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#### Semester-V

Sr. No.	Course Type	Course Code	Course Name	Te Se	eachin cheme	g	Credits
				L	Т	Р	
1.	PCC	CL10	Database Management System	2	1	-	3
2.	PCC	CL11	Foundations of Machine Learning	2	1	-	3
3.	PCC	CL12	Neural Network	3	-	-	3
4.	PEC	CL01	Elective-I	3	-	-	3
5.	HSMC	HS06	Humanities and Social Sciences Open Courses - II	2	-	-	2
6.	IFC	EC01	Interdisciplinary Foundation Course-II	2	-	-	2
7.	LC	CL10 (P)	SQL & MongoDB Lab	-	-	4	2
8.	LC	CL11 (P)	Machine Learning Lab	-	-	2	1
9.	PROJ	CL02	Mini Project	-	-	4	2
10.	LLC	LLC03	Liberal Learning Course -III		-	2	0*
11.	SBC	CL02 (P)	Programming with Java Script			2	1
12.	MLC	MLC03	Environmental Studies	1	-	I.	Audit
13.	PROJ	_	Internship-I	Credit Sixth	to Semes	be a ster.	dded in
		Total Aca	demic Engagement and Credits	15	2 31	14	22

Electives-I	Humanities and Social Sciences Open Courses – II	Liberal Learning Course -III
(A) Fuzzy Sets & Theory	(A) Industrial Psychology	(A) Sociology
(B) Advanced Computer Architecture	(B) Personnel Psychology	(B) Interior Design
(C) Cyber Security	(C) Buisness Comunciation	(C) Graphic Design
(D) Information Storage Management	(D) Finance for Engineers	(D) Animation
	(E) Stress Management	(E) Corporate Culture

\* LLC 03 will be evaluated in VI Semester.

- Interdisciplinary Foundation Course-II, EC01
  - Sensors and Automation

### **IPS Academy, Institute of Engineering & Science** (A UGC Autonomous Institute, Affiliated to RGPV, Bhopal) Scheme Based on AICTE Flexible Curriculum **Bachelor of Technology (B.Tech.) Department of Computer Science & Engineering-AIML** Semester-V

#### **Prerequisite:**

#### **Course Objective:**

The main objective of this course is to understand fundamental of data base management system.

#### Module 1:

Introduction to DBMS, File system vs DBMS, Advantages of database systems, Database System architecture, Data models, Schemas and instances, Data independence, Functions of DBA and designer, Design issues, Entity-Relationship model: Basic concepts, Design process, E-R diagrams, weak entity sets, extended E-R features-generalization, specialization and aggregation.

#### Module 2:

Structure of relational databases, Relation algebra fundamental operators and syntax, relational algebra queries, Tuple calculus, Keys, Types of Keys.

SOL: Data retrieval queries, Data extraction from single, multiple tables equi-join, nonequijoin, self-join, outer join. Usage of like, any, all, exists, in Special operators. DDL, DML, integrity constraints, Complex queries, Referential integrity,

#### Module 3:

Data Base Design: Introduction to normalization, Normal forms, Functional dependency, Types of FD, closure of attributes, irreducible set of FD, Decomposition, Dependency preservation and lossless join, problems with null valued and dangling tuples, multivalve dependencies.

#### Module 4:

Transaction Processing Concepts:- Transaction system, ACID Property, Testing of Serializability, Serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures. Log based recovery. Concurrency Control Techniques: Concurrency Control, locking Techniques for concurrency control, time stamping protocols for concurrency control, validation-based protocol, Recovery with concurrent transaction.

#### Module 5:

Data Storage and Indexes-file organizations, primary, secondary index structures, various index structures-hash-based, dynamic hashing techniques, multi-level indexes, B and B+ trees. Cursor management: nested and parameterized cursors, Triggers, Types of triggers.

#### (8hrs.)

# (11hrs.)

#### (08 hrs.)

#### (06hrs.)

### (07hrs.)

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#### Semester-V

#### **Course Outcomes:**

- 1. Describe basic concepts of DBMS and Design ER model.
- 2. Solve queries using Relational Algebra and SQL.
- 3. Understanding of functional dependencies and Explain normalization by applying Normalizations techniques to database.
- 4. Explain basic the fundamental concepts of transaction processing and concurrency control.
- 5. Understanding various storage systems and indexing.

- 1. Date CJ, "An Introduction to Database System", Pearson Educations, 8thEdition,2003.
- 2. Korth, Silbertz, Sudarshan, "Fundamental of Database System", McGraw Hill, 5thEdition,2006.
- 3. Peter Rob, "Database System: Design Implementation & Management", Cengage Learninig 4<sup>th</sup>Edition,2000.
- 4. Elmasri, Navathe, "Fundamentals of Database Systems", Pearson Educations, 7thEdition2017.
- 5. Atul Kahate, "Introduction to Database Management System", Pearson Educations, 2004.
- 6. Oracle 9i Database Administration Fundamental-I, Volume I, Oracle Press, TMH.
- 7. Paneerselvam," Database Management System", PHI Learning, 3rdEdition,2018.
- J.D. Ullman, "Principles of Database and Knowledge- Base Systems", Computer Science Press, 2<sup>nd</sup>Edition1988.
- 9. Serge Abiteboul, Richard Hull, Victor Vianu, "Foundations of Databases", Addison-Wesley, 1995.

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### **Bachelor of Technology (B.Tech.)**

**Department of Computer Science & Engineering-AIML** 

Semester-V

PCC-CL11Foundation of Machine Learning2L: 1T(4hrs.)Credit	ts: 3
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### **Prerequisite:**

#### **Course Objective:**

- 1. Students understand issues and challenges of Machine Learning.
- 2. Should be able to select data, model selection, model complexity etc.
- 3. Understanding of the strengths and weaknesses of many popular machine learning approaches.

#### Module 1:

Brief Introduction to Machine Learning, Supervised Learning, Unsupervised Learning, Reinforcement Learning

#### Module 2:

Data Link Probability Basics, Linear Algebra, Statistical Decision Theory - Regression & Classification, Bias - Variance Linear Regression Multivariate Regression

#### Module 3:

Dimensionality Reduction, Subset Selection, Shrinkage Methods, Principle Components, Regression Linear Classification, Logistic Regression, Linear Discriminant Analysis Optimization, Classification-Separating Hyperplanes Classification

#### Module 4:

Perceptron Learning, ANN Early models, Back Propagation: Initialization, Training & Validation, Parameter Estimation: Maximum Likelihood Estimation, Bayesian Parameter Estimation, Decision Trees, Evaluation Measures, Hypothesis Testing, Ensemble Methods, **Graphical Models** 

#### Module 5:

Clustering, Gaussian Mixture Models, Spectral Clustering Ensemble Methods Learning Theory, Reinforcement Learning, Introduction to Hypothesis Testing.

# (10hrs.)

(08hrs.)

(06hrs.)

#### (08 hrs.)

#### (06hrs.)

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# Department of Computer Science & Engineering-AIML Semester-V

#### **Course Outcomes:**

- 1. Identify the characteristics of data sets and compare the trivial data and big data for various applications.
- 2. Understand machine learning techniques and computing environment that are suitable for the applications under consideration.
- 3. Solve problems associated with batch learning and online learning, and the big data characteristics such as high dimensionality, dynamically growing data and in particular scalability issues.
- 4. Develop scaling up machine learning techniques and associated computing techniques and technologies for various applications.
- 5. Implement various ways of selecting suitable model parameters for different machine learning techniques.

- 1. Machine Learning Tom M. Mitchell, MGH
- 2. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor&Francis.
- 3. Machine Learning, Saikat Dull, S. Chandramouli, Das, Pearson
- 4. Machine Learning with Python for Everyone, Mark Fenner, Pearson
- 5. Machine Learning, Anuradha Srinivasa Raghavan, Vincy Joseph, Wiley
- 6. Machine Learning with Python, U Dinesh Kumar Manaranjan Pradhan, Wiley
- 7. Python Machine Learning, Sebastian Raschka, Vahid Mirjalili, Packt Publishing

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#### **Bachelor of Technology (B.Tech.)**

**Department of Computer Science & Engineering-AIML** 

Semester-V

PCC-CL12	Neural Network	3L: 0T(3hrs.)	Credits: 3
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#### **Prerequisite:**

#### **Course Objective:**

- 1. Understand the basics of artificial neural networks.
- 2. Learn about single-layer networks like the perceptron and supervised learning methods, including back propagation for multilayer networks.
- 3. Explore unsupervised learning networks and their ability to discover features and patterns in data and apply artificial neural networks to real-world problems.

#### Module 1:

Artificial Neural Networks (ANN) and their biological roots and motivations. ANNs as numerical data/signal/image processing devices. a summing dendrite, synapses and their weights, pre- and post- synaptic signals, activation potential and activation function. Excitatory and inhibitory synapses. The biasing input. Types of activating functions. Encoding (training phase) and decoding (active phase). Taxonomy of neural networks: - feed forward and recurrent networks with supervised and unsupervised learning laws laws, static & dynamic processing systems, basic data structures: mapping of vector spaces, clusters, principal components.

#### Module 2:

Linear Networks: - Adaline - the adaptive linear element, Linear regression. The Wiener-Hopf equation. The Least-Mean-Square (Widrow-Hoff) learning algorithm. Method of steepest descent. Adaline as a linear adaptive filter. A sequential regression algorithm. Multi-Layer Feedforward Neural Networks: - Multi-Layer Perceptrons. Supervised Learning. Approximation and interpolation of functions. Back-Propagation Learning law. Fast training algorithms. Applications of multilayer Perceptrons: Image coding, Paint-quality inspection, Nettalk. Module 3: (10hrs.)

Self-Organising Systems: -Unsupervised Learning, Pattern clustering, Topological mapping, Kohonen's self-organizing map, Local learning laws-Generalised Hebbian Algorithm. The Oja's and Sanger's rules. Principal component analysis - Karhunen-Loeve transform.

#### Module 4:

Feedback neural networks: - Pattern storage and retrieval, Hopfield model, Boltzmann machine, Recurrent neural networks.

#### Module 5:

Radial basis function networks: - Regularization theory, RBF networks for function approximation, RBF networks for pattern classification.

Kernel methods for pattern analysis: - Statistical learning theory, Support vector machines for pattern classification, Support vector regression for function approximation, Relevance vector machines for classification and regression.

#### (08hrs.)

#### (06hrs.)

#### (06hrs.)

(08hrs.)

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal) Scheme Based on AICTE Flexible Curriculum Bachelor of Technology (B.Tech.) Department of Computer Science & Engineering–AIML Semester–V

#### **Course Outcomes:**

- 1. Ability to understand the concepts of Neural Networks.
- 2. Ability to select the Learning Networks in modeling real world systems.
- 3. Understand training of recurrent Hopfield networks and associative memory concepts.
- 4. Ability to use an efficient algorithm for Deep Models.
- 5. Ability to apply optimization strategies for large scale applications.

- 1. B.Yegnanarayana, Artificial Neural Networks, Prentice Hall of India.
- 2. Satish Kumar, Neural Networks A Classroom Approach, Tata McGraw-Hill.
- 3. S.Haykin, Neural Networks A Comprehensive Foundation, Prentice Hall.

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#### **Bachelor of Technology (B.Tech.)**

**Department of Computer Science & Engineering-AIML** 

Semester-V

PEC-CL01 (A)	Fuzzy Sets & Theory	3L: 0T(3hrs.)	Credits: 3
PEC-CL01 (A)	Fuzzy Sets & Theory	3L: 0T(3hrs.)	Credits: 3

#### **Prerequisite:**

**Course Objective:** This course introduces students to the basic concepts of modeling in systems using fuzzy sets. The concepts of fuzzy sets are introduced and their role in applications of semantic interpreters, control systems and reasoning systems.

#### Module 1: FUZZY SETS

Basic concepts of fuzzy set -t-norm -t-conorms - Membership function  $-\alpha$ -cut - Algebra of fuzzy sets - Distance between fuzzy sets - Fuzzy relation.

#### Module 2: FUZZY ARITHMETIC

Fuzzy numbers – Arithmetic operations of fuzzy numbers – Extension principle – Interval arithmetic – Defuzzification.

#### Module 3: FUZZY FUNCTION

Fuzzy valued functions – Fuzzy equations, fuzzy inequalities, system of fuzzy linear equations – Maximum and minimum of fuzzy functions.

#### Module 4: FUZZY LOGIC

Classical Logic – Multi-valued Logics – Fuzzy Propositions – Fuzzy Quantifiers – Linguistic hedges – Inference from conditional Fuzzy proposition.

#### Module 5: APPLICATIONS OF FUZZY SET THEORY

Fuzzy sets in Decision making – Optimization in Fuzzy environment – Fuzzy set application in image processing – Fuzzy set application in pattern reorganization.

# (10hrs.)

#### (8hrs.)

### (8hrs.)

(9hrs.)

(10hrs.)

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#### **Bachelor of Technology (B.Tech.)**

Department of Computer Science & Engineering-AIML Semester-V

#### **Course Outcomes:**

- 1. Understand basic knowledge of the fuzzy sets, operations and their properties.
- 2. Understand the fundamental concepts of Fuzzy functions and Fuzzy logic.
- 3. Apply the concepts of Fuzzy sets in image processing, pattern reorganization and decision making.
- 4. Apply the concepts of Fuzzy logic in image processing.
- 5. Identify the applications of fuzzy sets.

- 1. Didier Bubois and Henri Prade, "Fuzzy sets and systems", Academic Press.
- 2. James J Buckley, Esfandiar Eslami, "An Introduction to Fuzzy logic and Fuzzy sets" (Springer ).
- 3. H.J.Zimmernman, "Fuzzy set theory and application" (Allied Publication in Association with KLUWER).

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# **Bachelor of Technology (B.Tech.)**

**Department of Computer Science & Engineering-AIML** 

Semester-V

PEC-CL01 (B)	Advanced Computer Architecture	3L: 0T(3hrs.)	Credits: 3
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### **Prerequisite:**

#### **Course Objective:**

1. Understand parallel processing concepts and their applications.

2. Implement hardware for arithmetic operations and analyze the performance of different scalar computers.

3. Develop pipelining for instruction sets and compare the performance of pipelined versus non-pipelined processors.

#### Module 1:

Flynn's Classification, System Attributes to Performance, Parallel computer models -Multiprocessors and multicomputer, Multi vector and SIMD Computers. Data and resource dependencies, Hardware and software parallelism, Program partitioning and scheduling, Grain size and latency, Control flow, data flow and Demand driven mechanisms. Static interconnection networks, Dynamic interconnection Networks: Bus Systems, Crossbar Switch, Multiport Memory, Multistage and Combining Networks.

#### Module 2:

Instruction set architecture, CISC Scalar Processors, RISC Scalar Processors, VLIW architecture, Memory Hierarchy, Inclusion, Coherence and Locality, Memory capacity planning. Interleaved memory organization-memory interleaving, pipelined memory access, Bandwidth and Fault Tolerance. Backplane Bus System: Backplane bus specification, Addressing and timing protocols, Arbitration transaction and interrupt. Module 3: (**10hrs.**)

Linear pipeline processor, Nonlinear pipeline processor, Instruction pipeline design, Mechanisms for instruction pipelining, pipeline hazards, Dynamic instruction scheduling -score boarding and Tomasulo's algorithm, Branch handling techniques, Arithmetic Pipeline Design, Static arithmetic pipeline, Multifunctional arithmetic pipelines. Superscalar pipeline design, Super pipeline processor design.

#### Module 4:

Cache coherence, Snoopy protocols, Directory based protocols. Message routing schemes in multicomputer networks, deadlock, and virtual channels. Vector Processing Principles, Vector instruction types, Vector-access memory schemes. Vector supercomputer architecture, SIMD organization: distributed memory model and shared memory model. Principles of Multithreading: Multithreading Issues and Solutions, Multiple-Context Processors.

#### Module 5:

Parallel Programming Models, Shared-Variable Model, Message-Passing Model, Data-Parallel Model, Object-Oriented Model, Functional and Logic Models, Parallel Languages and Compilers, Language Features for Parallelism, Parallel Programming Environment, Software Tools, and Environments.

### (06hrs.)

(08hrs.)

# (09hrs.)

### (10hrs.)

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal) Scheme Based on AICTE Flexible Curriculum Bachelor of Technology (B.Tech.) Department of Computer Science & Engineering–AIML Semester–V

#### **Course Outcomes:**

- 1. Understand the Concept of Parallel Processing and its applications
- 2. Implement the Hardware for Arithmetic Operations
- 3. Analyze the performance of different scalar Computers
- 4. Develop the Pipelining Concept for a given set of Instructions
- 5. Distinguish the performance of pipelining and non-pipelining environment in a processor.

- 1. Advanced Computer Architecture, Kai Hwang, McGraw-Hill, India.
- 2. Computer System Architecture, Morris M. Mano, 3rd edition, Pearson/Prentice Hall India.
- 3. Computer Organization and Achitecture, William Stallings ,8th edition, PHI
- 4. Computer Organization, Carl Hamachar, Vranesic, Zaky, 5th edition, McGraw Hill.

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# **Bachelor of Technology (B.Tech.)**

**Department of Computer Science & Engineering-AIML** 

Semester-V

PEC-CL01 (C)	Cyber Security	3L: 0T(3hrs.)	Credits: 3	
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#### **Prerequisite:**

### **Course Objective:**

Analyze and resolve security issues in an organization to secure an IT infrastructure.

#### Module 1:

Introduction of Cyber Crime, Challenges of cyber-crime, Classifications of Cybercrimes: E-Mail Spoofing, Spamming, Internet Time Theft, Salami attack/Salami Technique.

### Module 2:

Web jacking, Online Frauds, Software Piracy, Computer Network Intrusions, Password Sniffing, Identity Theft, cyber terrorism, Virtual Crime, Perception of cyber criminals: hackers, insurgents and extremist group etc. Web servers were hacking, session hijacking.

#### Module 3:

Cyber Crime and Criminal justice: Concept of Cyber Crime and the IT Act, 2000, Hacking, Teenage Web Vandals, Cyber Fraud and Cheating, Defamation, Harassment, and E- mail Abuse, Other IT Act Offences, Monetary Penalties, jurisdiction and Cyber Crimes, Nature of Criminality, Strategies totackle Cyber Crime and Trends.

#### Module 4:

The Indian Evidence Act of 1872 v. Information Technology Act, 2000: Status of Electronic Records as Evidence, Proof and Management of Electronic Records; Relevancy, Admissibility and Probative Value of E-Evidence, Proving Digital Signatures, Proof of Electronic Agreements, Proving Electronic Messages.

### Module 5:

Tools and Methods in Cybercrime: Proxy Servers and Anonymizers, Password Cracking, Key loggers and Spyware, virus and worms, Trojan Horses, Backdoors, DoS and DDoS Attacks, Buffer and Overflow, Attack on Wireless Networks, Phishing: Method of Phishing, Phishing Techniques. Introduction to KALI Linux.

#### (10hrs.)

(10hrs.)

#### (08hrs.)

#### (06hrs.)

# (08hrs.)

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# **Bachelor of Technology (B.Tech.)**

Department of Computer Science & Engineering-AIML Semester-V

#### **Course Outcomes:**

- 1. Define and explain the concepts of cybercrime and its classification.
- 2. Delineate the components online frauds, intrusions, virtual crimes, and hacking.
- 3. Knowledge of different acts in cybersecurity
- 4. List the various parts of IT act related to electronic records.
- 5. Knowledge of different Cyber Security tools.

- 1. Jonathan Clough, "Principles of Cyber-crime", Cambridge University Press, 2ndEdition, 2015.
- 2. John R. Vacca, "Computer Forensics: Computer Crime Scene Investigation", Charles River Media, 2<sup>nd</sup>Edition, 2005.
- 3. Vivek Sood "Cyber Law Simplified", TMH,2001.
- 4. Nina Godbole, Sunit Belapure, "Cyber Security", Wiley-India
- 5. William Hutchinson, Mathew Warren, "Information Warfare: Corporate attack and defense in digital world", Elsevier, Reed International and Professional Publishing Ltd,2001
- 6. Harish Chander, "Cyber Laws and IT Protection", Prentice Hall India Learning PrivateLimited, 2012

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# **Bachelor of Technology (B.Tech.)**

**Department of Computer Science & Engineering-AIML** 

Semester-V

PEC-CL01 (D)	Information Storage & Management	3L: 0T(3hrs.)	Credits: 3
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#### **Prerequisite:**

### **Course Objective:**

To introduce solutions available for data storage, Core elements of a data center infrastructure, role of each element in supporting business activities

#### Module 1:

Introduction to Storage Technology: Data proliferation, evolution of various storage technologies, Overview of storage infrastructure components, Information Lifecycle Management, Data categorization.

#### Module 2:

Storage Systems Architecture: Intelligent disk subsystems overview, Contrast of integrated vs. modular arrays, Component architecture of intelligent disk subsystems, Disk physical structure components, properties, performance, and specifications, RAID levels & parity algorithms, hot sparing, Front end to host storage provisioning, mapping, and operation.

#### Module 3:

Introduction to Networked Storage: JBOD, DAS, NAS, SAN & CAS evolution, and comparison. Applications, Elements, connectivity, standards, management, security and limitations of DAS, NAS, CAS & SAN.

#### Module 4:

Hybrid Storage solutions; Virtualization: Memory, network, server, storage & appliances. Data center concepts & requirements, Backup & Disaster Recovery: Principles Managing & Monitoring: Industry management standards (SNMP, SMI-S, CIM), standard framework applications, Key management metrics (Thresholds, availability, capacity, security, performance).

#### Module 5:

Information storage on cloud: Concept of Cloud, Cloud Computing, storage on Cloud, Cloud Vocabulary, Architectural Framework, Cloud benefits, Cloud computing Evolution, Applications & services on cloud, Cloud service providers and Models, Essential characteristics of cloud computing, Cloud Security and integration.

#### (10hrs.)

# (08hrs.)

# (06hrs.)

# (10hrs.)

### (06hrs.)

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Department of Computer Science & Engineering-AIML Semester-V

#### **Course Outcomes:**

- 1. To Understand the Concept of Information Storage and Data Centre Environment.
- 2. To understand about Data Protection.
- 3. To Understand Fiber Channel SAN.
- 4. To describe the different backup and recovery topologies and their role in providing disaster recovery and business continuity capabilities.
- 5. To Understand Cloud Computing.

- 1. G. Somasundaram & Alok Shrivastava (EMC Education Services) editors, "Information Storage and Management: Storing, Managing, and Protecting Digital Information", Wiley India,2009.
- 2. Ulf Troppens, Wolfgang Mueller-Friedt, Rainer Erkens, Rainer Wolafka, Nils Haustein, "Storage Network explained: Basic and application of fiber channels, SAN, NAS, iSESI, INFINIBAND and FCOE", WileyIndia.
- 3. John W. Rittinghouse and James F. Ransome, "Cloud Computing: Implementation, Management and Security", CRC Press, Taylor Frances Pub.1stEdition,2017
- 4. Nick Antonopoulos, Lee Gillam, "Cloud Computing: Principles, System & Application", Springer.
- 5. Anthony T. Velete, Toby J.Velk, and Robert Eltenpeter, "Cloud Computing: A practical Approach", McGraw-Hill Education (India) Pvt. Limited, 2009
- 6. Dr. Kumar Saurabh, "Cloud Computing: Insight into New Era I", Wiley India Pvt. Limited, 2011.

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### **Bachelor of Technology (B.Tech.)**

**Department of Computer Science & Engineering-AIML** 

Semester-V

HSMC-HS06 (A)	Industrial Psychology	2L: 0T(2hrs.)	Credits: 2
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#### **Prerequisite:**

#### **Course Objective:**

The objective of this course is to develop an understanding of the origin and potential of Industrial Psychology and human behaviour in students.

#### Module 1:

**Introduction to Industrial Psychology:** Definition, Origin, and scope of Industrial Psychology, Principles of Industrial Psychology, Major field in industrial psychology, Prominent roles of Industrial Psychologist, , Influence of industrialization on human behaviour, Research Methods in Industrial psychology.

#### Module 2:

**Group Dynamics and Leadership:** Group dynamics Concepts, Group, teams and team work, Theories and styles of leaderships, Conflict and Conflict Resolution.

#### Module 3:

**Job satisfaction and Work Motivation:** Definition and meaning of Job Satisfaction, Effects of job satisfaction on work outcomes, Industrial conditions, Definition of motives and nature of work motivation, Theories of motivation

#### Module 4:

**Performance Review-** Job analysis and Appraisal and Job evaluation, Measurement of Job Performance, Performance Appraisal Process, Team Appraisals and the Future of Performance Appraisals; Legal Concerns in Employee Performance Appraisals, Placement and Training of Employees

#### Module 5:

**Work Environment:** Physical and psychological barrier, accidents and safety protocol, Emotional wellbeing, work life balance, Job analysis, Work schedule, Fatigue, monotony, growth and benefits.

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#### Semester-V

#### **Course Outcomes:**

- 1. CO 1: Students will learn the basic attributes of Personality.
- 2. CO 2: Students will learn the basic attributes of industry and management.
- 3. CO 3: Students will develop knowledge about group dynamics and leadership styles.
- 4. CO 4: Students will learn to deal with dynamics of diverse workplace, conflict and professional proficiency.
- 5. CO 5: Students will develop knowledge about task dynamics, accidents and safety measures.

- 1. Miner J.B.(1992) Industrial / Organizational Psychology. New York: McGraw Hill
- Daniel Katz and Robert L Kahn (1978). The Social psychology of Organizations, 2<sup>nd</sup> edition. Wiley
- 3. Arnold and John (2016) Work Psychology: Understanding Human Behaviour in the Work Place.6<sup>th</sup> Edition. Trans Atlantic Publications, Inc.
- 4. Cooper C.L. and Locke E.A. (2000). Industrial and Organizational Psychology: Linking Theory with Practice. Wiley
- 5. Blum and Naylor (1982). Industrial Psychology: Its Theoretical and Social Foundations. CBS Publication.
- 6. Gisbert Pascal,(1972). Fundamentals of Industrial Sociology. New Delhi Tata McGraw Hill
- Mamoria C.B. and Mamoria S.(2022) Dynamics of Industrial Relations in India. 13<sup>th</sup> Edition. Himalayan Publishing House
- 8. Conte J.M. and Landy F.J.(2018) Work in the 21st century. 6th Edition. Wiley
- 9. Adrian Furnham (2008). Personality and Intelligence at Work. Routledge
- 10. John Chandler (2016) Identity at Work. Routledge
- 11. Craig C. (2008). Work Motivation in Organizational Behaviour. Taylor and Francis
- 12. Wendy Hollway (1991). Work psychology and Organizational behaviour. Sage Publications ltd.

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### **Bachelor of Technology (B.Tech.)**

**Department of Computer Science & Engineering-AIML** 

Semester-V

#### Prerequisite:

#### **Course Objective:**

The objective of this course is to enable students to understand and learn financial key concepts.

#### Module 1:

Basics of Accounting: Introduction to Accounting, Definition and Purpose of Accounting, Accounting Principles and Concepts, The Accounting Cycle, Users of Financial Information. Understanding Debit and Credit, Double-Entry System, Rules of Debit and Credit, Practice Exercises

#### Module 2:

Books of Accounts: Introduction to Books of Accounts, Types of Books of Accounts-Journal, Ledger, Subsidiary Books, Journal Entries-Recording Transactions in the Journal. Posting to the Ledger, Balancing Ledger Accounts, Preparation of a Trial Balance, Identifying and Correcting Errors.

#### Module 3:

Cash Flow Statements: Introduction to Cash Flow Statements, Purpose and Importance of Cash Flow Statements, Components of Cash Flow Statements-Operating Activities, Investing Activities, Financing Activities. Preparation of Cash Flow Statements-Direct and Indirect Methods, Analyzing Cash Flow Statements, Practical Examples and Exercises.

#### Module 4:

Assets and Liabilities: Understanding Assets, Definition and Types of Assets-Current Assets, Fixed Assets, Tangible and Intangible Assets, Valuation of Assets. Understanding Liabilities: Definition and Types of Liabilities-Current Liabilities, Long-term Liabilities, Recording and Managing Liabilities.

#### Module 5:

Comprehensive Review and Final Assessment: Review of Key Concepts- Comprehensive Review of Units 1-4,Practice Exercises and Case Studies, Mock Tests and Q&A Sessions. Final Assessments and Feedback: Final Projects and Presentations, Written and Practical Examinations, Individual Feedback and Course Evaluation

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# Department of Computer Science & Engineering–AIML Semester–V

#### **Course Outcomes:**

- 1. CO1- Understand the definition and purpose of accounting. And also grasp the concept of debit and credit.
- 2. CO2- Understand the purpose and importance of maintaining books of accounts and process of posting journal entries to the ledger.
- 3. CO3- Identify the components of cash flow statements. Enhance understanding of cash flow analysis through real-world scenarios.
- 4. CO4- Learn the definition and types of assets. Develop skills in recording liabilities accurately.
- 5. CO5- Develop presentation and communication skills.

- 1. "Accounting Principles" by Jerry J. Weygandt, Paul D. Kimmel, and Donald E. Kieso
- 2. "Financial Accounting: Tools for Business Decision Making" by Paul D. Kimmel, Jerry J. Weygandt, and Donald E. Kieso
- 3. "Principles of Accounting" by Belverd E. Needles Jr., Marian Powers, and Susan V. Crosson
- 4. "Financial & Managerial Accounting" by Carl S. Warren, James M. Reeve, and Jonathan Duchac
- 5. "Intermediate Accounting" by Donald E. Kieso, Jerry J. Weygandt, and Terry D. Warfield
- 6. "College Accounting" by John Price, M. David Haddock, and Michael Farina
- 7. "Financial Statement Analysis and Security Valuation" by Stephen H. Penman
- 8. "Cash Flow Analysis and Forecasting: The Definitive Guide to Understanding and Using Published Cash Flow Data" by Timothy Jury
- 9. "Intermediate Accounting" by David Spiceland, James Sepe, and Mark Nelson
- 10. "Accounting for Non-Accountants" by Wayne Label
- 11. "Essentials of Accounting" by Robert N. Anthony and Leslie K. Breitner
- 12. "Financial Accounting and Reporting" by Barry Elliott and Jamie Elliott
- 13. "Financial Accounting: An International Introduction" by David Alexander and Christopher Nobes
- 14. "Accounting Made Simple: Accounting Explained in 100 Pages or Less" by Mike Piper
- 15. "Accounting Demystified" by Jeffry R. Haber

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# **Bachelor of Technology (B.Tech.)**

**Department of Computer Science & Engineering-AIML** 

Semester-V

HSMC-	Strong Monogoment	<b>31</b> . <b>0T</b> ( <b>2h</b> -r <sub>2</sub> )	Creaditary 2	
HS06 (E)	Stress Management	2L: 01(2nrs.)	Creatts: 2	

#### Prerequisite:

#### **Course Objective:**

The objective of this course is to enable students to understand and learn how to use various techniques and determine the most appropriate method to aid in managing reaction to stress.

#### Module 1:

#### **Introduction to Stress**

Introduction to stress: Meaning, Definition, Eustress and Distress, Types of stress: Acute stress, Episodic Acute stress and chronic stress, Signs and Symptoms

#### Module 2:

#### **Causes of Stress**

Psychological, Social, Environmental, Academic, Family and Work stress, Adaptive and Maladaptive Behavior, Individual and Cultural Differences **Module 3**:

#### **Consequences of Stress:**

(i) Physiological Impact of stress -Autonomic Nervous System Changes, Changes in Brain, General adaptive syndrome (GAD), Quality of sleep, Diet and Health effects (ii) Psychological Impact of stress - Impaired Mental functions, Poor memory (iii) Social Impact of stress - Stressful Life Events, Social support and health

#### Module 4:

#### **Coping with Stress:**

Understanding your stress level, Role of Personality Pattern, Self Esteem, Locus of Control, Role of Thoughts Beliefs and Emotions Coping Mechanisms: - Coping Mechanisms: Appraisal focus Use of Audio and Video Aids, Cultural Activities, Autogenic Training, Biofeedback, Relaxation, Yoga and Meditation Emotional focused and Problem focused, 'Fight or Flight' Response, Stress warning signals

#### Module 5:

#### **Project based learning:**

Project report on Stress Management (Students will prepare and submit a report under the guidance of the mentors)

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# Department of Computer Science & Engineering–AIML Semester–V

#### **Course Outcomes:**

- 1. CO1- To make students acquainted with fundamentals of Stress management for the purpose of improving everyday functioning.
- 2. CO2-Students will learn various sources of stress like psychological, Social, Environmental, Academic, Family and work for the smooth functioning of day to day life.
- 3. CO3-To enable study of stress as a subjective experience and to enable practical approach with measurable levels of stress.
- 4. CO4-To provide understanding of stress whether it can be positive or negative and ways to deal with it.
- 5. CO5- Students will be able to learn through practical based approach.

- 1. Greenberg, J. S. (2017). Comprehensive Stress Management (14th edition). New York: McGraw Hill.
- 2. Roy, Sumita. (2005) Managing Stress: Handle, Control, Prevent Sterling Publisher
- 3. Davis M. (2000) The Relaxation and Stress Reduction Work Book, New Harbinger inc.
- 4. Simmons M., Daw W. (1994) Stress, Anxiety, Depression: a Practical Workbook, Winslow Press.
- 5. Tyler M. (1999) Stress Management Training for Trainers Handbook, Living with Stress Ltd
- 6. Udai, Y. (2015). Yogasan aur pranayam. New Delhi: N.S. Publications
- 7. Cooper K. (1991) Overcoming Hypertension, Bantam Books.
- 8. Hambly K., Muir A. (1997) Stress Management in Primary Care, Butterworth Heinemann.
- 9. Jones H. (1997) I'm too Busy to be Stressed, Hodder and Stoughton
- 10. Payne R. (1995) Relaxation Techniques: a Practical Handbook for Healthcare Professionals, Churchill Livingstone.
- 11. Steinmetz J. (1980) Managing Stress Before it Manages You, Bull Publishing.

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## **Bachelor of Technology (B.Tech.)**

# **Department of Computer Science & Engineering-AIML**

Semester-V

IFC-EC01	Sensors and Automation	2L: 0T(2hrs.)	Credits: 2
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**Prerequisite:** Basic Electronics, Electronics & Computer Workshop (ECW).

### **Course Objective:**

- 1. Able to Identify and Select Appropriate Sensor for a given Application.
- 2. Analyze & Design a basic circuit building block of Sensor System.
- 3. Train the students to suggest appropriate solution for Industrial automation.

#### Module 1:

**Fundamental of Sensing:** Basic Sensor Technology, Sensor classifications and characteristics, Measurement Issues and Criteria, Introduction to various Signal & Conditioning models, Introduction & Classification of Transducer, Applications of Sensor & Transducer.

#### Module 2:

**Motion, Proximity and Ranging Sensor:** Introduction to Capacitive and Inductive Displacement Sensors, LVDT, RVDT, Introduction to GPS, Bluetooth, Ultrasonic and Microwave Sensors, Laser Range Sensor (LIDAR). Optical and Radiation Sensors.

#### Module 3:

**Force, Magnetic and Heading Sensors:** Shock and Vibration Sensors, Flow and Level Sensors, Force, Load and Weight Sensors, Humidity Sensors, Machinery Vibration Monitoring Sensors, Pressure Sensors, Strain Gauge, Temperature Sensors.

### Module 4:

Advanced Sensor Technologies: Introduction to LASER, Characteristics of LASER, Types of LASER Sensors, Bar Code Sensors, Benefits of Bar Coding, RFID (Radio Frequency Identification), Biosensors, Chemical Sensors.

### Module 5:

**Industrial Automation:** Concept, Automation Components, Necessity and Working Principle, Block Schematic of Programmable Logic Controller (PLC). Input & Output Modules (AI, DI, AO, DO), Introduction to Ladder Programming, Introduction to Distributed Control Systems (DCS). Industrial Automation Leads to Industrial IoT and Industry 4.0.

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# Department of Computer Science & Engineering–AIML Semester–V

#### **Course Outcomes:**

- 1. To understand the general principles of sensors.
- 2. To describe the working principle and characteristics Motion, Proximity and Ranging Sensors.
- 3. To describe the working principle and characteristics of force, magnetic and heading sensors.
- 4. To understand the working principle & application of advanced sensor and its technology.
- 5. To apply the advanced sensor technology for industrial automation.

- 1. Jon S. Wilson, "Sensor Technology: Handbook", Elsevier, 2005.
- 2. Patranabis D, Sensors and Transducers, 2nd Edition, PHI, New Delhi, 2011.
- 3. Smart Sensors, Measurement and Instrumentation by Subhas Chandra Mukhopadhyay, Springer Book Series.
- 4. Nikolay Kirianaki, Sergey Yurish, Nestor Shpak, Vadim Deynega, "Data Acquisition and Signal Processing for Smart Sensors", John Wiley & Sons Ltd, 2002.

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#### **Bachelor of Technology (B.Tech.)**

**Department of Computer Science & Engineering-AIML** 

Semester-V

PCC-LC-CL10 (P)	SQL & Mongo DB Lab	04P (4hrs.)	Credits: 2
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#### **Prerequisite:**

#### **Course Objective:**

To introduce solutions available for data storage, Core elements of a data center infrastructure, role of each element in supporting business activities

#### Module 1:

Installation: SQL Server or Oracle or MySQL, Overview of using SQL tool, SQL Syntax, Data types in SQL: Numeric data types, Date and Time data types, Character and String data types, Unicode character string data types, Binary data types, and Miscellaneous data types, Creating Tables, Oracle and SQL Data Definition language (DDL), Data manipulation language (DML) Data Control language (DCL)

#### Module 2:

DDL Commands, Create, Alter, Drop, Truncate, and Rename. Data Definition Language Operations, Create a Database, Use Database, Rename a Database, Drop Database, Add a Column to exiting Table, Add multiple columns to existing Table, Modify an existing column, Rename a Column, Drop a Column, Truncate a Table, and Drop a Table. Integrity Constraints.

#### Module 3:

DML Commands, select, insert, update, and delete. Data Manipulation Language Operations, retrieving data from a table, inserting data into a table, updating existing data into a table, and deleting all records from a table. logical operation (and, or, not), like, wildcards, in, between, aliases, any, all, union, intersect, SQL aggregate functions, count, sum, avg, max, min, clauses: order by, group by, having.

#### Module 4:

Joins: inner join, left join, right join, full join, self-join, sub query: nested query. Correlated sub query exists, not exists, DCL commands such as grant and revoke, views: views creation and dropping. Introduction to PL/SQL, practicing on triggers - creation of trigger.

#### Module 5:

Introduction to Basics of NoSQL and MongoDB, Overview of MongoDB Architecture, CRUD Operations in MongoDB

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#### Semester-V

#### **Course Outcomes:**

- 1. Describe basic concepts of SQL and its data type.
- 2. Apply data definition language command and analyze its output.
- 3. Apply data manipulation language command and analyze its output.
- 4. Apply data control language command, PLSQL and analyze its output.
- 5. Understand the fundamentals of MongoDB, including its architecture and core concepts, and perform basic CRUD operations to manage databases and collections within a NoSQL environment.

#### **List of Practical's:**

- 1. Introduction to Oracle and SQL
- 2. Write the queries for Data Definition language (DDL)
- 3. Write the queries for Data manipulation language (DML)
- 4. Use of various types of Integrity Constraints
- 5. Write the queries for Data Control language (DCL)
- 6. Use of SELECT command with different clauses.
- 7. Write SQL queries using logical operation (AND, OR, NOT)
- 8. Write SQL queries for aggregate functions (Max, Min, Sum, Avg, and Count)
- 9. Write SQL queries for group by and having.
- 10. Write SQL queries for sub queries and nested queries.
- 11. Write an SQL query to implement JOINS.
- 12. Write SQL queries to create views.
- 13. Write program by the use of PL/SQL
- 14. Installing and setting up MongoDB.
- 15. Creating and dropping databases & collections.

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# **Bachelor of Technology (B.Tech.)**

**Department of Computer Science & Engineering–AIML** 

Semester-V

PCC-LC-CL11 (P)Machine Learning Lab02P (2hrs.)Credits: 1	PCC-LC-CL11 (P)	Machine Learning Lab	02P (2hrs.)	Credits: 1
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### **Prerequisite:**

### **Course Objective:**

- 1. Provide a comprehensive understanding of machine learning concepts, including supervised and unsupervised learning, and their applications.
- 2. Develop proficiency in applying various machine learning algorithms and techniques, such as regression, clustering, and classification, to solve real-world problems.
- 3. Enhance practical skills in using Python and relevant libraries to implement and evaluate machine learning models.

#### Module 1:

- Introduction to Machine Learning
- Supervised Learning Concepts
- Linear Regression
- Evaluation Metrics for Regression

#### Module 2:

- Introduction to Unsupervised Learning
- Clustering Techniques
- K-means Clustering
- Visualization of Clusters

#### Module 3:

- Introduction to Linear Algebra
- Matrix Operations
- Applications of Linear Algebra in Machine Learning

#### Module 4:

- Introduction to Classification
- Logistic Regression
- Binary Classification
- Multi-class Classification
- Evaluation Metrics for Classification

#### Module 5:

- Introduction to Artificial Neural Networks (ANN)
- Building and Training ANNs
- Introduction to Gaussian Mixture Models (GMM)
- Comparing Clustering Techniques

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Department of Computer Science & Engineering-AIML Semester-V

#### **Course Outcomes:**

1. Students will be able to understand the basics of machine learning and implement linear regression models, evaluating their performance using appropriate metrics.

2. Students will be able to apply unsupervised learning techniques, particularly K-means clustering, and visualize clusters to interpret data patterns.

3. Students will gain proficiency in performing linear algebra operations and applying these concepts to machine learning problems.

4. Students will be able to implement and evaluate logistic regression models for both binary and multi-class classification tasks.

5. Students will be able to build and train artificial neural networks and compare clustering techniques, including Gaussian Mixture Models and K-means, to analyze their effectiveness.

### **List of Practical's:**

1. Implement a linear regression model using python.

2. Perform K-means clustering on the Iris dataset and visualize the clusters using a scatter plot.

3. Perform basic linear algebra operations using NumPy, such as matrix multiplication and inversion.

4. Implement logistic regression for binary classification on the Iris dataset (using only two classes for simplicity).

5. Implement logistic regression for multi-class classification on the Iris dataset and evaluate its performance using a confusion matrix.

6. Demonstrate how to build a simple Artificial Neural Network (ANN) using Keras to classify images from the MNIST dataset, which contains handwritten digits from 0–9.

7. Implement K-means clustering using Python.

8. Implement naive baye's theorem to classify the English text.

9. Implement an algorithm to demonstrate the significance of genetic algorithm.

10. Implement the finite words classification system using Back-propagation algorithm.

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### **Bachelor of Technology (B.Tech.)**

**Department of Computer Science & Engineering-AIML** 

Semester-V

PROJ-CL02 (P)	Mini Project	04P (4hrs.)	Credits: 2

**Prerequisite:** Knowledge of programming languages, databases, software engineering, problem-solving, teamwork, communication, project planning, and relevant tools and technologies.

### **Course Objective:**

To provide computer science and engineering students with hands-on experience in project development, enhancing their technical, problem solving, teamwork, and project management skills while applying theoretical knowledge to real-world challenges.

#### Module 1:

Introduction to mini projects, emphasizing real-world applications and problem-solving. Students brainstorm and generate project ideas, conduct feasibility studies, and write detailed proposals covering objectives, scope, literature review, methodology, and expected outcomes. The module concludes with the proposal approval process, involving presentation to and feedback from faculty.

#### Module 2:

Focuses on project planning, defining tasks, setting milestones, and creating timelines. Students manage resources, estimate budgets, and form teams, assigning roles and responsibilities. Detailed system design is covered, including high-level architecture, detailed design (UML diagrams, flowcharts), and database design (ER diagrams, normalization, and indexing).

#### Module 3:

Students set up development environments, adhere to coding standards, and develop project modules, integrating front-end and back-end components. User interface design, including prototyping and user experience, is emphasized. The module also covers comprehensive testing phases: unit testing, integration testing, and system testing.

#### Module 4:

Teaches technical documentation, including user manuals and comprehensive project reports. Students submit regular progress reports and prepare a final project report. Quality assurance practices are covered, focusing on compliance with standards, peer reviews, and effective bug tracking and management techniques.

#### Module 5:

Students prepare and deliver project presentations, highlighting key aspects and results. They conduct live project demonstrations and engage in Q&A sessions. The module includes collecting feedback from evaluators, submitting the final report, and reflecting on the learning experience, discussing potential improvements and future project scope.

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#### **Course Outcomes:**

- 1. Devise project ideas, conduct feasibility studies, write, and present proposals, incorporating feedback.
- 2. Develop project plans, set milestones, estimate budgets, form teams, and create detailed system designs.
- 3. Develop modules, follow coding standards, and perform comprehensive testing.
- 4. Prepare documentation, submit progress reports, ensure quality, and manage bug tracking effectively.
- 5. Ability to demonstration of project, gather feedback from evaluators, submit project reports with software engineering standards.

- 1. Project Management: A Systems Approach to Planning, Scheduling, and Controlling, 13th Edition, Harold Kerzner, ISBN: 978-1-119-80537-3
- 2. "Software Engineering: A Practitioner's Approach" by Roger S. Pressman.
- 3. "Software Engineering" by Ian Sommerville.
- 4. "Software Quality Assurance: Principles and Practice" by Nina S. Godbole.

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### **Bachelor of Technology (B.Tech.)**

**Department of Computer Science & Engineering-AIML** 

Semester-V

SBC-CL02 (P)Programming with Java Script021	P (2hrs.)	Credits: 1
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### **Prerequisite:**

#### **Course Objective:**

- 1. Understand JavaScript Fundamentals and Syntax.
- 2. Master JavaScript Data Types, Operators, and Control Structures.

#### Module 1:

General overview of JavaScript, JavaScript history, Relation between JavaScript and ECMA Script, Versions of JavaScript. Syntax review, Keywords and reserved words, Variable declaration, Variable scope, Block scope.

#### Module 2:

Data Types: Primitive values, Reference values, Types, Type conversion. Expressions (arithmetic, relational, logical, assignment and others), and Operators overview.

#### Module 3:

Control structures: Flow control and conditionals, Loops, and iteration, Jumps. Error handling: Throwing errors, Error handling.

#### Module 4:

Numbers: Number literals, Number object, Number methods, Math object, Date object, Working with Numbers. Strings: String literals, String object, String methods, Working with Strings. Arrays: Creating and populating Arrays, Array methods, Working with Arrays.

#### Module 5:

Functions: Defining functions, Calling functions, Functions as values, Arguments and parameters, Function scope, Closures, Arrow functions. Regular Expressions: Creating regular expressions, RegExp object and its methods, String methods for matching patterns.

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# Department of Computer Science & Engineering-AIML Semester-V

#### **Course Outcomes:**

- 1. Understand JavaScript's historical context, its relationship with ECMA Script standards, and differentiate between JavaScript versions.
- 2. Proficiently use JavaScript data types (primitive and reference), apply type conversion techniques, and use various operators and expressions effectively.
- 3. Confidently utilize control structures (conditional statements, loops) and error handling mechanisms to write robust JavaScript code.
- 4. Learn to work adeptly with JavaScript number literals, methods of Number and Math objects, manipulate strings, and manage arrays effectively.
- 5. Demonstrate proficiency in defining and invoking functions, understanding function scope and closures, using arrow functions, and applying regular expressions for pattern matching.

### Suggested idea for Practical's:

- 1. Research and present a timeline of major JavaScript versions and their features.
- 2. Compare ECMA Script versions (e.g., ES5, ES6) and discuss their impact on JavaScript development.
- 3. Create examples demonstrating the use of JavaScript syntax including variables, operators, and statements.
- 4. Identify and explain the use of keywords and reserved words in JavaScript.
- 5. Write code snippets to demonstrate global scope, function scope, and block scope in JavaScript.
- 6. Contrast variable hoisting and its implications with block-scoped variables (let and const).
- 7. Develop exercises illustrating implicit and explicit type conversion in JavaScript.
- 8. Compare coercion between primitive values and reference values.
- 9. Construct practical scenarios using if, else if, and switch statements.
- 10. Develop exercises using for, while, and do-while loops to iterate over arrays and objects.
- 11. Develop exercises to manipulate string literals and utilize String object methods like slice, indexOf, and replace.
- 12. Create exercises to demonstrate array creation, population, and manipulation using methods like push, pop, map, and filter.
- 13. Develop practical exercises to define functions with parameters and return values.
- 14. Create exercises to build regular expressions for pattern matching.

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### **Bachelor of Technology (B.Tech.)**

**Department of Computer Science & Engineering-AIML** 

Semester-V

MLC-MLC03	<b>Environmental Studies</b>	1L:0T (1hrs.)	Credits: Audit	

#### **Prerequisite:**

#### **Course Objective:**

Provide knowledge about environment and types of pollution including environmental systems, air, water, soil, and their interactions. Learning strategies and technologies to prevent, control, or mitigate pollution in air, water, and soil, aiming for sustainable development. Familiarizing students with environmental laws, regulations, and policies at local, national, and international levels.

#### Module 1:

**Introduction:** Environmental pollution, Importance of environmental pollution control. Role of environmental engineer.

#### Module 2:

Water Pollution: Classification, sources & effect of water pollutant on human being & ecology. Sampling, measurement & standards of water quality. Determination of organic and inorganic matters. Primary treatment, Secondary treatment, Tertiary treatment. Recovery of materials from process effluents.

#### Module 3:

**Air pollution:** Sources & effect on man & environment. Dispersion of air pollutants. Air pollution sampling & measurement. Source correction methods for air pollution control. Cleaning of gaseous effluents, Particulate emission control, Air pollution control equipment.

#### Module 4:

**E-Waste**: Definition, Classification, Cause, effects and control measures of e-waste, global trade issues of e-waste, Recycling method of e-waste & its benefit.

#### Module 5:

**Environment Impact & Protection Act Environment**: Air (Prevention and Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act; Issues involved in enforcement of environmental legislation; Public awareness. Environmental Impact Assessment. Measuring environmental impacts and policies for the regulation of environmental impacts.

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Department of Computer Science & Engineering-AIML Semester-V

#### **Course Outcomes:**

- 1. Understand and explain the various types of environmental pollution.
- 2. Classify & analyze the effects of water pollutants on human health and ecosystems.
- 3. Understand the dispersion of air pollutants and methods to measure air pollution.
- 4. Define and classify e-waste and understand its causes, effects, and control measures.
- 5. Discuss the issues involved in the enforcement of environmental legislation and the importance of public awareness.

- 1. H. Peavy, D. Rowe & G. Tchobanoglous. Environmental Engineering, McGraw Hill Education. 2017.
- 2. K. De, Environmental Chemistry, 1<sup>st</sup> Edition New Age Publisher Int. Pvt. Ltd. 2016.
- 3. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai.
- 4. C.R. Brunner, Hazardous Waste Incineration, McGraw Hill Inc. 1993.
- 5. R.K. Trivedi, Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards', Vol I and II, B.S. Publications, 2010.