SEMESTER –III

S.No	Category	Course Code	Course Title	L	T	P	C
Theory							
1	GE	GE20201	தமிழரும் தொழில்நுட்பமும் / Tamil and Technology	1	0	0	1
2	BS	MA20305	Probability and Statistics	3	1	0	4
3	ES	EC20308	Digital Principles and System Design	3	0	0	3
4	PC	CL20301	Object Oriented Programming	3	0	0	3
5	PC	CL20302	Foundations of Artificial Intelligence	3	0	0	3
6	PC	CL20303	Computer Architecture	3	0	0	3
7	MC	MC20301	Value Education	2	0	0	0
Practical							
8	ES	EC20309	Digital Laboratory	0	0	4	2
9	PC	CL20304	Object Oriented Programming Laboratory	0	0	4	2
10	EE	EN20301	English Proficiency Course Laboratory	0	0	2	1
TOTAL				17	01	10	22

SEMESTER –IV

S.No	Category	Course Code	Course Title	L	T	P	C
Theory							
1	PC	CL20401	Machine Learning	3	0	0	3
2	PC	CL20402	Design Thinking	3	0	0	3
3	PC	CL20403	Database Management System	3	0	0	3
4	PC	CL20404	Python Programming	3	0	0	3
5	PC	CL20405	Operating Systems	3	0	0	3
6	PC	CL20406	Design and Analysis of Algorithm	3	0	0	3
Practical							
7	PC	CL20407	Python Programming Laboratory	0	0	4	2
8	PC	CL20408	Database Management System Laboratory	0	0	4	2
9	PC	CL20409	Operating System Laboratory	0	0	4	2
TOTAL				**18**	**01**	**12**	**24**

GE23201 **தமிழரும் தொழில்நுட்பமும்** L T P C
1 0 0 1

அலகு I நெசவு மற்றும் பானைத் தொழில்நுட்பம் 3

சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்.

அலகு II வடுவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம் 3

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் &சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை வடிவமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும் கோவில்களும் - சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டி நாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ - சாரோசெனிக் கட்டிடக்கலை

அலகு III உற்பத்தி தொழில் நுட்பம் 3

கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பு உருக்குதல், எஃகு - வரலாற்றுச் சின்னங்களாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் -எலும்புத் துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

அலகு IV வேளாண்மை மற்றும் நீர்பாசனத் தொழில்நுட்பம் 3

அணை - ஏரி குளங்கள், மதகு - சோழர்காலக் குமிழித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மை சார்ந்த செயல்பாடுகள் கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு -அறிவுசார் சமூகம்

அலகு V *அறிவியல் தமிழ் மற்றும் கணித்தமிழ்* 3

அறிவியல் தமிழின் வளர்ச்சி -கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் சொற்குவைத் திட்டம்

TOTAL PERIODS: 15

TEXT CUM REFERENCE BOOKS:

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே.பிள்ளை. (வெளியீடு தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு).
4. பொருநை – ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு).
5. Social Life of Tamils (Dr.K.K.Pillay) A Joint publication of TNTB & ESC and RMRL – (in print).

6. Social Life of the Tamils – The Classical Period (Dr.S.Singaravelu) (Published by International institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subramanian, Dr.K.D.Thirunavukkarasu)
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by International institute of Tamil Studies)
9. Keeladi – 'Sangam City Civilzation on the vanks of river vaigai' (Jointly Published by Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by the author)
11. Porunai Civilization (Jointly Published by Department of Arcaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamilnadu).
12. Journey of Civilization Indus to vaigai (R.Balakrishnan) (Published by RMRL) – Reference Book

PAAVAI ENGINEERING COLLEGE, NAMAKKAL
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GE23201	TAMILS AND TECHNOLOGY	L T P C 1 0 0 1

UNIT I WEAVING AND CERAMIC TECHNOLOGY **3**

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY **3**

Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

UNIT III MANUFACTURING TECHNOLOGY **3**

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting,steel -Copper and goldCoins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.

UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY **3**

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING **3**

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project

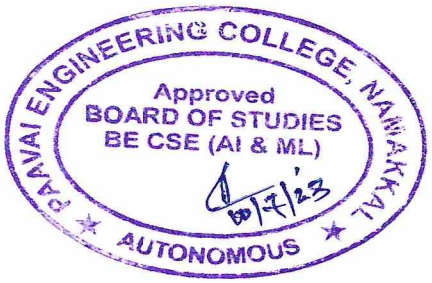
TOTAL PERIODS: 15

TEXT CUM REFERENCE BOOKS:

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே.பிள்ளை. (வெளியீடு தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு).
4. பொருநை – ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு).
5. Social Life of Tamils (Dr.K.K.Pillay) A Joint publication of TNTB & ESC and RMRL – (in print).
6. Social Life of the Tamils – The Classical Period (Dr.S.Singaravelu) (Published by

International institute of Tamil Studies.

7. Historical Heritage of the Tamils (Dr.S.V.Subramanian, Dr.K.D.Thirunavukkarasu)
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by International institute of Tamil Studies)
9. Keeladi – 'Sangam City Civilzation on the vanks of river vaigai' (Jointly Published by Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by the author)
11. Porunai Civilization (Jointly Published by Department of Arcaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamilnadu).
12. Journey of Civilization Indus to vaigai (R.Balakrishnan) (Published by RMRL) – Reference Book



EC20308 DIGITAL PRINCIPLES AND SYSTEM DESIGN 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand the fundamentals and simplification of digital logic.
- design the various combinational logic circuits using logic gates.
- know the design procedures for synchronous sequential circuits.
- implement the asynchronous sequential circuits.
- acquire basic knowledge about memory devices and HDL programming.

UNIT I BOOLEAN ALGEBRA AND LOGIC GATES 9

Boolean laws and theorems - De-Morgan's Theorem- Boolean functions - Canonical and Standard Forms - Sum of products and product of sums, Simplifications of Boolean functions using Karnaugh map and Quine McClusky methods – Implementation of Boolean functions using logic gates - NAND -NOR implementations.

UNIT II COMBINATIONAL CIRCUITS 9

Design procedure of Combinational circuits - Adders, Subtractors, Carry look ahead adder, BCD adder, Multiplexer, De-multiplexer, Decoder, Encoder, Priority encoder, 2-bit Magnitude comparator; Code converters, Parity Generator and Checker.

UNIT III SEQUENTIAL CIRCUITS 9

Latches, Flip flops - SR, JK, D and T; Realization of flip flop using other flip flops; Asynchronous and Synchronous counters; Classification of sequential circuits - Moore and Mealy; Design of Synchronous counters - Modulo - N counter; Shift registers.

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS 9

Design of fundamental mode circuits - Primitive flow table, Minimization of Primitive flow table, State assignment table, Excitation table; Cycles - Race Free State assignment; Hazards- Static, Dynamic, Essential Hazards, Hazards free elimination.

UNIT V MEMORY DEVICES AND INTRODUCTION TO HDL 9

Classification of memories - ROM organization, types; RAM - RAM organization, Write operation, Read operation, Static RAM Cell, Bipolar RAM cell, Dynamic RAM cell; Programmable Logic Devices - PLA, PAL; Introduction to HDL - HDL Models of Combinational circuits, HDL Models of Sequential Circuits.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end this course, students will be able to

- apply the concept of Boolean algebra, K map and tabulation method in digital circuits.
- design and implement combinational circuits for various real time applications.
- construct sequential logic circuits using flipflops.
- analyze the asynchronous sequential circuits.
- optimize the concepts of memory devices, PLDs and HDL programming.

TEXT BOOKS

1. M. Morris Mano, "Digital Design", 3.ed., Prentice Hall of India Pvt. Ltd., New Delhi, 2003 / Pearson Education (Singapore) Pvt. Ltd., New Delhi,2003.
2. H. Charles Roth Jr, "Digital System Design using VHDL", Thomson/ Brookscole, 2005. (Unit V).

REFERENCES

1. S. Salivahanan and S. Arivazhagan, "Digital Circuits and Design", 3rd Edition, Vikas Publishing House Pvt.Ltd, New Delhi. 2007.
2. John .M Yarbrough, "Digital Logic Applications and Design", Thomson Publications, New Delhi, 2007.
3. Charles H.Roth, "Fundamentals of Logic Design", Thomson Publication Company, 2003.
4. Donald P.Leach and Albert Paul Malvino, "Digital Principles and Applications", 5th edition, Tata Mc-Graw Hill Publishing Company Limited, New Delhi, 2003.

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes (3/2/1 indicates strength of correlation) 3-Strong,2-Medium,1-Weak														
COs	**Programme Outcomes(POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	2	-	-	-	-	2	-	-	3	3	3
CO2	3	3	3	2	-	-	-	-	2	-	-	-	3	3
CO3	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO4	3	3	3	2	-	-	-	-	-	-	-	3	3	3
CO5	3	3	3	2	-	-	-	-	2	-	-	3	3	3

SEMESTER III

CL20301 OBJECT ORIENTED PROGRAMMING 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand Object Oriented Programming concepts and basics of Java programming Language
- know the principles of packages, inheritance and interfaces
- develop a java application with threads and generics classes
- define exceptions and use I/O streams
- design and build Graphical User Interface Application using JAVA FX

UNIT I INTRODUCTION TO OOP AND JAVA 9

Overview of OOP – Object oriented programming paradigms – Features of Object Oriented Programming – Java Buzzwords – Overview of Java , Data Types, Variables and Arrays, Operators , Control Statements; Programming Structures in Java – Defining classes in Java , Constructors, Methods , Access specifiers , Static members, Java Doc comments.

UNIT II INHERITANCE, PACKAGES AND INTERFACES 9

Overloading Methods – Objects as Parameters , Returning Objects , Static, Nested and Inner Classes, Inheritance Basics; Types of Inheritance - Super keyword , Method Overriding , Dynamic Method Dispatch, Abstract Classes final with Inheritance; Packages and Interfaces- Packages , Packages and Member Access , Importing Packages, Interfaces.

UNIT III EXCEPTION HANDLING AND MULTI-THREADING 9

Exception Handling basics – Multiple catch Clauses, Nested try Statements , Java's Built-in Exceptions , User defined Exception; Multi-threaded Programming- Java Thread Model, Creating a Thread and Multiple Threads Priorities ,Synchronization , Inter Thread Communication,Suspending, Resuming, and Stopping Threads –Multi-threading; Wrappers – Auto boxing.

UNIT IV I/O, GENERICS, STRING HANDLING 9

I/O Basics – Reading and Writing Console I/O – Reading and Writing Files; Generics-Generic Programming , Generic classes , Generic Methods – Bounded Types ,Restrictions and Limitations; Strings- Basic String class, methods and String Buffer Class.

UNIT V JAVA FX EVENT HANDLING, CONTROLS AND COMPONENTS 9

JAVA FX Events and Controls: Event Basics – Handling Key and Mouse Events, Controls-Checkbox, Toggle Button , Radio Buttons, List View , Combo Box, Choice Box ; Text Controls – Scroll Pane, Layouts , Flow Pane, H Box and V Box – Border Pane , Stack Pane , Grid Pane; Menus – Basics, Menu , Menu bars, Menu Item.

TOTAL PERIODS: 45

COURSE OUTCOMES:

At the end of this course, the students will be able to

- apply the concepts of classes and objects to solve simple problems
- develop programs using inheritance, packages and interfaces
- make use of exception handling mechanisms and multi-threaded model to solve real worldproblems
- build Java applications with I/O packages, string classes, Collections and generics concepts
- integrate the concepts of event handling and Java FX components and controls for developing GUI based applications

TEXT BOOKS

1. Herbert Schildt, "Java: The Complete Reference", 11th Edition, McGraw Hill Education, New Delhi, 2019
2. Herbert Schildt, "Introducing Java FX 8 Programming", 1st Edition, McGraw Hill Education, New Delhi, 2015

REFERENCES

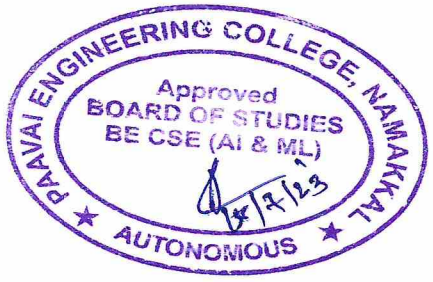
1. Cay S. Horstmann, "Core Java Fundamentals", Volume 1, 11th Edition, Prentice Hall, 2018.
2. K. Arnold and J. Gosling, "The JAVA programming language", Third edition, Pearson Education, 2000.
3. ISRD Group, "Introduction to Object-oriented programming through Java", Tata McGraw-Hill Publishing Company Ltd., 2007
4. Steven Holzner, —Java 2 Black book‖, Dreamtech press, 2011
5. Paul Deitel, Harvey Deitel, —Java SE 8 for programmers‖, 3rd Edition, Pearson, 2015

PO/CO MAPPING:

CO/PO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programmes Outcomes (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	3	1	3	-	-	-	3	2	2	2	1	1	1
CO2	2	1	3	2	1	-	-	-	2	1	1	3	2	2	-
CO3	3	3	1	2	2	-	-	-	3	2	1	2	1	1	1
CO4	3	1	2	2	2	-	-	-	1	2	1	3	2	1	-
CO5	1	1	2	3	2	-	-	-	3	2	1	2	1	1	-



CL20302 FOUNDATIONS OF ARTIFICIAL INTELLIGENCE 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand the various characteristics of Intelligent agents
- learn the different search strategies in AI
- learn and to represent knowledge in solving AI problems
- understand the different ways of designing software agents
- know about the various applications of AI.

UNIT I INTRODUCTION 9

Introduction – Definition, Foundation of Artificial Intelligence , History of Artificial Intelligence, Future of Artificial Intelligence - Characteristics of Intelligent Agents, Typical Intelligent Agents - Problem Solving Approach to Typical AI problems.

UNIT II PROBLEM SOLVING METHODS 9

Problem Solving Methods – Search Strategies, Uniformed, Informed, Heuristics, Local Search Algorithm and Optimization Problems, Searching with Partial Observations- Constraint Satisfaction Problems- Constraint Propagation ,Backtracking Search, Game playing, Optimal Decision in Games – Alpha, Beta Pruning, Stochastic Game.

UNIT III REPRESENTATION OF KNOWLEDGE 9

First Order Predicate Logic- Prolog Programming-Unification-Forward Chaining-Backward Chaining-Resolution –Knowledge Representation-Ontological Engineering, Categories and Object-Events-Mental Events and Mental Objects-Reasoning System for Categories -Reasoning with Default Information

UNIT IV SOFTWARE AGENTS 9

Architecture for Intelligent Agents-Agent communication-Negotiation and Bargaining-Argumentation among Agents –Trust and Reputation in Multi-agent system.

UNIT V APPLICATIONS 9

AI applications-Language Models-Information Retrieval - Information Extraction –Natural Language Processing-Machine Translation – Speech Recognition - Robot – Hardware – Perception - Planning – Moving.

TOTAL PERIODS: 45

COURSE OUTCOMES:

At the end of this course, the students will be able to

- formulate a problem and build intelligent agents.
- use appropriate search algorithms for any AI problem
- provide the apt agent strategy to solve a given problem
- design software agents to solve a problem

- design some of the applications that use Artificial Intelligence

TEXT BOOK(S):

1. S.Russel, P.Norvig, Artificial Intelligence - A Modern Approach, Pearson Education, New Delhi, 4 th Edition, 2020.
2. I. Bratko, Prolog: Programming for Artificial Intelligence, Addison-Wesley Educational Publishers Inc., 4th Edition, 2011.

REFERENCES

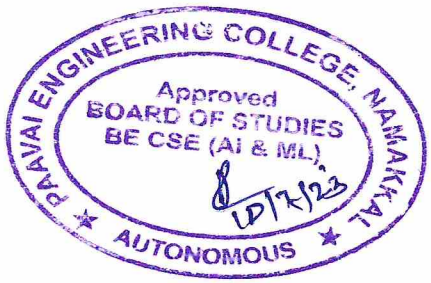
3. M. Tim Jones," Artificial Intelligence: A Systems Approach(Computer Science)", Jones and Bartlett Publishers, Inc.; 1st Edition, 2008.
4. Nils J. Nilsson, "The Quest for Artificial Intelligence", Cambridge University Press, 2009.
5. Gerhard Weiss, "Multi Agent Systems", MIT Press, 2nd Edition, 2013.
6. David L. Poole and Alan K. Mackworth, "Artificial Intelligence: Foundations of Computational Agents", Cambridge University Press, 2010.
7. E. Alpaydin. Introduction to Machine Learning. MIT Press, 2nd edition, 2010

PO/CO MAPPING:

CO/PO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programmes Outcomes (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	1	3	-	1	-	-	-	1	2	2	-
CO2	2	2	3	3	3	3	-	1	-	-	-	1	1	2	-
CO3	2	2	3	3	3	3	-	1	-	-	-	1	1	2	-
CO4	2	3	3	2	1	3	-	1	-	-	-	1	1	-	1
CO5	2	3	3	2	1	3	-	1	-	-	-	1	3	2	1



CL20303 **COMPUTER ARCHITECTURE** **3 0 0 3**

COURSE OBJECTIVE:

To enable the students to

- gain the knowledge about basic structure, Instructions and functional units of a digital computer
- discuss in detail the operation of the arithmetic unit including the algorithms and implementation of data manipulation.
- study in detail the different types of control and the concept of pipelining and study the hierarchical memory system, cache memory
- study the different ways of communicating with I/O devices and standard I/O interfaces
- understand the instruction and thread level parallelism concepts and multi core processors

UNIT - I BASIC STRUCTURE OF COMPUTERS **9**

Functional units - Basic operational concepts , Bus structures , Software performance – Memory locations and addresses–Memory operations , Instruction and instruction sequencing–Addressing modes–Assembly language–Basic I/O operations – Stacks and queues

UNIT - II ARITHMETIC UNIT **9**

Addition and subtraction of signed numbers–Design of fast adders–Multiplication of positive numbers-Signed operand multiplication and fast multiplication – Integer division – Floating point numbers and operations.

UNIT - III BASIC PROCESSING UNIT **9**

Fundamental concepts – Execution of a complete instruction – Multiple bus organization – Hardwired control – Micro programmed control – Pipe-lining –Basic concepts–Data hazards–Instruction hazards – Influence on Instruction sets – Data path and control consideration – Super scalar operation.

UNIT - IV MEMORY AND I/O SYSTEMS **9**

Speed, Size, Cost– Cache memories – Performance considerations – Accessing I/O Devices – Interrupts – Direct Memory Access – Buses– Interface Circuits– PCI, USB.

UNIT - V AUGMENTED ARCHITECTURE **9**

Instruction Level Parallelism: ILP concepts –Pipe-lining overview-Compiler Techniques for Exposing ILP – Dynamic Branch Prediction – Dynamic Scheduling -Hardware Based Speculation – Static scheduling – Thread Level Parallelism: Symmetric and Distributed Shared Memory Architectures – Case studies: Intel core i7, Atom Processors

TOTAL PERIODS: 45

COURSE OUTCOMES:

At the end of this course, the students will be able to

- determine the basic structure of computer, Instruction sequencing andAddressing modes.Dd
- execute the basic design of Addition and subtraction for fixed point numbers, multiplication and division of fixed numbers and basics of floating point numbers
- explain the concept of Instruction execution, generation of controlsignals, pipelining and hazards.

- implement the concept of Cache memory and its performance, interrupts,buses, Direct Memory Access and Standard I/O Interfaces.
- illustrate Parallelism concepts, compiler techniques, multiprocessorarchitecture and case studies on Intel's processors.

TEXT BOOK(S)

1. CarlHamacher, Zvonko Vranesicand Safwat Zaky, 6thEdition "ComputerOrganization", McGraw-Hill, 2012.
2. David A.Patterson and John L.Hennessy, "Computer Organization and Design: The hardware/software interface", 5thEdition, Morgan Kaufmann, 2014

REFERENCES

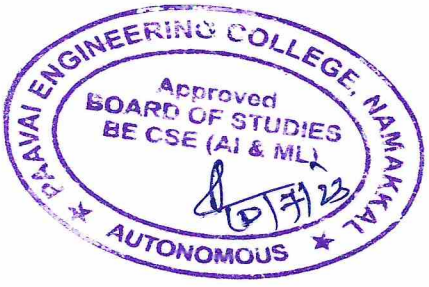
1. William Stallings, "Computer Organization and Architecture –Designing for Performance"9th edition pearson education ,2012.
2. JohnP. Hayes, "Computer Architecture and Organization", 3rd Edition, McGraw-Hill, 2012.
3. Vincent P. Heuring, Harry F. Jordan, "Computer System Architecture", Second Edition, Pearson Education, 2005
4. Govindarajalu, "Computer Architecture and Organization, Design Principles and Applications", first edition, Tata McGraw Hill, New Delhi, 2005
5. Http:/Nptel.ac.in

PO/CO MAPPING:

CO/PO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programmes Outcomes (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	-	-	-	-	-	-	-	-	2	1	2
CO2	3	2	1	1	-	-	-	-	-	-	-	-	2	1	1
CO3	3	3	2	2	-	-	-	-	-	-	-	-	2	1	1
CO4	3	3	2	1	-	1	-	-	-	-	-	1	2	-	1
CO5	3	3	2	1	-	-	-	-	-	-	-	-	2	1	1



MC20301 VALUE EDUCATION 2 0 0 0

COURSE OBJECTIVES

To enable students to

- develop the individual multi-dimensionally in physical, intellectual, emotional and spiritual dimensions.
- facilitate individuals think about and reflect on different values.
- understand their responsibility in making choices and the practical implications of expressing them.
- instigate to choose their personal, social, moral and spiritual values.
- design and chisel the overall personality of an individual.

UNIT I PERSONAL VALUES 6

Value Education – Definition, Types of values; Human values - Respect, Acceptance, Consideration, Appreciation, Listening, Openness, Affection, Patience, Honesty, Forgiveness, Sacrifice, Authenticity, Self Control, Altruism, Tolerance and Understanding, Wisdom, Decision making, Self –actualization, Character formation towards positive Personality,Contentment; Religious Values -Humility, Sympathy and Compassion, Gratitude. Peace, Justice, Freedom, Equality.

UNIT II COMMUNAL VALUES 6

Social Values - Pity and probity - Self control - Respect to Age, Experience, Maturity, Family members, Neighborhood- Universal Brotherhood - Flexibility -Peer pressure - Sensitization towards Gender Equality, Physically challenged, Intellectually challenged - Reliability - Unity - Modern Challenges of Adolescent Emotions and behavior - Comparison and Competition- Positive and Negative thoughts- Arrogance, Anger and Selfishness.

UNIT III ENGINEERING ETHICS 6

Professional Values -.Knowledge thirst - Sincerity in Profession- Regularity, Responsibility, Punctuality and Faith - Perseverance - Courage - Competence - Co-operation- Curbing unethical practices - Integrity, Social Consciousness and Responsibility.Global Values - Computer Ethics – Moral Leadership - Code of Conduct - Corporate Social Responsibility.

UNIT IV SPIRITUAL VALUES 6

Developing Spirituality - Thinking process, Moralization of Desires - Health benefits- Physical exercises, Mental peace; Meditation - Objectives, Types, Effects on body, mind and soul; Yoga - Objectives, Types, Asanas;. Family values -family's structure, function, roles, beliefs, attitudes and ideals, Family Work Ethics, Family Time, Family Traditions.

UNIT V HUMAN RIGHTS 6

Classification of Human Rights - Right to Life, Liberty and Dignity- Right to Equality - Right against Exploitation - Cultural and Educational Rights- Physical assault and Sexual harassment - Domestic violence.

TOTAL PERIODS 30

COURSE OUTCOMES

At the end of this course, the students will be able to

- cultivate the values needed for peaceful living in the existing society.
- comprehend humanistic values to develop peace in the world.
- foster ethics in profession and usage of technology.
- orient with the importance of value education towards personal, group and spiritual attributes.
- nurture physical, mental, spiritual growth to face the competitive world.

TEXT BOOKS

1. Sharma, S.P. Moral and Value Education; Principles and Practices, Kanishka publishers, 2013.

REFERENCES

1 Little, William, An introduction of Ethics. Allied publisher, Indian Reprint 1955.

2. "Values (Collection of Essays)". Sri Ramakrishna Math. Chennai. 1996.

	CO/PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak													
COs		Programmes Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	2	2	-	-	2	-	2
CO2	-	-	-	2	-	2	-	1	3	2	1	3	-	2
CO3	-	-	3	2	2	3	2	3	3	1	3	3	2	3
CO4	-	-	3	1	-	2	-	-	1	-	-	3	2	-
CO5	-	-	-	-	-	1	-	-	-	-	-	3	-	-

EC20309 **DIGITAL LABORATORY** **0 0 4 2**

COURSE OBJECTIVES

To enable the students to

- understand the concept of Boolean theorems.
- know the concept of combinational circuits using digital logic gates.
- design and implement the combinational and sequential logic circuits using MSI devices.
- acquire knowledge about simulation of digital circuits with Verilog HDL.

LIST OF EXPERIMENTS

1 Verification of Boolean theorems using digital logic gates.

2 Design and implementation of Full and Half adders and Full and Half subtractors using logic gates.

3 Design and implementation of code converter: Binary to Gray code and Gray code to Binary code.

4 Design and implementation of 2-bit magnitude comparator.

5 Design and implementation of 4-bit binary adder / subtractor using IC7483.

6 Design and implementation of encoder and decoder using basic gates.

7 Design and implementation of multiplexers and Demultiplexers using basic gates.

8 Design and implementation of Shift registers.

9 Design and implementation of 3-bit synchronous up (or) down counter.

10 Design and Simulation of Full and Half Adders, Full and Half Sub tractors

TOTAL PERIODS 60

COURSE OUTCOMES

At the end this course, students will be able to

- design adders and subtractors using basic logic gates and Karnaugh map.
- create code converters using basic logic gates.
- implement the combinational logic circuits like MUX,DEMUX, Encoder, Decoder etc.
- design various counters and shift registers and simulate digital circuits using Verilog HDL.

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes (3/2/1 indicates strength of correlation) 3-Strong,2-Medium,1-Weak														
COs	**Programme Outcomes(POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	2	-	-	-	-	2	-	-	3	3	3
CO2	3	3	3	2	-	-	-	-	2	-	-	-	3	3
CO3	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO4	3	3	3	2	-	-	-	-					3	3

COURSE OBJECTIVE:

To enable the students to

- understand Object Oriented Programming concepts and basics of Java programminglanguage
- know the principles of packages, inheritance and interfaces
- develop a java application with threads and generics classes.
- design and build Graphical User Interface Application using JAVA FX

LIST OF EXPERIMENTS

1. Solve problems by using sequential search, binary search, and quadratic sorting algorithms(selection, insertion)
2. Develop stack and queue data structures using classes and objects.
3. Develop a java application with an Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of P as PF, 0.1% of BP for staff club funds. Generate pay slips for the employees with their gross and net salary.
4. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle,
5. Triangle and Circle such that each one of the classes extends the class Shape. Each oneof the classes contains only the method print Area( ) that prints the area of the given shape.
6. Solve the above problem using an interface.
7. Implement exception handling and creation of user defined exceptions.
8. Write a java program that implements a multi-threaded application that has three threads.
9. First thread generates a random integer every 1 second and if the value is even, the second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of the cube of the number.
10. Write a program to perform file operations.
11. Develop applications to demonstrate the features of generics classes.
12. Develop applications using Java FX controls, layouts and menus.
13. Develop a mini project for any application using Java concepts.

TOTAL PERIODS: 60

COURSE OUTCOMES:

At the end of this course, the students will be able to

- design and develop java programs using object oriented programming concepts
- develop simple applications using object oriented concepts such as package, exceptions
- create GUIs and event driven programming applications for real world problems
- implement multi-threading, and generics concept.

PO/CO MAPPING:

CO/PO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programmes Outcomes (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	3	1	3	-	-	-	3	2	2	2	1	1	1
CO2	2	1	3	2	1	-	-	-	2	1	1	3	2	2	-
CO3	3	3	1	2	2	-	-	-	3	2	1	2	1	1	1
CO4	3	1	2	2	2	-	-	-	1	2	1	3	2	1	-

EN20301 **ENGLISH PROFICIENCY COURSE LABORATORY** **0 0 2 1**

COURSE OBJECTIVES

To enable the students to

- familiarize with the reading skills such as skimming and scanning.
- practise writing tasks to the level expected.
- develop listening strategies such as listening for key words, making inferences and identifying main ideas.
- speak well without inhibition and to assist the students in improving their vocabulary, pronunciation and comprehension of grammar.
- enrich their LSRW skills so as to crack on-line proficiency tests and to bring their career aspirations true.

EXERCISES FOR PRACTICE

1. ListeningExercises from TOEFL
    a. Conversations, Lectures
2. Listening Exercises from IELTS
    a. Places and directions
    b. Actions and processes
3. Reading Exercises from PTE
    a. Re-order paragraphs
4. Reading Exercises from IELTS
    a. Opinions and attitudes
    b. Locating and matching information
    c. Identifying information
5. Reading Exercises from BEC Vantage & BEC Higher
    a. Error identification
    b. Gap filling
6. Writing Exercises from PTE
    a. Summarize written text
7. Writing Exercises from IELTS
    a. Describing maps
    b. Describing diagrams
8. Speaking IELTS format
    a. Talking about familiar topics
    b. Giving a talk
    c. Discussion on aTopic

TOTAL: 30 PERIODS

COURSE OUTCOMES

At the end of this course, the students will be able to

- skim, scan and infer the given texts and attend the tasks successfully.
- write coherently using appropriate vocabulary and grammar.
- listen to speeches and conversations and answer the questions.
- communicate fluently and effectively on any given topics.
- appear with confidence for on-line tests.

REFERENCES

1. Cambridge University Press India Pvt.Ltd, New Delhi.2016.
2. PTE Academic Testbuilder. Macmillan Education.London. 2012.
3. Cambridge IELTS 12 Academic Student's Book with Answers: Authentic Examination Papers (IELTS… by Cambridge University Press . New Delhi.2016
4. TOEFL iBT Prep Plus 2018-2019 4 Practice Tests) Kaplan Publishing. Newyork.2017.

WEB LINKS

1. https://magoosh.com/toefl/2018/best-toefl-books/
2. https://ptetutorials.com/
3. http://ieltsliz.com/recent-ielts-questions-and-topics/

	CO/PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak												
COs		Programmes Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	2	3	-	-	-	3	2	-	-	-	2
CO2	-	-	2	2	-	-	1	1	3	2	-	2	-	2
CO3	-	-	-	-	-	3	1	2	3	2	2	3	2	-
CO4	-	-	-	-	-	2	2	3	3	2	2	-	2	-
CO5	-	-	2	-	-	1	2	-	3	3	-	1	2	3

SEMESTER IV

CL20401 **MACHINE LEARNING** **3 0 0 3**

COURSE OBJECTIVES:

To enable the students to

- teach the theoretical foundations of various learning algorithms
- train the students better understand the context of supervised learning methods
- apply all Unsupervised learning algorithms over appropriate real-time dataset
- evaluate the algorithms Neural Network models
- perform sample Machine Learning Applications

UNIT I INTRODUCTION TO MACHINE LEARNING 8

Review of Linear Algebra for machine learning; Introduction and motivation for machine learning; Examples of machine learning applications, Vapnik-Chervonenkis (VC) dimension, Probably Approximately Correct (PAC) learning, Hypothesis spaces, Inductive bias, Generalization, Bias variance trade-off

UNIT II SUPERVISED LEARNING 11

Linear Regression Models: Least squares, single & multiple variables, Bayesian linear regression, gradient descent, Linear Classification Models: Discriminant function – Perceptron algorithm, Probabilistic discriminative model - Logistic regression, Probabilistic generative model – Naive Bayes, Maximum margin classifier – Support vector machine, Decision Tree, Random Forests

UNIT III UNSUPERVISED LEARNING 9

Combining multiple learners: Model combination schemes, Voting, Ensemble Learning - bagging, boosting, stacking, Unsupervised learning: K-means, Instance Based Learning: KNN, Gaussian mixture models and Expectation maximization.

UNIT IV NEURAL NETWORKS 9

Multilayer perceptron, activation functions, network training – gradient descent optimization – stochastic gradient descent, error back propagation, from shallow networks to deep networks –Unit saturation (aka the vanishing gradient problem) – ReLU, hyper parameter tuning, batch normalization, regularization, dropout.

UNIT V MACHINE LEARNING IN PRACTICE 8

Guidelines for machine learning experiments, Cross Validation (CV) and resampling – K-fold CV, bootstrapping, measuring classifier performance, assessing a single classification algorithm and comparing two classification algorithms – t test, McNemar's test, K-fold CV paired t test

TOTAL PERIODS : 45

COURSE OUTCOMES:

At the end of the course ,the students will be able to

- explain the basic cocepts of machine learning.
- construct supervised learning models.
- construct unsupervised leaning algorithms.
- analyze the results of algorithm and Neural Networks models.

- evaluate and compare different models.

TEXT BOOK(S)

1. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Fourth Edition, 2020.
2. Stephen Marsland, "Machine Learning: An Algorithmic Perspective, "Second Edition", CRC Press, 2014

REFERENCES

1. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.
2. Tom Mitchell, "Machine Learning", McGraw Hill, 3rd Edition, 1997
3. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, "Foundations of Machine Learning", Second Edition, MIT Press, 2012, 2018.
4. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016
5. Sebastain Raschka, Vahid Mirjalili , "Python Machine Learning", Packt publishing 3rd Edition, 2019.

PO/CO MAPPING:

CO/PO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programmes Outcomes (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	1	3	-	1	-	-	-	1	3	3	1
CO2	2	2	3	2	1	3	-	1	-	-	-	1	3	3	-
CO3	2	2	3	2	1	3	-	1	-	-	-	1	3	3	1
CO4	2	3	3	2	3	3	-	1	-	-	-	1	3	3	1
CO5	2	2	3	2	2	3	-	1	-	-	-	1	3	3	1

CL20402 **DESIGN THINKING** 3 0 0 3

COURSE OBJECTIVES:

To enable the students to

- recognize the importance of design thinking and its various phases
- apply design thinking phases to create successful prototypes
- understand that both agile and design thinking process complement each other
- recognize Prototyping and testing
- implement design thinkings

UNIT I INTRODUCTION TO DESIGN THINKING 7

Importance of Design Thinking – Phases in design thinking process – Five stage model – Non-linearity of the five-stage model – Applications of design thinking in various domains.

UNIT II EMPATHIZE ,DEFINE PHASE 12

Empathy – Empathize with the users - Steps in empathize phase – Developing empathy towards people – Assuming a beginner's mindset – Ask What? And Why? – Immersion Activity – Steps in immersion activity- Body Storming – Case studies. Define the problem and interpret the result – Analysis and synthesis – Personas – Four different perspectives on Personas – Steps to creating personas – Problem statement – Affinity diagrams – Empathy mapping – Point of View – "How might we" questions – Why-how laddering – Case studies.

UNIT III IDEATE 8

What is ideation – Need for ideation – Uses of ideation – Ideation Methods – Brainstorming – Rules for brainstorming – Mind maps – Guidelines to create mind maps – Ideation games - Six Thinking Hats – Doodling – Use of doodling in expressing creative ideas – Case studies

UNIT IV PROTOTYPE AND TESTING 10

Prototyping – Types of prototyping – Guidelines for prototyping – Story telling – Characteristics of good stories – Reaching users through stories – Importance of prototyping in design thinking – Value proposition - Guidelines to write value proposition – Case studies. Need to test –User feedback - Conducting a user test – Guidelines for planning a test – How to test -Desirable, feasible and viable solutions – Iterate phase

UNIT V ROLE OF DESIGN THINKING AND CONTEMPORARY ISSUES 8

Software and good design – Design thinking and coding – Agile Methodology – Differences between agile and design thinking – Complementing agile with design thinking. Guest lecture by Industry Experts or R&D organization

TOTAL PERIODS: 45

COURSE OUTCOME:

At the end of this course, the students will be able to

- understand the importance of design thinking and its different phases.
- empathize with user situations and be able to define clear problem statements.
- use the different ideation methods and come with different feasible and viable ideas for solving the problem statements.

- create prototypes for clear understanding of the problem statement.
- test the created prototypes and be able to iterate if the design does not meet the customer requirement.

TEXT BOOK(S)

1. Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires, 1st Edition, HarperCollins, 2009.
2. Eli Woolery, Design Thinking Handbook, Invision, 2019.

REFERENCES

1. Nir Eyal , Hooked: How to build habit-forming, 2014
2. Rod Judkins, The Art of Creative Thinking, Sceptre; 1st edition, 2015
3. Michael Lewrick, Patrick Link, Larry Leifer , "The Design Thinking Toolbox: A Guide to Mastering the Most Popular and Valuable Innovation Methods", March 2020 edition, ISBN: 978-1-119- 62921-4, WILEY Publication.
4. Tim Brown, "Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation", ISBN- 9780061937743, Harper Collins, 2009.
5. Eli Woolery, "Design Thinking Handbook", In-Vision publisher

PO/CO MAPPING:

CO/PO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programmes Outcomes (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	2	-	2	1	-	-	-	-	1	2	1	-	-
CO2	1	-	2	-	2	1	-	-	-	-	1	2	1	-	1
CO3	1	-	3	-	3	1	-	-	-	-	2	2	2	-	-
CO4	1	-	3	-	2	2	-	-	-	-	1	2	2	-	-
CO5	1	-	1	-	2	1	-	-	-	-	1	2	2	-	1

CL20403 **DATABASE MANAGEMENT SYSTEM** 3 0 0 3

COURSE OBJECTIVES:

To enable the students to

- learn the fundamentals of data models, relational algebra and SQL
- represent a database system using ER diagrams and to learn normalization techniques
- understand the fundamental concepts of transaction, concurrency and recovery processing
- understand the internal storage structures using different file and indexing techniques which will help in physical DB design
- have an introductory knowledge about the Distributed databases, NOSQL and database security.

UNIT I RELATIONAL DATABASES 7

Introduction to Database System –Views of data , Database System Architecture – ER Models , Enhanced-ER Model ,Relational Model, ER-to-Relational Mapping ; SQL - SQL Syntax , Data types , Operators ,SQL Keys , DDL Statements – DML Statements, SQL Aliases , Operators , SQL Aggregate Functions.

UNIT II ADVANCED QUERY STRUCTURES 12

SQL Clauses , Group By ; Having – Sub Query , Nested Sub Query ; Data Control Language , Null Functions – Indexes , Sequences , Clone tables , SQL Joins, Basics, Types; Self Join, Inner Join , Outer Join , Left Join, Right Join, Full outer Join , Views – SQL Injections.

UNIT III T-SQL AND STORED PROCEDURES 8

T-SQL: Scripts and Batches Declaring Variables – Using Statements , Error Handling , Global Variables Using Dynamic SQL , Stored Procedures ; PL/SQL Functionalities , Control statements ; Functions –Triggers – ODBC/JDBC connectivity – ODBC/JDBC Implementation – Case Study: Banking / University database system.

UNIT IV NORMALIZATION AND TRANSACTION MANAGEMENT 10

Functional Dependencies –Non loss Decomposition–Normalization: First, Second, Third Normal Forms, Dependency Preservation –Boyce/Codd Normal Form – Transaction: Basic Concepts -Transaction Recovery – ACID Properties – Concurrency – Deadlock – RAID – B+ Tree Indexing.

UNIT V NO-SQL DATABASES 8

Introduction – Types of No-SQL databases : Document-oriented, Key Value Pairs, Column-oriented and Graph – CRUD Operations – MongoDB, Cassandra, HBASE, Neo4j use and deployment, POSTGRESQL: Data types-CRUD Operations – Use Cases: Event Logging – Content Management Systems – E-commerce Applications.

TOTAL PERIODS: 45

COURSE OUTCOME:

At the end of this course, the students will be able to

- apply the SQL concepts and operations in a relational database design.
- apply the Sub-Queries and Join concept in relational database design.
- illustrate the use of T-SQL and stored procedures in real time scenarios.
- demonstrate the normalization design concept for effective query processing.
- acquire knowledge about No-SQL databases in emerging applications.

TEXT BOOK(S)

1. Abraham Silberschatz, Henry F. Korth, S.Sudharshan, "Database System Concepts", Tata McGraw Hill, 6th Edition, 2013.
2. C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Pearson Education, 8th Edition, 2012.

REFERENCES

1. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Pearson Education, 7th Edition, 2016.
2. Thomas Cannolly and Carolyn Begg, "Database Systems, A Practical Approach to Design, Implementation and Management", Pearson Education, 5th Edition, 2009.
3. Peter Membrey, "MongoDB Basics", Apress; 1st Edition, 2014.
4. Shashank Tiwari, "Professional NoSQL", John Wiley and Sons, 2011
5. G.K.Gupta,"Database Management Systems, Tata McGraw Hill, 2011

PO/CO MAPPING:

CO/PO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programmes Outcomes (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	1	-	-	-	1	-	-	-	3	2	2	-
CO2	-	2	3	-	-	2	-	-	-	-	-	3	-	1	-
CO3	-	2	3	-	1	-	-	-	-	-	-	3	-	2	-
CO4	2	2	2	2	-	-	-	-	-	1	-	3	2	1	-
CO5	-	2	3	-	-	-	-	-	-	-	1	3	-	2	-

CL20404 **PYTHON PROGRAMMING** **3 0 0 3**

COURSE OBJECTIVE:

To enable the students to

- know the basics of programming in Python
- understand modules and functions
- study files and exception handling
- recognize the basic concepts of NumPy
- create layouts using graphical tools

UNIT I INTRODUCTION **9**

Introduction to Python – Strings – List – Tuples - Dictionaries – Basic Operators – DecisionMaking — Loop

UNIT II MODULAR DESIGN **10**

Modules – Python module – Namespaces – Importing modules – Loading and Execution – Program Routine – Functions – Parameter Passing - Types – Recursion

UNIT III FILES AND EXCEPTION HANDLING **8**

Introduction - Data Streams - Creating own data Streams - Access Modes - Writing Data to a File – Reading Data From a File - Additional File Methods- Exceptions – Types, Handling Exceptions, User Defined Exceptions

UNIT IV NUMPY BASICS **10**

NumPy Data Types – NumPy Arrays - Creating, Adding items, Removing items, Printing Items, Sorting items, Reshaping, Indexing and Slicing

UNIT V GUI PROGRAMMING AND GRAPHICS **8**

GUI Programming toolkits – Introduction to Tkinter – Creating GUI widgets – Resizing – Configuringwidget options – Creating Layouts – Radio buttons – Check boxes – Dialog boxes – Drawing using Turtle

TOTAL PERIODS: 45

COURSE OUTCOME:

At the end of this course, the students will be able to

- apply the basics of Python Programming for problem-solving
- develop programs using modules and functions
- implement programs using file and exception handling
- create a solution for real world problems using NumPy arrays
- design layouts with GUI toolkits using Tkinter

TEXT BOOK(S)

1. John Paul Mueller, "Beginning Programming with Python", 2nd Edition, Wiley India Pvt Ltd, 2014
2. Usman Malik, "Python NumPy for Beginners: NumPy Specialization for data Scientists", AI Publishing, 2021

REFERENCES

1. Wesley J. Chun, "Core Python Applications Programming", 3rd Edition, Pearson Education, 2013
2. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.
3. Charles Dierbach, "Introduction to Computer Science using Python", 2nd Edition, Wiley India Pvt Ltd, 2015
4. Dr. R.Nageswara Rao "Core Python Programming", DreamTech Press, 2nd Edition, 2018

PO/CO MAPPING:

CO/PO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programmes Outcomes (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	-	-	-	-	2	2	3	3	1
CO2	3	3	3	3	2	-	-	-	-	-	2	2	3	-	1
CO3	3	3	3	3	2	-	-	-	-	-	2	-	3	-	1
CO4	2	2	-	2	2	-	-	-	-	-	1	-	3	-	2
CO5	1	2	-	-	1	-	-	-	-	-	1	-	2	-	1

CL20405 **OPERATING SYSTEMS** 3 0 0 3

COURSE OBJECTIVE:

To enable the students to

- understand the basics and functions of operating systems.
- understand Processes and Threads and analyze Scheduling algorithms and process synchronization.
- understand the concept of Deadlocks and analyze various memory management schemes.
- be familiar with I/O management and File systems.
- be familiar with the basics of virtual machines and Mobile OS like iOS and Android.

UNIT I INTRODUCTION 9

Computer System – Elements and organization; Operating System Overview – Objectives and Functions – Evolution of Operating System; Operating System Structures – Operating System Services – User Operating System Interface – System Calls – System Programs – Design and Implementation – Structuring methods.

UNIT II PROCESS MANAGEMENT 10

Processes – Process Concept – Process Scheduling – Operations on Processes – Inter-process Communication; CPU Scheduling – Scheduling criteria – Scheduling algorithms: Threads – Multithread Models – Threading issues; Process Synchronization – The critical-section problem – Synchronization hardware – Semaphores – Mutex – Classical problems of synchronization – Monitors; Deadlock – Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

UNIT III MEMORY MANAGEMENT 8

Main Memory – Swapping – Contiguous Memory Allocation – Paging – Structure of the Page Table - Segmentation, Segmentation with paging; Virtual Memory – Demand Paging – Copy on Write – Page Replacement – Allocation of Frames –Thrashing.

UNIT IV STORAGE MANAGEMENT 10

Mass Storage system – Disk Structure – Disk Scheduling and Management; File-System Interface - File concept – Access methods – Directory Structure – Directory organization – File system mounting – File Sharing and Protection; File System Implementation – File System Structure – Directory implementation – Allocation Methods – Free Space Management; I/O Systems – I/O Hardware, Application I/O interface, Kernel I/O subsystem.

UNIT V VIRTUAL MACHINES AND MOBILE OS 8

Virtual Machines – History, Benefits and Features, Building Blocks, Types of Virtual Machines and their Implementations, Virtualization and Operating-System Components; Mobile OS – iOS and Android.

TOTAL PERIODS: 45

COURSE OUTCOMES:

At the end of this course, the students will be able to

- analyze various scheduling algorithms and process synchronization.
- explain deadlock, prevention and avoidance algorithms.
- compare and contrast various memory management schemes.
- explain the functionality of file systems I/O systems, and Virtualization
- compare iOS and Android Operating Systems.

TEXT BOOK(S)

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Inc., 2018.
2. Andrew S Tanenbaum, "Modern Operating Systems", Pearson, 4th Edition, New Delhi, 2016

REFERENCES

1. Ramaz Elmasri, A. Gil Carrick, David Levine, "Operating Systems – A Spiral Approach", Tata McGraw Hill Edition, 2010.
2. William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, Prentice Hall, 2018.
3. Achyut S.Godbole, Atul Kahate, "Operating Systems", McGraw Hill Education, 2016.
4. Harvey M. Deitel, "Operating Systems", Third Edition, Pearson Education, 2004.
5. Gary Nutt, "Operating Systems", Third Edition, Pearson Education, 2004.

PO/CO MAPPING:

CO/PO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programmes Outcomes (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	1	2	2	-	-	-	-	-	-	-	-	-	-	-	-

CL20406 **DESIGN AND ANALYSIS OF ALGORITHM** **3 0 0 3**

COURSE OBJECTIVE:

To enable the students to

- provide a mathematical foundation for analyzing and proving the efficiency of analgorithm.
- focus on the design of algorithms in various domains of computer engineering.
- provide familiarity with main thrusts of work in algorithms sufficient to give somecontext for formulating and seeking known solutions to an algorithmic problem.
- able to give solution for real-world problem
- perform algorithm efficiency

UNIT I ALGORITHM DEVELOPMENT **7**

Stages of algorithm development for solving a problem: Describing the problem, Identifying asuitable technique, Design of an algorithm, Proof of Correctness of the algorithm.

UNIT II ALGORITHM DESIGN TECHNIQUES **10**

Brute force techniques – Travelling Salesman Problem, Divide and Conquer - Finding a maximum and minimum in a given array -Matrix multiplication: Strassen's algorithm, Greedy techniques Huffman Codes and Data Compression -Fractional Knapsack problem, Dynamic programming - O/1 Knapsack problem-Matrix chain multiplication, LCS, Travelling Salesman Problem, Backtracking- N-Queens Problem, Knights Tour on Chess Board.

UNIT III COMPUTATIONAL GEOMETRY ALGORITHMS **9**

Naïve String matching Algorithms, KMP algorithm, Rabin-Karp Algorithm, Line Segments – properties, intersection; Convex Hull finding algorithms- Graham's Scan, Jarvis's March Algorithm.

UNIT IV GRAPH ALGORITHMS **9**

All pair shortest path – Floyd-Warshall Algorithm. Network Flows - Flow Networks, Maximum Flows – Ford-Fulkerson Algorithm, Push Re-label Algorithm, Minimum Cost Flows – Cycle Cancelling Algorithm.

UNIT V COMPLEXITY, APPROXIMATION AND RANDOMIZED ALGORITHMS **10**

The Class P, The Class NP, Reducibility and NP-completeness – SAT (without proof), 3-SAT, Vertex Cover, Independent Set, Maximum Clique - Approximation Algorithms - The set-covering problem – Vertex cover, K-center clustering.Randomized Algorithms - The hiring problem, Finding the global Minimum Cut

TOTAL PERIODS: 45

COURSE OUTCOME:

At the end of this course, the students will be able to

- ability to use mathematical tools to analyze and derive the running time ofalgorithms and prove the correctness
- explain and apply the major algorithm design paradigms
- explain the major Computational Geometry algorithms and their analysis
- provide algorithmic solutions to real-world problem from various domains

- explain the hardness of real world problems with respect to algorithmic efficiency andlearning to cope with it.

TEXT BOOK(S)

1. Thomas H. Cormen, C.E. Leiserson, R L.Rivest and C. Stein, Introduction to Algorithms , Third edition, MIT Press, 2009.
2. Jon Kleinberg, ÉvaTardos ,Algorithm Design, Pearson education, 2014

REFERENCES

1. Ravindra K. Ahuja, Thomas L. Magnanti, and James B. Orlin, —Network Flows: Theory, Algorithms, and Applications‖, Pearson Education, 2014.
2. Anany Levitin, —Introduction to the Design and Analysis of Algorithms‖, Third Edition,
3. Pearson Education, 2012.
4. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algorithms/ C++, Second
5. Edition, Universities Press, 2007
6. S. Sridhar, —Design and Analysis of Algorithms‖, Oxford university press, 2014.
7. Harsh Bhasin, —Algorithms Design and Analysis‖, Oxford university press, 2016.

PO/CO MAPPING:

CO/PO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programmes Outcomes (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	3	-	-	-	-	-	-	-	-	-	1	1	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-	1	1	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-	1	-	-
CO4	2	2	2	-	-	-	-	-	-	-	-	-	1	1	-
CO5	1	2	2	-	-	-	-	-	-	-	-	-	1	1	-

CL20407 **PYTHON PROGRAMMING LABORATORY** 0 0 4 2

COURSE OBJECTIVES:

To enable the students to

- gain the knowledge in Python programming Language
- understand the concepts decision making and looping statements
- implement functions with the aid of modules using exception handling
- create layouts using graphical modules such as Tkinter and Turtle

LIST OF EXPERIMENTS

1. Implement the basic concepts of Python
2. Implement List, Tuples, Dictionary, and String
3. Implement the concept of decision-making and looping statements.
4. Working with functions and modules
5. Implement File operations
6. Build a program with Exception handling
7. Perform various NumPy operations and special functions
8. Design windows using Tkinter
9. Draw shapes and images using Turtle
10. Mini Project

TOTAL PERIODS: 60

COURSE OUTCOMES:

At the end of this course, the students will be able to

- implement the basics and data structures of Python programming
- implement the concepts of decision making and looping statements
- create programs using NumPy arrays
- design layouts with GUI toolkits using Tkinter

PO/CO MAPPING:

CO/PO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programmes Outcomes (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	3	-	-	-	-	-	-	-	-	-	1	1	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-	1	1	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-	1	1	-
CO4	2	2	2	-	-	-	-	-	-	-	-	-	1	1	-

CL20408 DATABASE MANAGEMENT SYSTEM LABORATORY 0 0 4 2

COURSE OBJECTIVES:

To enable the students to

- learn and implement important commands in SQL.
- learn the usage of nested and joint queries.
- understand functions, procedures and procedural extensions of databases.
- understand design and implementation of typical database applications.

LIST OF EXPERIMENTS

1. Create a database table, add constraints (primary key, unique, check, Not null), insert rows, update and delete rows using SQL DDL and DML commands.
2. Create a set of tables, add foreign key constraints and incorporate referential integrity.
3. Query the database tables using different 'where' clause conditions and also implement aggregate
4. functions.
5. Query the database tables and explore sub queries and simple join operations.
6. Query the database tables and explore natural, equi and outer joins.
7. Write user defined functions and stored procedures in SQL.
8. Execute complex transactions and realize DCL and TCL commands.
9. Write SQL Triggers for insert, delete, and update operations in a database table.
10. Create View and index for database tables with a large number of records.
11. Create an XML database and validate it using XML schema.
12. Create Document, column and graph based data using NOSQL database tools

TOTAL PERIODS: 60

COURSE OUTCOMES:

At the end of this course, the students will be able to

- generate the query using SQL commands.
- develop PL/SQL programs to enhance the database activities using stored procedures, stored functions and triggers.
- design and build No-SQL applications using Mongo-DB and Cassandra.
- develop programs using functions and modules with exception handling

PO/CO MAPPING:

CO/PO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programmes Outcomes (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	1	-	-	-	1	-	-	-	3	2	2	-
CO2	-	2	3	-	-	2	-	-	-	-	-	3	-	1	-
CO3	-	2	3	-	1	-	-	-	-	-	-	3	-	2	-
CO4	2	2	2	2	-	-	-	-	-	1	-	3	2	1	-

CL20409	OPERATING SYSTEM LABORATORY	0	0	4	2

COURSE OBJECTIVE:

To enable the students to

- gain the knowledge in Unix C programming Language
- understand the basics and Unix Programming of operating systems.
- implement Threads and analyze Scheduling algorithms and process synchronization
- implement various File Allocation methods.

LIST OF EXPERIMENTS

1. Installation of Operating system : Windows/ Linux
2. Illustrate UNIX commands and Shell Programming
3. Process Management using System Calls : Fork, Exec, Getpid, Exit, Wait, Close
4. Write C programs to implement the various CPU Scheduling Algorithms
5. Illustrate the inter process communication strategy
6. Implement mutual exclusion by Semaphores
7. Write a C program to avoid Deadlock using Banker's Algorithm
8. Write a C program to Implement Deadlock Detection Algorithm
9. Write C program to implement Threading
10. Implement the paging Technique using C program
11. Write C programs to implement the following Memory Allocation Methods
12. First Fitb. Worst Fit c. Best Fit
13. Write C programs to implement the various Page Replacement Algorithms
14. Write C programs to Implement the various File Organization Techniques
15. Implement the following File Allocation Strategies using C programs
16. Sequential b. Indexed c. Linked
17. Write C programs for the implementation of various disk scheduling algorithms

TOTAL PERIODS: 60

COURSE OUTCOME:

At the end of this course, the students will be able to

- test all Unix Commands
- demonstrate basics and Unix Programming of operating systems.
- analyze Scheduling algorithms and process synchronization
- demonstrate Deadlocks and analyze various memory management schemes

PO/CO MAPPING:

CO/PO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programmes Outcomes (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	2	-	-	-	-	-	-	-	-	-	-	-	-