K.L.N. COLLEGE OF ENGINEERING

Pottapalayam-630612, Sivagangai District

(An Autonomous Institution, Affiliated to Anna University, Chennai)

Estd: 1994

FOURTH SEMESTER

CURRICULUM AND SYLLABUS

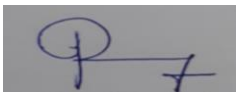
REGULATIONS 2024

For under Graduate Program

B.E. COMPUTER SCIENCE AND ENGINEERING (Internet of Things)

CHOICE BASED CREDIT SYSTEM

(For the students admitted from the academic year 2024-2025 onwards)



Dr.P.PremKumar
Professor & Head,
Department of CSE(IOT),
K.L.N. College of Engineering,
Pottapalayam, Sivaganga – 630612

K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM
(An Autonomous Institution, Affiliated to Anna University, Chennai)

VISION OF THE INSTITUTION

To become a Centre of Excellence in Technical Education and Research in producing Competent and Ethical professionals to the society

MISSION OF THE INSTITUTION

To impart Value and Need based curriculum to the students with enriched skill development in the field of Engineering, Technology, Management and Entrepreneurship and to nurture their character with social concern and to pursue their career in the areas of Research and Industry.

VISION OF THE DEPARTMENT

To evolve in the field of Computer Science & Engineering through sustainable technical education with innovative research and to foster competent professionals to serve and lead the society

MISSION OF THE DEPARTMENT

- Imparting demand based proficient education through quality teaching – learning process in tune with the interdisciplinary needs of global work environment.
- Inculcating the attitude of continuous learning through industry institution interaction, consultancy and research activities.
- Cultivating professionalism, ethics and integrity of character for positive contributions to society.

K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM
(An Autonomous Institution, Affiliated to Anna University, Chennai)

PROGRAM EDUCATIONAL OBJECTIVES

PEO I	Contribute effectively to the society by applying principles of Computer Science and Engineering for analyzing the real world problems to produce optimal and sustainable technical solutions.
PEO II	Sustain as good professionals by pursuing career / advanced studies and practice innovation in emerging technologies and current trends through lifelong learning.
PEO III	Build professionalism, team work, effective communication, ethical values and leadership qualities**.**

PROGRAM SPECIFIC OUTCOMES

PSO 1	Ability to apply good analytical design and implementation skills to formulate and solve scientific and business applications pertaining to Algorithms, Computer Systems, Networks, Security, Data Analytics and Artificial Intelligence.
PSO 2	Ability to update knowledge continuously in various domains like Virtualization, Mobile Application Development, Data Visualization, Machine Learning and Technologies like Storage, Computing, Communication to meet the industry requirements.

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Program Outcomes (POs)

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5 and WK7).

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

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Knowledge and Attitude Profile (WK)

WK1: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

WK2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modeling applicable to the discipline.

WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, re- use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

WK7: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

WK8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

WK9: Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes

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REGULATIONS 2024

For Under Graduate Program

B.E. COMPUTER SCIENCE AND ENGINEERING (IOT)

CHOICE BASED CREDIT SYSTEM

CATEGORY OF COURSES

i. **Humanities and Social Sciences (HS) Courses** include Technical English, Environmental Science and Engineering, Engineering Ethics and human values, Communication Skills and Management courses.

ii. **Basic Sciences (BS**) **Courses** include Mathematics, Physics, and Chemistry.

iii. **Engineering Sciences (ES) Courses** include Engineering practices, Engineering Graphics, Basics of Electrical / Electronics / Mechanical / Computer Engineering / Instrumentation etc.

iv. **Professional Core (PC) Courses** include the core courses relevant to the chosen programme of study.

v. **Professional Elective (PE) Courses** include the elective courses relevant to the chosen programme of study.

vi. **Open Elective (OE) Courses** include courses from other branches which a student can choose from the list specified in the curriculum of the students B.E. / B.Tech. Programmes.

vii. **Employability Enhancement Courses (EEC)** include Project Work and/or Internship, Seminar, Professional Practices, Case Study and Industrial/Practical Training.

viii. **Mandatory (MC) courses** include Personality and Character development and the courses recommended by the regulatory bodies such as AICTE, UGC, etc

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B.E. COMPUTER SCIENCE AND ENGINEERING (IOT)
REGULATIONS 2024
CHOICE BASED CREDIT SYSTEM
CURRICULUM AND SYLLABUS

SEMESTER IV

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	24BS402	Probability and Statistics (Common to B.E. CSE, CSE(CS), CSE (IoT), B.Tech IT & AI&DS programmes)	BS	4	3	1	0	4
2	24CI401	Embedded Systems Architecture	PC	3	3	0	0	3
3	24CI402	Fundamentals of IOT	PC	3	3	0	0	3
4	24CS401	Database Management Systems (Common to B.E. CSE, CSE(CS), CSE(IoT), B.Tech IT & AI&DS programmes)	PC	3	3	0	0	3
5	24IT401	Machine Learning (Common to B.E.,CSE(IoT) & B.Tech IT programmes)	PC	3	3	0	0	3
THEORY CUM PRACTICAL								
6	24CS404	Operating Systems (Common to B.E. CSE, CSE(CS) CSE (IoT) & B.Tech IT programmes)	PC	5	3	0	2	4
PRACTICAL								
7	24CI4L1	Embedded Systems Architecture Laboratory	PC	3	0	0	3	1.5
8	24CS4L1	Database Management Systems Laboratory (Common to B.E. CSE, CSE(CS), CSE(IoT), B.Tech IT & AIDS programmes)	PC	3	0	0	3	1.5
9	24HS4L1	Aptitude and Soft Skills – III (Common to all B.E. / B.Tech programmes)	EEC	2	0	0	2	1*
TOTAL				**29**	**18**	**1**	**10**	**23**

* **The grades earned by the students will be recorded in the mark sheet, however the same shall not be considered for the computation of CGPA**

		L	T	P	C
24BS402	**PROBABILITY AND STATISTICS**	**3**	**1**	**0**	**4**

OBJECTIVES:

- This course aims at providing the required skill to apply the statistical tools in engineering problems.
- To introduce the basic concepts of probability and random variables of one and two dimensions.
- To acquaint the knowledge of testing of hypothesis for small and large samples and to introduce the basic concepts of classifications of design of experiments which plays very important roles in the field of agriculture and statistical quality control

UNIT - I PROBABILITY AND RANDOM VARIABLES 9+3

Probability–Discrete and continuous random variables –Moments–Moment generating functions– Binomial, Poisson, Uniform, Exponential and Normal distributions (Except derivations).

UNIT - II TWO-DIMENSIONAL RANDOM VARIABLES 9+3

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression –Transformation of random variables–Central limit theorem (for independent and identically distributed random variables).

UNIT - III TESTING OF HYPOTHESIS 9+3

Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample tests based on Normal distribution for single mean and difference of means-Tests based on t,Chi-square and F distributions for mean, variance and proportion-Contingency table (test for independence)-Goodness of fit.

UNIT - IV DESIGN OF EXPERIMENTS 9+3

One way and Two way classifications – Completely randomized design–Randomized block design–Latin square design-2^2 factorial design.

UNIT - V STATISTICAL QUALITY CONTROL 9+3

Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts)–Tolerance limits-Acceptance sampling.

TOTAL: 45+15 PERIODS

TEXT BOOKS:

1. Johnson.R.A.,Miller ,I and Freund J.,"Miller and Freund‘s Probability and Statistics for Engineers", Pearson Education, Asia,8th Edition, 2015.
2. Veerarajan.T.,"Probability, Statistics and Random Processes", Tata Mc Graw Hill, New Delhi, 2006.

REFERENCES:

1. Papoulis.A. and Unnikrishnapillai.S., "Probability, Random Variables and Stochastic Processes", McGraw Hill Education India, New Delhi, 4thEdition, 2002.
2. Spiegel.M.R.,Schiller.J and Srinivasan.R.A.,"Schaum’s Outline of Theory and Problems of Probability and Statistics", Tata McGrawHill,3rdEdition,2004.
3. Walpole.R.E.,Myers.R.H.,Myers.S.L. and Ye.K., "Probability and Statistics for Engineers and Scientists",Pearson Education,Asia,8thEdition,2011.
4. Gupta.S.C., Kapoor.V.K,, "Fundamental of Mathematical Statistics", Sultanch and & Sons Educational Publishers, New Delhi, Reprint 2013.
5. Kandasamy.P.,Thilagvathi. K.,Gunavathi.K., "Probability R and om Variables& Random Processes",S.Chand&Co.Ltd.,Reprint2008.

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name : PROBABILITY AND STATISTICS		**Course Code : 24BS402**	
CO	**Course Outcomes**	**Unit**	**K –CO**
C209.1	Build the parameters of statistical distributions using basic probability theory concepts.	I	K3
C209.2	Calculate the statistical measures for two dimensional random variables.	II	K3
C209.3	Apply the concepts of testing of hypothesis for large and small samples.	III	K3
C209.4	Apply the basic concepts of design of experiments in the field of agriculture.	IV	K3
C209.5	Use control charts for quality control problems.	V	K3

HOD/CSE(IOT)

24CI401	EMBEDDED SYSTEMS ARCHITECTURE	L	T	P	C
		3	0	0	3

PRE-REQUISITE:NIL

OBJECTIVES:

● To introduce the fundamental concepts and architecture of 8-bit embedded processors.

● To develop understanding of embedded system design, RTOS, and programming approaches.

● To provide knowledge of hardware testing and embedded C programming techniques.

UNIT - I INTRODUCTION TO 8-BIT EMBEDDED PROCESSORS 9

Microcontrollers for an Embedded System – 8051 – Architecture – Addressing Modes – Instruction Set – Program and Data Memory – Stacks – Interrupts – Timers/Counters – Serial Ports – Programming.

UNIT - II EMBEDDED SYSTEMS ARCHITECTURE 9

Introduction to Embedded Systems – Core of Embedded Processors - Embedded System Design Process – Model Train Controller – ARM Processor – Instruction Set Preliminaries – CPU – Programming Input and Output – Supervisor Mode – Exceptions and Trap – Models for programs – Assembly, Linking and Loading – Compilation Techniques – Program Level Performance Analysis.

UNIT - III PROCESSES AND OPERATING SYSTEMS 9

Structure of a real – time system – Task Assignment and Scheduling – Multiple Tasks and Multiple Processes – Multirate Systems – Pre emptive real – time Operating systems – Priority based scheduling – Interprocess Communication Mechanisms – Distributed Embedded Systems – MPSoCs and Shared Memory Multiprocessors – Design Example – Audio Player, Engine Control Unit and Video Accelerator.

UNIT - IV HARDWARE TEST AND DEBUG 9

Module Debug and Test - Debugging and Testing - Testing and Debugging - Combinational Logic - Path Sensitizing - Masking and Untestable Faults - Single Variable–Multiple Paths - Bridge Faults - Debugging – Sequential Logic - Scan Design Testing - Boundary-Scan Testing

UNIT - V EMBEDDED C PROGRAMMING 9

An Embedded C Program - Developing Embedded Software - C Building Blocks -C Program Structure - Bitwise Operators - Pointer Variables and Memory Addresses -The Function – Structures - Peripheral programming (GPIO, ADC/DAC, Timers) – Device drivers – System design considerations – Power optimization.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Muhammad Ali Mazidi, Janice Gillispie Mazidi, “The 8051 Microcontroller and Embedded Systems,” Pearson Education.

2. ·David E. Simon, “An Embedded Software Primer,” Pearson Education.

REFERENCES:

1. Raj Kamal, “Embedded Systems: Architecture, Programming, and Design,” McGraw Hill.
2. Wayne Wolf, “Computers as Components: Principles of Embedded Computing System Design,” Morgan Kaufmann.
3. Steve Heath, “Embedded Systems Design,” Elsevier.
4. Peter Marwedel, “Embedded System Design: Embedded Systems Foundations of Cyber-Physical Systems,” Springer.

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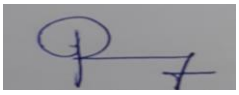
OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO

Course Name :EMBEDDED SYSTEMS ARCHITECTURE		**Course Code: 24CI401**	
CO	**Course Outcomes**	**Unit**	**K-CO**
C210.1	Explain the architecture, addressing modes, instruction set, and peripherals of 8051 microcontroller.	I	K2
C210.2	Demonstrate knowledge of embedded system design process and ARM processor basics.	II	K2
C210.3	Illustrate various concepts of real time operating systems.	III	K2
C210.4	Apply debugging and testing techniques for combinational and sequential circuits in embedded systems.	IV	K3
C210.5	Apply the concept of Embedded C to develop the embedded based application.	V	K3



HOD/CSE(IOT)

24CI402	FUNDAMENTALS OF IOT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To Understand the concepts of Internet of Things and able to build IoT applications
- To Learn the programming and use of Arduino and Raspberry Pi boards.
- To Known about data handling and analytics in SDN.

UNIT I INTRODUCTION TO IOT 9

Evolution of Internet of Things-Characteristics of IoT- Physical design of IoT-Functional blocks of IoT-Sensing-Actuation- Basics of Networking- Communication Protocols- Sensor Networks-Concept of IOT Devices – IOT Devices Versus Computers – IOT Configurations – Basic Components

UNI - II HARDWARE FOR IOT 9

Sensors- Digital sensors- actuators- radio frequency identification (RFID) technology- wireless sensor networks-participatory sensing technology- Embedded Platforms for IoT- Embedded computing basics-Overview of IOT supported Hardware platforms such as Arduino, NetArduino, Raspberry pi, Beagle Bone, Intel Galileo boards and ARM cortex

UNIT -III ARDUINO PROGRAMMING 9

Introduction to Arduino – Types of Arduino – Arduino Tool chain - Arduino Programming Structure – Sketches – Pins – Input/output From Pins Using Sketches – Integration of Sensors and Actuators-Machine-to-Machine Communications- Difference between IoT and M2M communication- Interoperability in IoT- Integration of Sensors and Actuators with Arduino

UNIT – IV PYTHON AND RASPBERRY PI FOR IOT 9

Raspberry Pi: Board configuration- Interfacing Raspberry Pi with basic peripherals-Implementation of IoT with Raspberry Pi - Accessing GPIO Pins – Sending and Receiving Signals Using GPIO Pins –Software defined Network (SDN)-SDN for IoT- Data Handling and Analytics – Connecting data to cloud

UNIT - V APPLICATIONS OF IOT 9

Smart Cities and Smart Homes- Connected Vehicles- Smart Grid- Industrial IoT- Case Study-Agriculture- Healthcare-Activity Monitoring Sensor -Actuators in smart cities- Sensors in Home activity monitoring- human activity recognition-road traffic management

TEXT BOOKS: **TOTAL: 45 PERIODS**

1. "The Internet 'of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)

2. “Make sensors”: Terokarvinen, kemo, karvinen and villey valtokari, 1st edition, maker media,2014.

3. "Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madisetti

REFERENCE BOOKS:

1. Vijay Madisetti, Arshdeep Bahga, “Internet of Things: A Hands-On Approach”

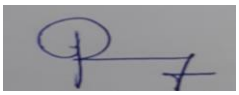
2. Waltenegus Dargie,Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice"

3.Beginning Sensor networks with Arduino and Raspberry Pi – Charles Bell, Apress

COURSE OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO

Course Name : FUNDAMENTALS OF IOT		**Course Code: 24CI402**	
CO	**Course Outcomes**	**Unit**	**K-CO**
C211.1	Explain the evolution, characteristics, physical design and functional blocks of IOT.	I	K2
C211.2	Develop Arduino-based IoT applications by integrating sensors, actuators, and communication modules.	II	K2
C211.3	Demonstrate the use of Raspberry Pi and Python for IoT applications including GPIO handling, interfacing, and cloud connectivity.	III	K3
C211.4	Analyze the role of Software Defined Networks (SDN) in IoT and demonstrate data handling and analytics using IoT platforms.	IV	K4
C211.5	Compare IoT and M2M communication, ensuring interoperability in real-time applications.	V	K4



HOD/CSE(IOT)

		L	T	P	C
24CS401	**DATABASE MANAGEMENT SYSTEMS**	**3**	**0**	**0**	**3**

OBJECTIVES:

- To learn the fundamentals of data models and to depict a database system using ER Diagrams
- To study relational database model and to write SQL queries for store/retrieve database
- To understand Normalization technique to improve the performance data base design
- To understand the concepts of Transaction processing, concurrency control techniques and recovery procedures for real time applications.
- To understand working procedures of query processing and internal storage structures using different file and indexing techniques which will help in physical DB design

UNIT - I DATABASE FUNDAMENTALS 9

Purpose of Database System – Views of data – Data abstraction and data independence- Instances and schemas- Database System Architecture – Difference between File system and DBMS, Compare Centralized vs Distributed database, Data Models –Constraints- Keys with its types, Entity Relationship Model: Entity Sets – Relationship sets-Types of mapping constraints-Attributes–Relationships in ER diagram- E-R design issues– Extended ER features: Generalization, Specialization and Aggregation in ER model

UNIT - II RELATIONAL DATABASE 9

Relational Algebra: Relational operators- Joins - Relational Calculus: Tuple relational calculus and Domain relational calculus, SQL: Types of commands- set operations, Constraints- Aggregate Functions- Clauses-- operators, Subqueries: Correlated and Nested Subqueries – Joins – Views – Authorization – Advanced SQL – Triggers – Cursors – Procedure – Functions – Embedded SQL – Dynamic SQL

UNIT - III RELATIONAL DATABASE DESIGN 9

Need for Database Design – Functional Dependencies – Closure of Functional Dependencies – Canonical Cover – Armstrong Axioms - Problem of Redundancy in database-Lossless join and Dependency Preserving decomposition, Normalization: First Normal Form– Second Normal Form – Third Normal Form –Boyce Code Normal Form – Fourth Normal Form – Fifth Normal Form

UNIT - IV TRANSACTIONS AND CONCURRENCY CONTROL 9

Transaction: ACID properties and their necessity – Transaction States – Schedule and conflict: Types of schedules–Conflict Serializable schedule–View Serializable schedule-Conflict equivalent schedule-Recoverability in DBMS: Recoverable and Irrecoverable Schedule- Cascading rollback, Cascade less and strict schedule, Equivalence of schedule, Concurrency Control: Lock Based Protocols–Time stamp based Protocols –Validation Based Protocols - Deadlock handling

UNIT - V STORAGE AND QUERY PROCESSING 9

File Organization – RAID- Indexing and Hashing: Ordered Indices – Static Hashing – Dynamic Hashing, Comparison of Ordered indexing and Hashing, B+ tree Index Files, Query Processing – Measures of Query cost, Algorithms for SELECT and JOIN operations – Evaluation of expressions.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan — Database System Concepts, Seventh Edition, Tata McGraw Hill, 2019.
2. Ramez Elmasri, Shamkant B. Navathe —Fundamentals of Database Systems, Seventh Edition, Pearson Education, 2016.

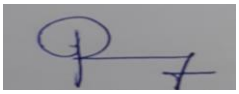
REFERENCES:

1. Raghu Ramakrishnan —Database Management Systems, Fourth Edition, McGraw-Hill College Publications, 2015.
2. C.J.Date, A.Kannan, S.Swamynathan -An Introduction to Database Systems, Eighth Edition, Pearson Education, 2006.

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO

Course Name : DATABASE MANAGEMENT SYSTEMS		**Course Code : 24CS401**	
CO	**Course Outcomes**	**Unit**	**K –CO**
C212.1	Illustrate the fundamental elements of relational database management systems and also ability to design the database using ER modeling.	I	K3
C212.2	Apply SQL queries to interact with database.	II	K3
C212.3	Apply normalization to design the database efficiently through elimination of anomalies	III	K3
C212.4	Analyze database transactions and can control them by applying ACID properties and also Summarize concurrency control protocols.	IV	K3
C212.5	Illustrate database storage structures and access techniques: file organization, indexing methods including B+ tree and hashing.	V	K3



HOD/CSE(IOT)

24IT401	MACHINE LEARNING	L	T	P	C
		3	0	0	3

Objectives:

- To understand machine learning basics and regression.
- To learn key supervised algorithms such as KNN, DT, NB, SVM
- To explore clustering and PCA.
- To build simple recommender systems.
- To study Bayesian Networks, MRFs, and HMMs.
-

UNIT - I SUPERVISEDLEARNING:REGRESSION 9

ParadigmsofMachineLearning-Examples-TypesofLearning-Typesofsupervisedlearning-Introduction to Regression–Types of Regression- Line arregression- Iterative solution: Gradient descent –Performance metrics of machine learning- Python libraries suitable for Machine Learning.

UNIT - II SUPERVISEDLEARNING:CLASSIFICATION 9

K-Nearest Neighbour Classification – Distance metric and Cross – Validation – Computational efficiency of KNN –Introduction to Decision Trees – Entropy and Information Gain – Naïve Bayes classifier – Support Vector Machine –Twitter Sentiment Analysis **:**Analyze the tweets posted on twitter to predict the sentiment of the tweet i.e positive, negative or neutral.

UNIT - III UNSUPERVISEDLEARNING 9

Clustering algorithms – Proximity measures —Types —Partitioning methods: K-Means clustering – DBSCAN –Hierarchical clustering– Case study on various clustering applications -

UNIT – IV RECOMMENDERSYSTEMS 9

Recommender Systems – Introduction - Non-Personalized Recommender Systems- Content- Based Recommender Systems-Collaborative Filtering: User-based nearest neighbour recommendation, Item based nearest neighbour recommendation, Model based and pre-processing based approaches-Recommender System Evaluation.

UNIT – V GRAPHICALMODELS 9

Bayesian Networks – Conditional Independence - Markov Random Fields – Learning - Naïve Bayes Classifiers – Markov Model – Hidden Markov Model.

TOTAL:45PERIODS

TEXTBOOKS:

1. Tom M. Mitchell, Machine Learning, McGraw Hill, 1st Edition, 2017.
2. StephenMarsland,“MachineLearning:AnAlgorithmicPerspective”,CRCPress,2009

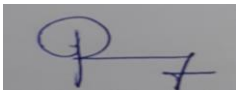
REFERENCES:

1. Mehryar Mohri, Afshin Rostamizadeh and Ameet Talwalkar, “Foundations of Machine Learning”, MIT Press,2012.
2. Kevin P. Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012.
3. EthemAlpaydin, Introduction to Machine Learning, MIT Press, 4th Edition, 2020.
4. Charu C. Aggarwal, Recommender Systems: The Textbook, Springer, 2016.

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO

Course Name : MACHINE LEARNING		**Course Code : 24IT401**	
CO	**Course Outcomes**	**Unit**	**K –CO**
C213.1	Classify the various paradigms of machine learning and develop regression models using suitable performance evaluation metrics.	I	K2
C213.2	Apply classification algorithms such as KNN, Decision Trees, Naive Bayes, and SVM to real-world problems.	II	K4
C213.3	Examine clustering algorithms and dimensionality reduction techniques like PCA for data analysis.	III	K3
C213.4	ApplyContent-based recommender systems and Collaborative Filtering to implement recommender systems	IV	K3
C213.5	Build probabilistic graphical models such as Bayesian Networks and HMMs	V	K3



HOD/CSE(IOT)

24CS404	OPERATING SYSTEMS	L	T	P	C
		3	0	2	4

OBJECTIVES:

- To understand the basic concepts and functions of operating systems.
- To understand Processes, Threads and Scheduling algorithms.
- To understand the concept of Deadlocks.
- To analyze various memory and I/O management schemes.
- To study various operating systems like Distributed OS, Real-Time OS, Virtual machine and basic concepts of virtualization.

UNIT-I OPERATING SYSTEM OVERVIEW 6

Operating System Overview - Objectives and Functions, Evolution of Operating Systems, Operating System Structure and Operations- System Calls, System Programs, Operating Systems Generation and System Boot.

LAB COMPONENT 6

- Basic Linux Commands and Overview
- Write Shell Script to experiment with system calls like fork, grep, pipe, open, create read, write, etc.

UNIT-II PROCESS MANAGEMENT AND CONCURRENCY CONTROL 10

Processes - Process Concept and Scheduling, Operations on Processes, Inter Process Communication - CPU Scheduling - Scheduling criteria, Scheduling algorithms; Threads-Overview, Multithreading models, Threading issues - Process Synchronization - The critical-section problem, Mutex locks, Semaphores, Classic problems of synchronization, critical region, Monitors.

LAB COMPONENT 6

- Implementation of FCFS, SJF, Round Robin, Priority Scheduling Algorithms and analyzing their performance
- Implement semaphore for solving producer-consumer problem using threads.

UNIT - III DEADLOCK AND STORAGE MANAGEMENT 10

Deadlock - System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock; Main Memory - Background, Swapping, Contiguous Memory Allocation, Paging, Segmentation; Virtual Memory - Background, Demand Paging, Page Replacement, Allocation, Thrashing - Allocating Kernel Memory.

LAB COMPONENT **6**

- Simulate situations for testing Deadlock avoidance algorithm.
- Implementation Of FIFO, LRU, Optimal Page Replacement Algorithms

UNIT - IV MASS STORAGE AND FILE SYSTEMS **10**

Overview of Mass Storage System and Structure- Disk Structure, Disk Scheduling and Management Swap space management; File-System-Interface- File concept, Access methods, File Sharing and Protection, Allocation Methods, Free Space Management; Directory-Structure, organization, implementation.

LAB COMPONENT **6**

- Implementation of Directory organizations like - single, two-level, hierarchy
- Implementation of Allocation methods used for files like - sequential, indexed, linked

UNIT - V ADVANCED OPERATING SYSTEMS AND VIRTUALIZATION **9**

Basics of Network Operating System, Server Operating System, Real Time Operating System and Distributed Operating Systems - Virtual Machines - Types and Structure - virtualization - Types, Techniques and Application - supporting multiple operating systems simultaneously on a single hardware platform; Running one operating system on top of another.

LAB COMPONENT **6**

- Case Study to Learn Virtualization platforms - VM Ware, etc.
- Installation of Raspbian OS in Raspberry pi and execute OS services using simple C programs

TOTAL: 45+30 PERIODS

TEXT BOOKS:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, - Operating System Concepts, 10th Edition, John Wiley and Sons Inc., 2018.
2. William Stallings, “Operating Systems - Internals and Design Principles”, 9th Edition, Prentice Hall, 2018.

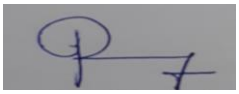
REFERENCES:

1. Andrew S. Tanenbaum, “Modern Operating Systems”, Fifth Edition, Pearson Publications, 2022.
2. Achyut S.Godbole, Atul Kahate, - Operating Systems‖, McGraw Hill Education, 2016.
3. RamazElmasri, A. Gil Carrick, David Levine, - Operating Systems - A Spiral Approach, Tata McGraw Hill Edition, 2010.

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO

Course Name : OPERATING SYSTEMS		**Course Code : 24CS404**	
CO	**Course Outcomes**	**Unit**	**K –CO**
C214.1	Explain the basic functions, structure and operations of Operating System.	I	K2
C214.2	Analyze process synchronization methods and performance of CPU scheduling algorithms like FCFS, SJF, Priority and Round Robin.	II	K4
C214.3	Apply the concept of deadlock avoidance and memory management schemes using paging and segmentation.	III	K3
C214.4	Generalize the concepts of mass storage systems, various file allocation methods and directory structures.	IV	K3
C214.5	Classify different operating systems based on application requirements and utilize virtualization platform to build virtual machines.	V	K3



HOD/CSE(IOT)

24C14L1 EMBEDDED SYSTEMS ARCHITECTURE LABORATORY

L	T	P	C
0	0	3	1.5

OBJECTIVES:

- To learn the working of ARM processor
- To understand the Building Blocks of Embedded Systems
- To learn the concept of memory map and memory interface
- To write programs to interface memory, I/Os with processor
- To know the characteristics of Real Time
- To write programs to interface memory, I/Os with processor

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PRE-REQUISITE:NIL LIST OF EXPERIMENTS

1. Study of ARM evaluation system
2. Interfacing ADC and DAC.
3. Interfacing LED and PWM.
4. Interfacing real time clock and serial port.
5. Interfacing keyboard and LCD.
6. Interfacing EPROM and interrupt.
7. Interrupt performance characteristics of ARM and FPGA.
8. Flashing of LEDS.
9. Interfacing stepper motor and temperature sensor.
10. Implementing zigbee protocol with ARM.

TOTAL: 45 PERIODS

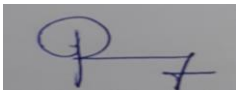
LABORATORY REQUIREMENT FOR BATCH OF 30 STUDENTS: HARDWARE/ SOFTWARE:

1. Embedded trainer kits with ARM board.
2. Embedded trainer kits suitable for wireless communication.
3. Adequate quantities of Hardware, software and consumables.

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO

Course Name :EMBEDDED SYSTEMS ARCHITECTURE LABORATORY		**Course Code: 24C14L1**	
CO	**Course Outcomes**	**Expt.**	**K-CO**
C215.1	Explore the ARM processor architecture and Instruction set for program	1	K3
C215.2	Apply the concept of ARM processor for interfacing the peripherals to control system	2,3,5,8	K3
C215.3	Develop the communication protocol using the embedded kit	4	K3
C215.4	Developing of memories such as EPROM, EEPROM, FPGA using ARM processor	6,7	K3
C215.5	Develop real time embedded System using ARM processor.	9,10	K4



HOD/CSE(IOT)

24CS4L1	DATABASE MANAGEMENT SYSTEMS LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To write and debug Database commands.
- To implement advanced query in Database tool.
- To use functions and procedures for implementing simple logics in Database.
- To design real time applications using front end tool and Database.
- To implement Database connectivity for real time application.

LIST OF EXPERIMENTS

1. Implementation of Data Definition and Data Manipulation Language Commands of SQL with suitable examples.
2. Implementation of Data Control and Transaction Control Language Commands of SQL with suitable examples.
3. Implementation of Aggregate Functions and Set Operations with suitable examples.
4. Implementation of different types of constraints and Group by, Order by, Having clause with suitable examples
5. Implementation of different types of Joins with suitable examples.
6. Implementation of Nested Sub queries and Views.
7. Study of PL/SQL programs
8. PL/SQL - procedures
9. PL/SQL - Functions
10. PL/SQL – Triggers and Cursor
11. Front end application development – Create Forms, Menu and Reports.
12. Implementation of Database Connectivity

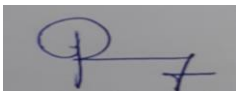
PLATFORM NEEDED: Oracle/Mysql/Visual Basics/Netbeans IDE

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO

Course Name : DATABASE MANAGEMENT SYSTEMS LABORATORY		**Course Code : 24CS4L1**	
CO	**Course Outcomes**	**Exp.No**	**K –CO**
C216.1	Develop simple Database using DDL, DML and TCL commands.	1,2	K3
C216.2	Create Relational Database for real time application through Database constraints.	3,4	K3
C216.3	Write and execute nested sub queries and join queries with privileges.	5,6	K3
C216.4	Develop PL/SQL programs using Procedure, Functions, Triggers and Cursor.	7-10	K3
C216.5	Design real time applications with Database Connectivity.	11,12	K3



HOD/CSE(IOT)

24HS4L1	APTITUDE AND SOFT SKILLS - III	L	T	P	C
		0	0	2	1

Module I LOGICAL REASONING SKILLS 10

Logical Reasoning, Letter and Symbol series, Number series, Analyzing arguments, Making judgments, Logical Reasoning, Direction Sense test, Venn diagrams, Seating arrangements, Cause and effect, Blood relation test, Dice Logical, verbal puzzles, Analytical puzzles and sudoku.

Module II BEHAVIOURAL SKILLS 5

Interview Etiquettes - Body language, Dress code, Eye contacts, Handshakes for Interview - Interview handling – Mock Interview Videos - High Frequency words in resume and interviews - Visual Interpretation – HR Interview question – Sell yourself - Interpersonal and intrapersonal communication

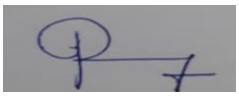
Module III VERBAL SKILLS 15

Vocabulary basics, Grammar basics, Critical Reasoning, Reading comprehension, Synonyms, Antonyms, Idioms and phrases - sentence completion, Spotting errors, Error correction, Sentence correction, Writing Resume, Letter writing, Official mail correspondence - Ways to communicate in different scenarios-job interview, business meeting, project proposal submission, informal gathering, speech for a large audience and debate.

TOTAL: 30 PERIODS

REFERENCES:

1. Quantitative aptitude for competitive examinations , R.S.Agarwal, S.Chand publications
2. Quantitative Aptitude – AbijithGuha, TMH
3. Quantitative Aptitude for Cat – Arun sharma,TMH
4. Gulati. S., (2006) “Corporate Soft Skills”, New Delhi, India: Rupa& Co.
5. Prasad, HariMohan,A Handbook of Spotting Errors, Mcgraw Hill Education, 2010



HOD/CSE(IOT)