computer Science and Engineering are compulsory.
4. **HM-CS**: Humanities and Management- Computer Science and Engineering are compulsory.
5. **PW-CS**: Project Work-– Computer Science and Engineering are compulsory.
6. **MC-CS**: Mandatory Course -Environmental Studies which is compulsory for theory 70 marks and project work 30 marks.

Second Year B. Tech (Artificial Intelligence & Machine Learning) Sem – III

1. Probability & Statistics (BSC-AIML301)

TEACHING SCHEME	EXAMINATION SCHEME
Theory:3 Hrs./Week	**Theory:** ESE 70 Marks CIE: 30 Marks
Tutorial:1 Hrs./Week	**Term work: 25 Marks**
Credits: 4	

Pre-requisites: Basic Statistics and Probability Theory

Course Objectives:

1. To teach mathematical methodologies and models to develop mathematical skills and enhance thinking power of students.
2. To expose the students to the topics in fuzzy set theory, probability and statistics with an emphasis on the application of solving engineering problems
3. To prepare students to formulate a mathematical model using engineering skills & interpret the solution in real world.

Course Outcomes:

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

1. **Remember** the basic concepts of statistics.
2. **Describe** the statistical data numerically by using Lines of regression and Curve fittings.
3. **Solve** basic problems in probability theory, including problems involving the binomial, Poisson, and normal distributions.
4. **Apply** the knowledge to test the correlation, to test hypothesis, to do sample tests.
5. **Define** fuzzy sets and represent these sets by membership functions, convexity, Normality, support, etc.
6. **Solve** assignment problems by using different techniques of operation research.

UNIT NO.	UNIT NAME & DETAILS	NO. OF LECTURES
1.	**Measures of central Tendency and Dispersion:** Arithmetic mean, median, mode, geometric mean, Harmonic mean Range, Quartile deviation, Mean deviation and Standard deviation.	6
2.	**Correlation, Regression & Curve Fitting:** Introduction, Karl Pearson's Coefficient of Correlation, Lines of regression of bivariate data, Fitting of Curves by method of Least-squares: Fitting of Straight lines, Fitting of exponential curves, Fitting of second-degree Parabolic curves.	6
3.	**Probability Distribution:** Random variables, Discrete Probability distribution, Continuous probability distribution, Binomial Distribution, Poisson Distribution, Normal Distribution.	6
4.	**Testing of Hypothesis and Large Sample Tests:** Statistical Hypothesis-Simple and Composite, Tests of Significance, Null Hypothesis, Alternative Hypothesis, Types of errors in Testing of Hypothesis, level of significance, Critical regions, one-tailed and two tailed tests, P-value or Probability value of Test Statistics. Large sample tests: sampling of attributes, sampling of variables	6
5.	**Introduction to Fuzzy sets:** Crisp set and Fuzzy set, Basic concepts of fuzzy sets, Basic operations on fuzzy sets, Properties of fuzzy sets, Fuzzy cardinality	6
6.	**Assignment Problem:** Definition, Balanced and Unbalanced assignment problem, Hungarian Method, Balanced assignment problems, Unbalanced assignment problems Traveling salesmen problem.	6

Term Work

- For the term work of 25 marks, batch wise tutorials are to be conducted. The number of students per batch per tutorial should be as per university rules.
- Number of assignments should be at least six covering all units.

Text Books

Sr. No.	Title	Author(s) Name	Publication & Edition	Units Covered
1.	Fundamentals of Statistics	S. C. Gupta	Himalaya Publishing House (Seventh Revised and Enlarged Edition)	Unit 1 to 4
2.	Fuzzy Sets and Fuzzy Logic: Theory and Applications	George J. Klir and Bo Yuan	Prentice Hall of India Private Limited	Unit 5
3.	Operation Research	Prem Kumar Gupta, D. S. Hira	S. Chand (Fifth Edition)	Unit 6

Reference Books

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Higher Engineering Mathematics	B. S. Grewal	Khanna Publication Delhi (44^{th} Edition)
2	Advance Engineering Mathematics	Erwin Kreyszig	Wiley India
3	Advanced Engineering Mathematics	H. K. Das	S. Chand Publication

Second Year B. Tech (Artificial Intelligence & Machine Learning) Sem – III

2. Discrete Mathematical Structures (PCC-AIML302)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs./Week	**Theory :** ESE 70 Marks CIE 30 Marks
Tutorial :1 Hr/Week	**Term work: 25 Marks**
Practical : --	**Practical : –**
Credits: 4	

Pre-requisites: Basic Mathematics

Course Objectives

1. To expose the students to the mathematical logic related to computer science areas.
2. To enhance the problem solving skills in the areas of theoretical computer science.
3. To use mathematical concepts in the development of computer applications.

Course Outcomes

After completion of this course students will be able to:

1. Apply logic concepts in designing a program.
2. Illustrate basic set concepts & apply operations onset.
3. Minimize the Boolean Function.
4. Apply basic concepts of probability to solve real world problem.
5. Represent data structures using graph concepts.
6. Design abstract machine, detect deadlocks.

UNIT NO.	UNIT NAME & DETAILS	NO. OF LECTURES
1.	**Mathematical Logic** Statements & Notations, Connectives, Statement Formulas & truth table, Well-formed formulas, Tautologies , Equivalence of formulas, Duality law, Tautological Implications, Functionally complete set of connectives, Other connectives, Normal Forms	8
2.	**Set Theory** Basic concepts of set theory, Operations on Sets, Ordered pairs & n-tuples, Cartesian product	4
3.	**Relations & Functions** Relations. Properties of binary relations. Matrix & Graph Representation of Relation, Partition & covering of Set, Equivalence Relations, Composition of Binary Relation, POSET & Hasse Diagram, Functions, Types of Functions, Composition of functions.	6

4.	**Algebraic Systems** Algebraic Systems: Examples & general Properties, Semi groups & Monoids, Groups: Definitions & Examples, Subgroup & Homomorphism.	6
5.	**Lattice and Boolean Algebra** Lattice as partially ordered sets, Lattice as Algebraic Systems., Special Lattices., Boolean Algebra: Definitions & examples, Boolean Functions., Representation & Minimization of Boolean Functions.	7
6.	**Graph Theory** Basic concepts of graph theory., Paths, Reachability & Connectedness, Matrix, Representations of Graphs, Storage Representation & Manipulations of Graphs. PERT & Related technologies.	5

Text Books

Sr. No.	Title	Author(s) Name	Publication & Edition	Units Covered
1	Discrete Mathematical Structures with Application to Computer Science	J. P. Tremblay & R. Manohar	(MGH)	Unit 1 to 6

Reference Books

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Discrete Mathematics	Semyour Lipschutz, Marc Lipson	MGH Schaum's outlines
2	Discrete Mathematics and its Applications	Kenneth H. Rosen	AT&T Bell Labs
3	Discrete Mathematical Structures	Bernard Kolman, Robert Busby, S. C. Ross and Nadeemur- Rehman	Pearson Education

Term Work

It should consist of minimum 10 to 12 assignments based on topics of syllabus & Exercise problems mentioned in text books out of which 4 to 5 implementations of above assignments must be using 'C' programming language.

Second Year B. Tech (Artificial Intelligence & Machine Learning) Sem – III

3. Data Structures using C (PCC-AIML303)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs./Week	**Theory :** ESE 70 Marks CIE 30 Marks
Tutorial :--	**Term work: 25 Marks**
Practical : 2 Hrs./Week	**Practical : --**
Credits: 4	

Pre-requisites: C programming

Course Objectives

1. To make the students familiar with basics of C programming and data structures.
2. To provide students with foundation in computer programming/problem.
3. To teach the students to select appropriate data structures in computer applications.
4. To provide the students with the details of implementation of various data structures using c language.

Course Outcomes

Upon successful completion of this course, the students will be able to:

1. Articulate the principles of procedure oriented problem solving and programming.
2. Identify the appropriate data structure for specific application.
3. Able to formulate problems and implement algorithms related with different data structure in C.
4. Chose appropriate sorting and searching algorithms.

UNIT NO.	UNIT NAME & DETAILS	NO. OF LECTURES
1.	**Introduction to C:** The Form of a C Program, Linking & Compiling of C Program, The Basic Data Types, Modifying the Basic Types, Identifies Names, Variables, The Four C Scopes, Storage Class Specifiers, Statements - Selection Statements, Iteration Statements, Jump Statements, Expression Statements, Block Statements. Console I/O & Basics of Array and Strings: Two-Dimensional Arrays, Arrays of Strings, Multidimensional Arrays, Array Initialization, Variable Length Arrays.	5
2.	**Functions and Pointers:** **Functions:** The General Form of a Function, Understanding the Scope of a Function, Parameter passing, passing arrays to functions, Function Arguments, the return Statement, Recursion,	7

	Function Prototypes, Declaring Variable Length Parameter Lists. **Pointers:** What Are Pointers? Pointer Variables, The Pointer operators, Pointer Expressions, Pointers and Arrays, Arrays of Pointers, Multiple Indirection, Initializing Pointers, Pointers to Functions and structures,	
3.	**Structures, Unions, Enumerations, and typedef:** Structures, Arrays of Structures, Passing Structures to Functions, Structure Pointers, Arrays and Structures Within Structures, Unions, Enumerations, using sizeof to ensure Portability, typedef.	6
4.	**Basics of Data Structures** Data structure- Definition, Types and operations of data structures, Searching and Sorting Techniques: Linear search, Binary search, Hashing – Definition, hash functions, Collision, Bubble sort, Selection sort, Insertion sort, Merge sort, Quick sort, Radix sort, Complexity and analysis.	6
5.	**Stacks and Queues** Stack: Definition, operations, Array representation of stack, applications Queue: Definition, operations, Array representation of queue, applications, Circular queue, Priority queue, Dequeue. **Linked Lists** Definition, representation, operations, implementation and applications of singly, doubly and circular linked lists.	6
6.	**Trees**: Terminology, representation, binary tree, traversal methods, binary search tree, AVL search tree, B tree, B+ tree, Heaps- Operations and their applications, Heap sort.	6

Term Work

- Implement minimum 8-10 experiments from the topics given below.
- Practical should include the implementation and use of the above-mentioned mechanisms and C terminologies.
- Implementation can be done in C Programming Language using gcc or any other suitable compiler on Linux operating system.

Experiment List

1. Study of Branching Statements.
2. Implementation of different looping constructs in C.
3. Arrays implementation in C.
4. Implementation of pointer.
5. Use of Structures.
6. Use of union and typedef in C.
7. Implementation of storage classes.
8. Implementation of STACK.
9. Implementation of QUEUE.
10. Implementation of LINKED LIST.
11. Implementation of TREE

Text Books

Sr. No.	Title	Author(s) Name	Publication & Edition	Units Covered
1	C the Complete Reference	Herbert Schild	Tata McGraw Hill 4th Edition	1 to 3
2	The C Programming Language	Brian W. Kernighan, Dennis Ritchie	2nd Edition	1 to 3
3	Schaum's Outlines Data Structures	Seymour Lipschutz	MGH	4 to 6

Reference Books

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Programming in ANSI C	E. Balaguruswamy	(Tata McGraw Hill) 4th Edition
2	Let Us C	Yashavant P. Kanetkar	5th Edition
3	Data Structure using C	A. M. Tanenbaum, Y. Langsam, M. J. Augenstein	PHI
4	Data Structures- A Pseudo code Approach with C	Richard F. Gilberg and Behrouz A. Forouzon	2nd Edition

Second Year B. Tech (Artificial Intelligence & Machine Learning) Sem – III

4. Computer Networks (PCC-AIML304)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs./Week	**Theory :** ESE 70 Marks CIE 30 Marks
Tutorial :--	**Term work:** 25 Marks
Practical : 2 Hrs./Week	**Practical :** 50 Marks
Credits: 4	

Course Objectives

1. To perceive fundamental concepts of data communications and computer Networks.
2. To understand layered architecture and basic networking protocols
3. To illustrate the TCP/IP protocol internal details

Course Outcomes

Upon successful completion of this course, the student will be able to –

1. Demonstrate concepts of Computer Networks.
2. Explain OSI and TCP/IP layered architecture
3. Implement network and data link layer.
4. Demonstrate TCP protocol in detail.

UNIT NO.	UNIT NAME & DETAILS	NO. OF LECTURES
1.	**Fundamentals of Data Communications** Data and signals, Transmission Impairments, Multiplexing Techniques, Modulation, Noise.	4
2.	**Fundamentals of Computer Networks** **Addressing, Network architecture:** Peer to Peer network architecture, Server client network architecture, **Network Topologies, Types of Networks-**LAN,MAN,WAN,PAN**, Networking Reference Models:** ISO OSI Model, TCP/IP Protocol Suite **Guided Media:** Twisted Pair Cable, Coaxial Cable and Fiber-Optic Cable. **Unguided Media:** Wireless, Radio Waves, Microwaves and Infrared, Wireless frequency spectrum. **Network connecting devices:** Router, Switch, bridge, hub, repeaters, and its comparisons	6
3.	**Data Link Layer** Framing, Error Detection and Correction**:** Hamming code, Hamming Distance, parity check code, CRC, Checksum Flow control**:** flow control protocols for Noiseless channels, Noisy channels, Random Access Techniques**:** CSMA, CSMA/CD, CSMA/CA Ethernet: IEEE Standards: 802.3, 802.4, 802.5, 802.6 Comparisons of Standard Ethernet, Fast Ethernet, Gigabit Ethernet**.**	8

4.	**Network Layer** Services, IPv4 Addresses: Classful and Classless Addressing, Subnet Mask, Subnetting, Supernetting, Delivery and Forwarding of IP Packet, IPv4 header and Fragmentation, Network layer protocols: ARP, RARP, DHCP, ICMPv4.Routing, Routing Protocols	6
5.	**Transport Layer** Services, Protocols: UDP: UDP header, Services, Applications. TCP: Services, Features, Segment, TCP Header, TCP Connection, Window in TCP, TCP Timers, Options, TCP Package. Applications: SCTP: Features, Services, Packet Format Flow control protocols, Congestion Control protocols: Congestion Control Algorithms, Leaky Bucket, Token Bucket and QoS. Socket: TCP and UDP Socket, Applications.	6
6.	**Application layer** Client Server Paradigm, Peer to Peer Paradigm, Communication using TCP and UDP services. Application Layer Protocols: DNS, FTP, TFTP, HTTP, SMTP, POP, IMAP, MIME. Network Management: SNMP.	6

Term Work

- Minimum of 10 to 12 Experiments to be performed from the list given below.
- Practical should include the implementation and use of the following mechanisms/Algorithms/Tools /Techniques
- Implementation can be in C / C++ Programming Language

Experiment List

1. Demonstration of different types of Network cables and practically implements the cross-wired cable and straight through cable using clamping tool.
2. Demonstration of different networking hardware components.
3. Study of basic network command and Network configuration commands-ifconfig, arp,
4. route, traceroute
5. nmap, netstat, finger
6. Implementation of framing using one of different framing techniques.
7. Implementation of Error Detecting Code (CRC).
8. Implementation of Error Correcting Code (Hamming Code).
9. Write a program to find class if an IP address, Network id, Host id and Default mask
10. Implementation of a program to calculate first, last and total number of addresses in the block from one of the given IP address in the same block.
11. Socket Programming for TCP client and server.
12. Socket Programming for UDP client and server.

13. Introduction to server administration (server administration commands and their applications) and configuration of any three of below Server: (Study/Demonstration Only) FTP, Web Server, DHCP, Telnet, Mail, DNS

Text Books

Sr. No.	Title	Author(s) Name	Publication & Edition	Units Covered
1	TCP/IP protocol suit	Behrouz A. Forouzen	Tata Mag. Hill 4th Ed.	Unit I To VI
2	Computer Networks	Andrew S. Tanenbaum	(PHI)	Unit I To VI
3	Unix Network Programming	W. Richard Stevens	(PHI)	Unit V

Reference Books

Sr. No.	Title	Author(s) Name	Publication & Edition
1	TCP/IP Illustrated, The Protocols, Vol. I	W. Richard Stevens, G. Gabrani	Pearson Education
2	Internetworking with TCP/IP, Vol. I Principles, Protocols, and Architectures	D. E. Comer	Pearson Education
3	Internetworking with TCP/IP, Vol. III, Client-Server Programming and Application (2nd Ed.)	D.E. Comer, David L. Stevens	Pearson Education
4	Data and Computer communications	William Stallings	Pearson Education, 8th Edition

Second Year B. Tech (Artificial Intelligence & Machine Learning) Sem – III

5. Computer Organization and Architecture (PCC-AIML305)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs./Week	**Theory :** ESE 70 Marks CIE 30 Marks
Tutorial : 1Hr./Week	**Term work:** 25 Marks
Practical :--	**Practical : –**
Credits: 4	

Pre-requisites: Basics of Computer

Course Objectives

1. To make the students aware of different generations of computers
2. Understand the concept of I/O organization
3. Apply different algorithms to perform arithmetic operations
4. Understand the concept of memory techniques

Course Outcomes

After completion of this course students will be able to:

1. Recapitulate the history of computer system and the basic concepts of computer architecture and organization
2. Understand the concept of I/O organization
3. Apply the different algorithms to perform arithmetic operations
4. Articulate the design issues in the development of processor
5. Conceptualize instruction level parallelism
6. Understand the concept of memory techniques

UNIT NO.	UNIT NAME & DETAILS	NO. OF LECTURES
1.	**Computer Evolution and Performance** Mechanical Era: Babbage's Difference Engine, Electronic Era: First generation, IAS Computers, Instruction Set and Instruction Execution, Second generation, Input-Output Operation, Programming Language, Third generation and VLSI Era – IC Circuits, Performance Consideration and Measures, Speed up Techniques, Difference between RICS and CISC	6
2.	**Input and Output Organization** Accessing I/O devices, Direct Memory Access (DMA), Buses: Synchronous Bus and Asynchronous Bus, Interface Circuits, Standard IO Interface	5
3.	**Arithmetic** Addition and Subtraction of Signed Numbers, Design of fast Adders, Multiplication of Positive numbers , Signed Operand Multiplication, Fast Multiplication, Integer Division, Floating Point Number Operations: IEEE 754 Floating Point Format, Arithmetic Operations	8
4.	**The Processing Unit** Some fundamental Concepts, Execution of complete Instruction, Multiple bus organization, Hardwired control, Micro programmed Control	6
5.	**Pipelining** Basic Concepts: Role of Cache Memory, Pipeline Performance. Data Hazards: Operand Forwarding, Handling Data Hazards in Software and Side Effects and Instruction Hazards: Unconditional Branches and Conditional Branches and Branch Prediction	5
6.	**Computer Memory System** Some Basic Concepts, Types of Memories: ROM and RAM, Semiconductor RAM, Cache Memories: Mapping functions, Replacement Algorithms, Example of Mapping Techniques	6

Term Work

- It should consist of minimum 8 to 10 assignments based on topics of syllabus
- Students are expected to solve batch wise problems on following topics:
  a. Addition and Subtraction of Signed Numbers
  b. Design of fast Adders
  c. Multiplication of Positive numbers
  d. Signed Operand Multiplication
  e. Fast Multiplication
  f. Integer Division
  g. IEEE 754 Floating Point Format
  h. Arithmetic Operations

Text Books

Sr. No.	Title	Author(s) Name	Publication & Edition	Units Covered
1	Computer Architecture and Organization	John P Hayes	(MGH) 3rd Edition	1
2	Computer Organization	Carl Hamacher, Zvonko Vranesic and Safwat Zaky	Tata McGraw Hill. 5thEdition	2, 3, 4, 5 & 6

Reference Books

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Computer Systems Organization & Architecture	John D. Carpinelli	Pearson Education

Second Year B. Tech CSE (Artificial Intelligence & Machine Learning) Sem – III

6. Programming Fundamentals using C++ (PCC-AIML306)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs./Week	**Theory :** --
Tutorial : --	**Term work:** 25 Marks
Practical : 2 Hrs./ Week	**POE :** 50 Marks
Credits:- 4	

Pre-requisites: Basic Understanding of Computer Programming Terminologies, Basics of C Programming Language.

Course Objectives:

1. To learn advanced features of the C++ programming language as a continuation of the previous course.
2. To learn the characteristics of an object-oriented programming language: data abstraction and information hiding, inheritance, and dynamic binding of the messages to the methods.
3. To learn the basic principles of object-oriented design and software engineering in terms of software reuse and managing complexity.
4. To enhance problem solving and programming skills in C++ with extensive programming projects.
5. To become familiar with the LINUX software development environment.

Course Outcomes:

After the completion of this course, a successful student will be able to do the following:

1. Differentiate object-oriented programming and procedural programming
2. Use the characteristics of an object-oriented programming language in a program.
3. Construct the basic object-oriented design principles in computer problem-solving.
4. Implement the basic principles of software engineering in managing complex software project.
5. Write programs with advanced features of the C++ programming language.
6. Develop programs in the LINUX programming environment.

UNIT NO.	UNIT NAME & DETAILS	NO. OF LECTURES
1.	**Introduction to Object Oriented Programming:** Object oriented paradigm-Differences between Object Oriented Programming and Procedure oriented programming, Basic concepts of Object-Oriented Programming, Encapsulation, Inheritance and Polymorphism, Benefits of OOP, Structure of a C++ program, namespace, Data types, C++ tokens, Identifiers, Variables, Constants, Operators, Control structures & Loops.	6
2.	**Functions, Classes, and Objects:** Introduction of Classes, Class Definition, defining a Members, Objects, Access Control, Class Scope, Scope Resolution Operator, Inline functions, Memory Allocation for Objects, Static Data Members, Static Member Functions, Arrays of Objects, Objects as Function Arguments, Friend Functions, manipulating strings.	6
3.	**Constructors, Destructors, Inheritance:** Introduction to Constructors, Default Constructors, Parameterized Constructors, Copy Constructors, Multiple Constructors in a Class, Destructors. Inheritance: Introduction to inheritance, Defining Derived Classes, Single Inheritance, Multiple Inheritance, Multi-level Inheritance, Hierarchical Inheritance, Hybrid Inheritance.	6
4.	**Pointers, Virtual Functions and Polymorphism:** Introduction to Memory management, new operator and delete operator, Pointers to objects, Pointers to Derived Classes, Polymorphism, Compile time polymorphism, Run time polymorphism, Virtual Functions, Overloading- Function Overloading, Operator overloading.	6
5.	**Templates and Exception handling:** Introduction to Templates, Class Templates, Class Templates with Multiple Parameters, Function Templates, Function Templates with Multiple Parameters, Generic function & Classes. Exception handling: Basics of Exception Handling, Types of exceptions, Exception Handing Mechanism, Throwing and Catching Mechanism, Rethrowing an Exception, Specifying Exceptions. Introduction to STL.	6
6.	**I/O System Basics, File I/O:** Managing console I/O operations: C++ stream, C++ Predefined stream classes, Formatted and unformatted console I/O operations. File I/O: Classes of File Stream Operations, C++ file I/O modes, manipulators, File Pointers & their manipulators, namespaces, std namespaces	6

Term Work

- Execute 12 experiments on the topics studied from Programming Fundamentals using C++.
- Practical should include the implementation and use of the above-mentioned mechanisms and C++ terminologies.
- Implementation can be done in C++ Programming Language using gcc or any other suitable compiler on Linux operating system.

Experiment List

1. Study of Branching Statements & Looping constructs in C++.
2. Arrays implementation in C++.
3. Use of Functions in C++.
4. Study of classes & objects in C++.
5. Use of Constructors & Destructors.
6. Demonstrate the use of Friend function and Friend Class.
7. Write a program using Inline Function, Static data members & member functions.
8. Make use of Array of Objects, Pointer to Object, THIS pointer, Dynamic allocation operators (New & Delete) in the program.
9. Demonstrate Function overloading, Operator overloading (unary/binary/arithmetic/comparison).
10. Show the implementation of Inheritance Terminology (multilevel, multiple, hybrid, Hierarchical) in C++.
11. Implement Virtual Function and Virtual Class, early and late binding through C++ program.
12. Demonstrate the use of Generic function & Classes.
13. Study of STL.
14. Implement Exception Handling.
15. Write and implement programs using File Handling in C++.

Text Books

Sr. No.	Title	Author(s) Name	Publication & Edition	Units Covered
1	Object-Oriented Programming with C++	E. Balaguruswamy	(Tata McGraw-Hill) 7th Edition onwards	All Units
3	The Complete Reference C++	Herbert Schild	Tata McGraw Hill 4^{th} Edition and onwards	All Units

Reference Books

Sr. No.	Title	Author(s) Name	Publication & Edition
1	C++ Primer	S. B. Lippman and J. Lajoie	Pearson Education 3rd Edition
2	The C++ Programming Language	B. Stroutstrup	Pearson Education 3rd Edition
3	Object-Oriented Programming with C++	Balaguruswamy	(Tata McGraw-Hill) 6^{th} Edition and onwards
4	Object oriented Programming with C++	Sourav Sahay	(Oxford) 2^{nd} edition

Second Year B. Tech (Artificial Intelligence & Machine Learning) Sem – III

7. Soft Skills (HM-AIML307)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : --	**Theory : --**
Tutorial :--	**Term work: 25 Marks**
Practical : 2Hrs./Week	**Practical : 25**
Credits:1	

Pre-requisites: Basic communication and writing skills in English

Course Objectives

1. To make the engineering students aware of the importance, the role and the content of soft skills.
2. To develop and nurture soft skills of the students through individual and group activities.
3. To expose students to right attitudinal and behavioural aspects and to build the same through activities.
4. To encourage overall development of students by focusing on soft skills.

Course Outcomes

After completion of this course students will be able to:

1. Effectively use skills to communicate clearly and improve listening and writing skills.
2. Make use of techniques for self-awareness and self-development.
3. Understand the importance of teamwork and group discussion skills.
4. Apply time management and stress management skills.
5. Apply professional skills and ethics effectively being an Engineer.

UNIT NO.	UNIT NAME & DETAILS	NO. OF HOURS
1.	**Unit 1: Getting Started with Soft Skills** Introduction to Soft Skills, Communication Basics, Official Communication, Online Meetings, Comprehension, Reading Research Papers.	4
2.	**Unit 2: Behavioural Skills and Self Development** Confidence Improvement, Positive Attitude, Positive Thinking, Personal Accountability, Diversity Awareness, Empathy, Emotional Intelligence, Emotional Quotient, Self-Management: Self-Evaluation, Self-Discipline, Self-Awareness.	4
3.	**Unit 3: Leadership and Team Building** Culture and Leadership: Salient Features of Corporate Culture, Leadership Styles, Leadership Trends. Team Building: Types of Teams, Team Development Stages, Attributes of a Successful Team, Barriers involved, Role of Team leader.	4
4.	**Unit 4: Developing Writing skills** Writing Proposals, Project Synopsis, Report Writing, Technical Paper Writing, Writing for Employment: Job Search, Cover Letter, Functional and Chronological Resumes, Professional Correspondence.	4
5.	**Unit 5: Stress and Time Management** Stress in Today‘s Time, Positive Stress, Negative Stress, Types of Stressors, Identify the Stress Source, Reasons and Effects, Identifying Stress, The four A's of Stress Management, Approaches: Action-oriented, Emotion-oriented and Acceptance-oriented. Time Management, Time Management Techniques.	4
6.	**Unit 6: Professionalism** Goal Setting, Planning and Managing Carrier, Developing Work Ethics, Presenting yourself Professionally: Dressing Etiquettes, Corporate Grooming and Dressing, Etiquette and Mannerism: All types of Etiquettes. Technology Etiquette: Email and Telephone Etiquette, Interview Etiquette. Job Interview: Types of Interviews as Telephonic, Face to Face and Online Interview.	4

Text Books

Sr. No.	Title	Author(s) Name	Publication & Edition	Units Covered
1	Developing Communication Skills	Krishna Mohan and Meera Banerji	MacMillan India Ltd., Delhi	Unit 1 & 2
2	Soft Skills – An Integrated Approach to Maximize Personality	Gajendra Singh Chauhan, Sangeeta Sharma	WILEY INDIA	Unit 4,6
3	The Ace of Soft Skills: Attitude, Communication and Etiquette for Success	Gopalaswamy Ramesh and Mahadevan Ramesh	Pearson Education, Edition 1, 2013	Unit 1 & 2
4	Group Discussions and Interview Skills	Priyadarshi Patnaik	Cambridge University Press	Unit 3,5,6

Reference Books

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Computer Systems Organization & Architecture	John D. Carpinelli	Pearson Education

Experiment List

Experiment No.	Name of Experiment
1	Role Play and Drama Play
2	Active Listening
3	Emotional Intelligence and Emotional Quotient Test Activity
4	Leadership and Team Building Activity
5	Group Discussion Activity
6	Debate Activity
7	Presentation Skills
8	Functional and Chronological Resume writing
9	Stress and Time Management Activity
10	Professional Etiquettes and Interview Activity

Term Work

1. The instructor shows videos to enhance skills supporting career aspects and discussion about same videos. Multiple set of observations based on videos can be prepared by students.
2. Multiple set of activity based assignments can be prepared to allow multiple skills exposure for example a group task encouraging discussions, team building, value sharing, leadership and role play all at the same time. Every student must be given adequate opportunity to participate actively in each activity.
3. Each student will write one report based on visit / project / business proposal etc.
4. Faculty may arrange one or more sessions from following: Yoga and Meditation. Stress management, relaxation exercises, and fitness exercises. Time management and personal planning sessions.
5. The student must prepare the journal in the form of report elaborating the activities performed in the lab.
6. Continuous assessment of laboratory work is to be done based on overall performance and lab assignments performance of student.
7. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, punctuality, neatness, enthusiasm, participation and contribution in various activities-SWOT analysis, presentations, team activity, event management, group discussion, Group exercises and interpersonal skills and similar other activities/assignments.

Second Year B. Tech (Artificial Intelligence & Machine Learning) Sem – IV

1. Automata Theory (PCC-AIML401)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs./Week	**Theory :** ESE 70 Marks CIE 30 Marks
Tutorial :2 Hrs./Week	**Term work:** 25 Marks
Practical : --	**Practical :** -
Credits: 4	

Course Objectives

1. To introduce students to the mathematical foundations of computation, the theory of formal languages and grammars.
2. To strengthen the students' ability to understand and conduct mathematical proofs for computations.
3. To make the students understand the use of automata theory in Compliers & System Programming.
4. To analyze and design finite automata, pushdown automata, grammars & Turing machines
5. To study the Markov chain problem

Course Outcomes

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

1. Understand basic concepts of Regular Language and Regular Expressions
2. Select appropriate abstract machine to recognize a given formal language.
3. Generate complex languages by applying Union, Intersection, Complement, Concatenation and Kleene * operations on simple languages.
4. Apply parsing concepts for syntax analysis.
5. Be familiar with thinking analytically and intuitively for problem solving situations in related areas of theory in computer science.

UNIT NO.	UNIT NAME & DETAILS	NO. OF LECTURES
1.	**Regular Languages and Finite Automata** Proofs and its types, Recursive Definitions, Regular expressions and regular languages, operations on regular languages- unions, intersection & complements of regular languages, Finite Automata Applications of FA.	6
2.	**Nondeterminism and Kleene's Theorem** Nondeterministic finite automata, NFA with null transition, Equivalence of FA's, Kleene's Theorem (Part I & Part II), Minimal Finite Automata	6
3.	**Context Free Languages and Grammar** Definitions, Regular Grammar, Derivation and ambiguity, Union, Concatenation and Kleene *'s of CFLs, Simplified forms and normal forms, Pumping Lemma for context free languages, Intersection and complements of context Free Languages, Introduction to GNF, BNF	7
4.	**Push Down Automata** Definition, examples, DPDA, Acceptance of string by PDA, Equivalence of	5

	CFG's & PDA's, Parsing-Top down and bottom up	
5.	**Turing Machines** Definition, TM as language acceptors, combining Turing Machines, Computing partial function with a TM, Multi-tape TMs, and Universal TM	6
6.	**Markov Chains** Markov Chains: Definitions and Representations, Application: A Randomized Algorithm for 2-Satisfiability, Classification of States Example: The Gambler's Ruin	6

Term work

- Minimum 8-10 tutorials should be given based on above mentioned topics.

Text Books

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Introduction to Languages & the Theory of Computations	John C. Martin	Tata MGH Edition
2	Discrete Mathematical Structures with applications to Computer Science	J .P. Trembley & R. Manohar (MGH)	(MGH)

Reference Books

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Introduction to Automata Theory, Languages and computation	John E. Hopcraft, Raje Motwani, Jeffrey D. Ullman	(Pearson Edition.)
2	Introduction to theory of Computations	Michael Sipser	Thomson Books/Cole
3	Theory of Computation	Vivek Kulkarni	

Second Year B. Tech (Artificial Intelligence & Machine Learning) Sem – IV

2. Fundamentals of AI (PCC-AIML402)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs./Week	**Theory :** ESE 70 Marks CIE 30 Marks
Tutorial :--	**Term work: 25 Marks**
Practical : 2 Hrs./Week	**Practical : 50 Marks**
Credits: 4	

Pre-requisites: Knowledge of Basic Computer Algorithm

Course Objectives

1. To expose the students to basic concepts and principles of AI.
2. To introduce the various tools for AI problem solving.
3. To make the students aware of expert system and open source platform for implementing AI applications.

Course Outcomes

Upon successful completion of this course, the students will be able to:

1. Identify AI problems and their features.
2. Use predicate calculus and propositional logic for knowledge representation. Describe the statistical data numerically by using correlation, regression and curve fittings.
3. Use heuristics in search based problems.
4. Use semantic networks, conceptual dependencies scripts and frames for information representation.

UNIT NO.	UNIT NAME & DETAILS	NO. OF LECTURES
1.	**Unit 1: AI- Its Root and Scope** Early history and applications, Attitude towards intelligence, knowledge and human artifices, Overview of AI application areas, AI- A summary	4
2.	**Unit 2: Representation and Search** The proportional calculus, The predicate calculus, Using inference rules to produce predicate calculus expression, Graph theory, Strategies for state space search, Introduction to heuristic search, Hill climbing and dynamic programming, Best first search algorithm, Using heuristics in games	7
3.	**Unit 3: Representation and intelligence** Issues in knowledge representation, Brief history of AI representational schemes, Introduction to conceptual graphs, Type, individuals and names, Generalization & specialization	6
4.	**Unit 4: Rule based expert system** Introduction, K rules as knowledge, representation, schemes, Expert system development teams, Structure, Characteristics, Forward chaining and backward chaining inference techniques., Media Advisor: A Demonstration, Conflict resolution, Advantages and disadvantages	6
5.	**Unit 5: Uncertainty management in rule based expert system** Introduction, Basic probability theory, Bayesian reasoning, Forecast, Certainty factors theory and evidential reasoning, Comparison of Bayesian reasoning and certainty factors	6
6.	**Unit 6: TensorFlow- Basic Concept** Machine learning and deep learning concepts, TensorFlow- general overview, Installing TensorFlow, first working session, Data Flow graph, TensorFlow Programming model, How to use TensorBoard.	7

Term Work

- Minimum of 10 Experiments to be performed from the list given below.
- Practical should include the implementation and use of the following mechanisms/Algorithms/Tools /Techniques

Experiment List

1. Study experiment on propositional logic and predicate logic..
2. Implementation of Best First Search (BFS)
3. Implementation of Depth First Search (DFS),
4. Implementation of Breadth First Search (BFS).
5. Implementation of Implementation of Tic Tac Toe game using heuristics.
6. Study experiment on conceptual graphs (semantic nets, conceptual dependency, and 3rd graph).
7. Case study on Expert System.
8. Development of a simple expert system.
9. Installation of Tensor flow.

10. Implementation of computational graph using Tensor flow core.
11. Study of Tensor board.
12. Case study on MYSIN and AI SHELL

Text Books

Sr. No.	Title	Author(s) Name	Publication & Edition	Units Covered
1	Artificial Intelligence; structures and strategies for complex problem solving	Gorge F Luger	Pearson Education 5th Edition	Units 1, 2, 3 &6
2	Artificial Intelligence: A guide to intelligent systems	Michael Negnevistsky	Person Education, 2nd edition	Units 4, 5
3	Getting started with TensorFlow	Giancarlo Zaccone	Packt Publishing, 2016	Unit 6

Reference Books

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Introduction to Artificial Intelligence	Dan W. Patterson	Pearson Education India, 6 January 2015

Online Resources

1. https://nptel.ac.in/courses/106/102/106102220/
2. https://onlinecourses.nptel.ac.in/noc21_ge20/preview

Second Year B. Tech (Artificial Intelligence & Machine Learning) Sem – IV

3. Advanced Computer Graphics (PCC-AIML403)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs./Week	**Theory :** ESE 70 Marks CIE 30 Marks
Tutorial : --	**Term work: 25**
Practical : 2 Hrs/ Week	**Practical : --**
Credits: 4	

Pre-requisites: Basics of Computer

Course Objectives

1. To expose students to the various transformation techniques and projections
2. To make students understand different algorithms concerned with scanning, filling, windowing and clipping on graphical objects
3. To make the students aware of generation of curves and surfaces

.

Course Outcomes

After completion of this course students will be able to:

1. Understand 2D & 3D Transformation techniques
2. Implement Bresenham's line and circle drawing algorithms
3. Implement windowing & clipping
4. Implement Bezier curves
5. Understand Computer Animation
6. Understand illumination models and surface rendering methods

UNIT NO.	UNIT NAME & DETAILS	NO. OF LECTURES
1.	**Transformations** Basic 2D & 3D transformations - Translation, Scaling, Rotation, Reflection, Shearing, Multiple Transformations, Rotation about an axis parallel to a coordinate axis, rotation about an arbitrary axis in space, Affine and Perspective Geometry, Orthographic projections and Axonometric projections	7
2.	**Raster Scan Graphics** Bresenham's line and circle drawing algorithms, Scan Conversion techniques: RLE, Frame Buffer, Scan converting polygons: Edge fill and Seed fill algorithms, Anti-aliasing and Halftoning.	7
3.	**Viewing and clipping** Introduction, Windowing and View-porting, Introduction to clipping, Point clipping, and line clipping: Sutherland - Cohen line clipping algorithm	4
4.	**Curves and Surfaces** Curve Representation, Non-parametric and parametric curves, representation of space curves, Cubic Spline, Parabolic Blended curves, Bezier curves and B-spline curves, Z- buffer, Warnock algorithm	7
5.	**Computer Animation** Introduction, Key frame animation, Construction of an animation sequence, Motion control methods, Procedural animation, Key-frame animation vs. Procedural animation, Introduction to Morphing, Warping techniques, Three dimensional morphing	5
6.	**Illumination models and surface rendering methods** Light sources, Basic illumination models, Displaying light intensities, Polygon Rendering methods, Ray tracing methods, Radiosity lighting model, Introduction to Blender	6

Term Work

- Minimum of 10 Experiments to be performed from the list given below.

Experiment List

1. Initial steps in drawing figures (polygon, rectangle etc).
2. Circle Algorithms.
3. Transformations (Scaling, Translation).
4. World Windows and View Ports. Zooming, Tiling etc.
5. Lighting objects and displaying a 3-d object.
6. Three Dimensional Objects.
7. Animations using Blender 3-D software
8. Implementation of filling algorithms.
9. Generation of Curves and surfaces.

10. Introduction to computer graphics, OPEN GL, GLUT, GLU

11. Getting started (Installation of VISUAL STUDIO, Library files of OPEN GL, GLUT).

Text Books

Sr. No.	Title	Author(s) Name	Publication & Edition	Units Covered
1	Mathematical elements for Computer Graphics	David F. Rogers, J. Alan Adams	(MGH Int.)	1 & 4
2	Procedural elements for Computer Graphics	David F. Rogers	(MGH International)	2 & 3
3	Computer Graphics	Rajesh Maurya	WILEY India	5
4	Computer Graphics C Version second edition	Donald D. Hearn, M. Pauline Baker	Pearson	6

Reference Books

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Computer Graphics (second Edition)	Zhigang Xiang & Roy Plastock	Schaum's Outline Series, TMGH
2	Computer Graphics Using OpenGL	F.S. Hill Jr. Stephen M. Kelley	Pearson

Second Year B. Tech (Artificial Intelligence & Machine Learning) Sem – IV

4. Operating Systems (PCC-AIML404)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs./Week	**Theory :** ESE 70 Marks CIE 30 Marks
Tutorial : --	**Term work:** 25 Marks
Practical : --	**Practical : –**
Credits: 3	

Pre-requisites: Fundamental knowledge of computer, C programming, Data Structure.

Course Objectives

1. To learn the basic concepts of operating system, services and operations in the operating system.

2. To expose the students to various functions of the operating system and their usage.

3. To make the students understand process management, memory management and I/O device Management.

4. To provide knowledge to the students about the fundamental architecture of UNIX and operating system kernel.

Course Outcomes

1. Understand the structure, functions and services of an operating system.

2. Describe the methods of process management, process synchronization and deadlocks.

3. Demonstrate the various memory management and I/O management techniques in effective execution of programs.

4. Analyze the process scheduling, memory management and I/O management techniques.

UNIT NO.	UNIT NAME & DETAILS	NO. OF LECTURES
1.	**Unit 1. Introduction** Evolution of operating systems, Types of operating systems, Different views of the operating system, The journey of a command execution, Overview of design and implementation of operating systems.	5

2.	**Unit 2. Process Management & Synchronization** Process Concept, Operations on Processes, Interprocess Communication, Threads, Process Synchronization - Race Conditions, Critical Sections, Synchronization Approaches, Classic Process Synchronization Problems, Semaphores, Monitors.	6
3.	**Unit 3.Process Scheduling & Deadlock** Scheduling Terminology and Concepts, Nonpreemptive Scheduling Policies, Preemptive Scheduling Policies, Process Scheduling- Case Studies, Deadlocks - Deadlocks in Resource Allocation, Handling Deadlocks, Deadlock Detection and Resolution, Deadlock Prevention, Deadlock Avoidance.	7
4.	**Unit 4. Memory Management** Managing the Memory Hierarchy, Static and Dynamic Memory Allocation, Memory Allocation to a Process, Contiguous Memory Allocation, Noncontiguous Memory Allocation, Paging, Segmentation, Virtual Memory-Demand Paging, Page Replacement Policies.	6
5.	**Unit 5. File Systems and I/O Management** Overview of File Processing, Files and File Operations, Fundamental File Organizations and Access Methods, Directories, Layers of the Input-Output Control System, Overview of I/O Organization, I/O Devices, Device Drivers.	7
6.	**Unit 6. Unix Operating System (Case Study)** System structure, User perspective, Architecture of the UNIX operating system, Introduction to system concepts, Kernel data structures, system administration, System calls for the file system-introduction, Network based Operating Systems.	5

Term Work

- The minimum 8-10 assignments should be given based on above mentioned topics.

Text Books

Sr. No.	Title	Author(s) Name	Publication & Edition	Units Covered
1	Operating systems concepts and design	Milan Milenkovic	McGRAW-Hill, 2nd Edition	Unit 1
2	Operating system concept	Silberschatz, Galvin, Gagne	Wiley India, 8th edition	Unit 2, 6
3	Operating systems - A Concept Based approach	Dhananjay M Dhamdhere	Mc-Graw Hill, 3rd Edition	Unit 3 to 5
4	The design of Unix Operating System	Maurice J. Bach	PHI	Unit 6

Reference Books

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Operating Systems: Internals and Design Principles	William Stallings	Pearson,7th edition
2	Modern Operating Systems	Andrew S. Tanenbaum	Pearson Education International, 4th edition
3	Operating System with case studies in UNIX, Netware and Windows NT	Achyut S. Godbole	TMGH

Second Year B. Tech (Artificial Intelligence & Machine Learning) Sem – IV

5. Software Engineering (PCC-AIML405)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs./Week	**Theory :** ESE 70 Marks CIE 30 Marks
Tutorial :--	**Term work:** --
Practical : --	**Practical :** --
Credits: 3	

Course Objectives

1. To expose the students to basic concepts & principles of software engineering.
2. To make the student aware of the importance of SDLC in their project development work.
3. To expose the students to software testing techniques and software quality management.

Course Outcomes

Upon successful completion of this course, the students will be able to:

1. Comprehend systematic methodologies of SDLC (Software Development Life Cycle)
2. Discriminate competing and feasible system requirements indicating correct real world problem scope and prepare stepwise system conceptual model using stakeholder analysis and requirement validation.
3. Prepare SRS document for a project
4. Apply software design and development techniques
5. Develop a quality software project through effective team-building, planning, scheduling and risk
6. Understand testing methods at each phase of SDLC

UNIT NO.	UNIT NAME & DETAILS	NO. OF LECTURES
1.	**Unit 1:The software Problem** Cost, Schedule & Quality, Scale and Change, Software Processes: Process & Project, Component Software Processes, Software Development process Models, Project Management Process.	6
2.	**Unit 2:Software Requirements Analysis & specification** Value of Good SRS, Requirement Process, Requirements Specification, Other Approaches for Analysis, Validation	5
3.	**Unit 3:Software Planning & Scheduling** Responsibilities of Software Project Manager, Project Planning, Project Scheduling, Project Staffing, People CMM, Risk Management	6

4.	**Unit 4:Design** Design Concepts, Function Oriented Design, Object Oriented Design, Detail Design, Verification, Metrics	6
5.	**Unit 5:Coding & Testing** Coding & Code Review, Testing, Unit Testing, Black Box ,Testing, White Box Testing, Program Analysis Tools, Integration Testing, System Testing	7
6.	**Unit 6:Software Reliability &Quality Management** Reliability, Software Quality, Software Quality Management System, ISO 9000, SEI capability Maturity Model, Six Sigma, Agile Software Development & Extreme Programming, Agile Project Management	6

Text Books

Sr. No.	Title	Author(s) Name	Publication & Edition	Units Covered
1	Software Engineering: A precise Approach	Pankaj Jalote	Wiley India	Unit 1,2,4
2	Fundamentals of Software Engineering	Rajib Mall	PHI 3rd Edition	Unit 5,6
3	Software Engineering	Jan Sommerville	Pearson 9th Edition	Unit 6.7 &6.8
4	Software Engineering Principles & Practices	Rohit Khurana ITLESL	Vikas Publishing House Pvt. Ltd. 2nd Edition	Unit 3

Reference Books

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Software Engineering– Concepts & Practices	Ugrasen Suman	Cenage Learning
2	Software Engineering Fundamentals	Behforooz & Hudson	Oxford: Indian Edition1st

Second Year B. Tech (Artificial Intelligence & Machine Learning) Sem – IV

6. Python Programming (PCC-AIML406)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 2 Hrs./Week	**Theory :** --
Tutorial : --	**Term work:** 25 Marks
Practical : 2 Hrs./Week	**Practical:** 50 Marks
Credits: 3	

Pre-requisites: Knowledge of programming language like C/C++

Course Objectives

1. Make the student learn basics of python programming language
2. Expose the students to various data structures
3. Make the students aware of various Object Oriented concepts
4. Expose the students to advanced concepts in Python

Course Outcomes

Upon successful completion of this course, the students will be able to:

1. Summarize the basic concepts in python
2. Identify the data structures to solve a problem
3. Demonstrate the use of Object Oriented concepts in problem solving
4. Apply Python concepts in web application.
5. Use networking and multithreading concepts to solve a problem

UNIT NO.	UNIT NAME & DETAILS	NO. OF LECTURES
1.	**Getting Started with Python:** Basics of Python: Python Installation and Working of it, Data types in python, Operators in python, Input and Output, detail study of python blocks, control statements, Branching statements.	3
2.	**Basics of Python Programming:** String and Character in python, List and Tuples, Dictionaries, Arrays in python, Functions.	5
3.	**OOP Concepts in Python:** Classes and OOP Concepts: Procedural and Object-Oriented Programming, Objects, class, Method overloading, Polymorphism, Inheritance, hands on with Lamba function in python coding with the use of functions, modules and external packages.	4
4.	**Files in Python:** Advanced Python: Files in Python, Directories, Building Modules, Packages, Text Processing, Regular expression in python.	5
5.	**Python Integration Primer:** Graphical User interface, Networking in Python.	4
6.	**Advanced Python:** Introduction to Django, Introduction to Multithreading and security in Python.	3

Term Work

- Minimum of 10 Experiments to be performed from the list given below.
- Practical should include the implementation and use of the following mechanisms/Algorithms/Tools /Techniques

Experiment List

1. Exploring basics of python like data types (strings, list, array, dictionaries, set, tuples)
2. Program for Implementation of control statements
3. Creating functions, classes and objects using python. Demonstrate exception handling
4. Program for implementation of inheritance
5. Python program to append data to existing file and then display the entire file
6. Python program to count number of lines, words and characters in a file.
7. Creating Registration form GUI with Python
8. Menu driven program to create a simple calculator
9. Creation of simple socket for basic information exchange between server and client
10. Creating web application using Django web framework to demonstrate functionality of user registration
11. Programs on Threading using python
12. Program to implement simple linear regression using Python

Text Books

Sr. No.	Title	Author(s) Name	Publication & Edition	Units Covered
1	Beginning Python: Using Python 2.6 and Python 3.1	James Payne	Wiley Publication	(Unit I to V)
2	Python Programming	Anurag Gupta, G. P. Biswas	McGraw-Hill	(Unit I to VI)

Reference Books

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Introduction to computing and problem-solving using Python	E. Balagurusamy	McGraw-Hill
2	Python Basics: A Practical Introduction to Python 3	David Amos, Dan Bader, Joanna Jablonski, Fletcher Heisler	Realpython
3	Django: Web Development with Python	Samuel Dauzon, AidaisBendoraitia, ArunRavindran	Packt

Second Year B. Tech (Artificial Intelligence & Machine Learning) Sem – IV

7. Mini Project (PW-AIML407)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : --	**Theory : --**
Tutorial :--	**Term work:** 25 Marks
Practical : 2 Hrs./Week	**Practical :** 50 Marks
Credits: 1	

Pre-requisites: Knowledge of software engineering and C/C++

Course Objectives

1. To expose the students to solve the real world problems.
2. To utilize the techniques. Skills and modern Engineering tools for building the project.
3. To follow the methods and tasks as per SDLC Approach

Course Outcomes

Upon successful completion of this course, the students will be able to:
1. Define the problem statement.
2. Organize, Plan and prepare the detailed project activities.
3. Construct Flowchart, System Architecture based on the project description
4. Implement the solution for their problem.

Platform: - C, C++

Course Contents/Description:-

The Mini Project should be undertaken preferably by a group of 3-4 students who will jointly work together and implement the project. The Mini Project topic should be based on the any one subject concepts that students have studied for their Academic Year. The group will select the project with the approval of the guide and submit the name of the project with a synopsis of the proposed work not more than 04 to 05 pages. In the Synopsis they have to state Flowchart, Usage of the logic, algorithm, functions and suitable data structure for implementing the solution. They have to implement project using C, C++languages.

Second Year B. Tech (Artificial Intelligence & Machine Learning) Sem – IV

8. Environmental Studies (MC-AIML408)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 2 Hrs./Week	**Theory :** ESE 70 Marks CIE 30 Marks
Tutorial : 1 Hrs./ Week	**Term work:--**
Practical : --	**Practical : –**
Credits: 3	

Course Objectives

1. Understand the scope and multidisciplinary nature of Environmental Studies.
2. Recognize the structure and function of Ecosystems with their importance.
3. Get acquainted with the problems associated with natural resources and their conservation.
4. Familiarize the environmental and social problems with global concern.

Course Outcomes

1. Get acquainted with the scope and multidisciplinary nature of environmental science with the overall aim of sustainable development.
2. Understand the importance of ecosystems in the view of its conservation.
3. Know the values of natural resources with associated problems for sustainable lifestyles.
4. Familiarize the basics of Biodiversity and concerned issues in the context of Western Ghats.
5. Make aware of the pollution issues with its mitigation measures.
6. Understand the social issues accompanied by environmental issues in the light of role of Indian culture and movements in conservation of the environment.
7. Recognize the significance of policies and legislation in environmental protection.
8. Acquire problem solving attitude through actual experiential learning in the form of field work and projects

UNIT NO.	UNIT NAME & DETAILS	NO. OF LECTURES
1.	**Nature of Environmental Studies** Definition, scope and importance, Multidisciplinary nature of environmental studies, Need for public awareness. Concept of sustainability, Sustainable development and its goals with Indian context.	3
2.	**Natural Resources and Associated Problems** Forest resources: Use and over-exploitation, deforestation, dams and their effects on forests and tribal people. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Mineral resources: Usage and exploitation. Environmental effects of extracting and using mineral resources. Food resources: World food problem, changes caused by agriculture effect of modern agriculture, fertilizer-pesticide problems. Energy resources: Growing energy needs, renewable and non- renewable energy resources, use of alternate energy sources. Solar energy, Biomass energy, Nuclear energy, Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of individuals in conservation of natural resources.	8
3.	**Ecosystems** Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Introduction, types, characteristics features, structure and function of the following ecosystem - Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) Degradation of the ecosystems and its impacts.	9
4.	**Biodiversity and its conservation** Introduction- Definition: genetic, species and ecosystem diversity. Bio-geographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. India as a mega- diversity nation. Western Ghat as a biodiversity region. Hot-spots of biodiversity. Threats to biodiversity habitat loss, poaching of wildlife, man- wildlife conflicts Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.	8
5.	**Environmental Pollution** Definition: Causes, effects and control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards. Global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Solid waste	8

	Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.	
6.	**Social Issues and the Environment** Human population growth, impact on environment. Human health and welfare. Environmental ethics: Role of Indian religious traditions and culture in conservation of the environment. Environmental movements- Chipko Movements, Appiko Movements, Silent valley. Resettlement and rehabilitation of people; its problems and concerns. Water conservation, rain water harvesting, watershed management, water conservation by Dr. Rajendra Singh, Anna Hazare etc. Disaster management: Floods, earthquake, cyclone, tsunami and landslides. Wasteland reclamation. Environmental communication and public awareness, case studies.	9
7.	**Environmental Protection – Policies and practices:** Environmental Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act Wildlife Protection Act, Forest Conservation Act, National and International conventions and agreements on environment.	5
8.	**Field Work** Visit to a local area to document environmental assets- River/forest/grassland/hill/mountain OR Visit to a local polluted site- Urban/Rural/Industrial/Agricultural OR Study of common plants, insects, birds OR Study of simple ecosystems- ponds, river, hill slopes etc.	10

Text Books

Sr. No.	Title	Author(s) Name	Publication & Edition	Units Covered
1	Environmental Studies	--	Shivaji University	1-7

Reference Books

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Introduction to Environmental Engineering and Science	Gilbert M. Master, Wendell P. Ela	Pearson,7th edition
2	Environmental Pollution	Hawards Peavy, Donald R. Rlowk	Pearson Education International, 4th edition
3	Environmental Chemistry	B. K. Sharma	Gokel Publication House, Meerut