3rd BoS

DRAFT

FACULTY OF ENGINEERING

Scheme of Instructions & Examination

For

Four Year Degree Programme of

Bachelor of Engineering (B.E)

in

Computer Engineering

(With effect from the academic year 2023-24)

Estd. 2008

STANLEY COLLEGE OF ENGINEERING AND TECHNOLOGY FOR WOMEN (AUTONOMOUS)

(Affiliated to Osmania University)
(Accredited by NAAC with "A" Grade)
ABIDS, HYDERABAD-500001, Telangana.

Stanley College of Engineering and Technology for Women (Autonomous)
Proposed for the academic batch 2023-2027

BOS-chairperson

Abbreviation	Meaning
HS	Humanities, Social Sciences and Management
BS	Basic Sciences including Mathematics, Physics and Chemistry
ES	Engineering Sciences including Workshop, Drawing, Basic Electrical / Electronics
PC	Professional Core Subjects
PE	Professional Elective Subjects
OE	Open Elective Subjects
PW	Project Work, Seminars, Internship
MC	Mandatory Courses
PY	Philosophy
EC	Electronics and Communication Engineering.
CE	Civil Engineering,
MP	Mechanical / Production Engineering
IT	Information Technology
CS	Computer Science Engineering
EE	Electrical and Electronics Engineering
CM	Computer Engineering
AD	Artificial Intelligence and Data Science
L	Lecture
T	Tutorial
P	Practical
G	Grade
D	Drawing
CIE	Continuous Internal Evaluation
SEE	Semester End Evaluation
	Each contact hour is a clock hour
	The duration of the Practical class is two hours; however, it can be extended wherever necessary, to enable the student to complete the experiment.

SMC901CM (Mandatory) Three Week Induction Program	3 weeks' duration
Induction program for students to be offered right at the start of the first year	• Physical Activity • Creative Arts • Universal Human Values • Literary • Proficiency Modules • Lectures by Eminent People • Visits to local Areas • Familiarization to Dept./Branch & Innovations

CME: SEMESTER -I

S.No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	D/P	Contact Hrs./W	CIE	SEE	SEE Duration in Hrs	
	SMC901CM	Induction Program	-	-	-	-	-	-	-	0
Theory Courses										
1	SBS101MT	Mathematics-I	3	1	-	4	40	60	3	4
2	SBS904CH	Applied Chemistry	3	1	-	4	40	60	3	4
3	SES101CM	Programming for Problem Solving	3	-	-	3	40	60	3	3
4	SHS901EG	English	2	-	-	2	40	60	3	2
5	SHS902EG	Universal Human Values	2	-	-	2	40	60	3	2
Practical and Laboratory Courses										
6	SBS914CH	Chemistry Lab	-	-	2	2	40	60	3	1
7	SES111CM	Programming for Problem Solving Lab	-	-	4	4	40	60	3	2
8	SES915ME	Engineering Graphics Lab	-	-	4	4	40	60	3	2
9	SHS916CM	Design Thinking	-	-	2	2	40	60	3	1
Total			**13**	**02**	**12**	**27**	**360**	**540**	**-**	**21**

K. Vaidehi
Dr. K. Vaidehi

[Prof. S. Srinivasa Rao]
[OU Nominee]
Dept. of CSE, UCE, OU.

CME: SEMESTER-II

S.No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	D/P	Contact Hrs/W	CIE	SEE	SEE Duration in Hrs.	
Theory Courses										
1	SBS202MT	Mathematics-II	3	1	-	4	40	60	3	4
2	SBS902PH	Applied Physics	3	1	-	4	40	60	3	4
3	SES201CM	Data Structures	3	-	-	3	40	60	3	3
4	SESX03EE	Fundamentals of Electrical & Electronics Engineering	3	1	-	4	40	60	3	4
Practical and Laboratory Courses										
5	SBS912PH	Applied Physics Lab	-	-	2	2	40	60	3	1
6	SHS911EG	English Lab	-	-	2	2	40	60	3	1
7	SES211CM	Data Structures Lab	-	-	4	4	40	60	3	2
8	SESX13EE	Fundamentals of Electrical & Electronics Engineering Lab	-	-	2	2	40	60	3	1
9	SES914ME	Engineering Workshop	-	-	4	4	40	60	3	2
10	SPW211CM	IDEA Lab	-	-	2	2	40	60	3	1
Total			**12**	**03**	**16**	**31**	**400**	**600**	**-**	**23**

NOTE: IDEA Lab to be evaluated in the subsequent semester

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CME: SEMESTER – III

S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	P/D	Contact Hrs/	CIE	SEE	SEE Duration in	
Theory Courses										
1	SBSX01MT	Mathematics-III	3	1	-	4	40	60	3	4
2	SESX01EC	Digital Electronics	3	-	-	3	40	60	3	3
3	SPC301CM	Discrete Mathematics	3	-	-	3	40	60	3	3
4	SPC302CM	OOPs Using Java	3	1	-	4	40	60	3	4
5	SPC303CM	Concepts in Computer Organization & Microprocessor	3	1	-	4	40	60	3	4
6	SMC901HS	Indian Constitution	2	-	-	2	40	60	3	0
Practical/ Laboratory Courses										
7	SHS912EG	Advanced Communication Skills Lab	-	-	2	2	40	60	3	1
8	SPC312CM	OOPs using Java Lab	-	-	2	2	40	60	3	1
9	SPC313CM	Concepts in Computer Organization & Microprocessor Lab	-	-	2	2	40	60	3	1
10	SPC314CM	Python Programming Lab	-	-	2	2	40	60	3	1
		Total	**15**	**03**	**08**	**26**	**360**	**540**	**-**	**22**

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CME: SEMESTER – IV

S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	P/D	Contact Hrs/Wk	CIE	SEE	SEE Duration	
Theory Courses										
1	SHS901BM	Managerial Economics & Financial Accountancy	3	-	-	3	40	60	3	3
2	SPC401CM	Automata Language and Computation	3	-	-	3	40	60	3	3
3	SPC402CM	Data Communication & Computer Networks	3	1	-	4	40	60	3	4
4	SPC403CM	Operating Systems	3	1	-	4	40	60	3	4
5	SPC404CM	Database Management Systems	3	1	-	4	40	60	3	4
6	SAC903CH	Environmental Science	2	-	-	2	50	-	-	0
Practical/ Laboratory Courses										
7	SPC412CM	Data Communication & Computer Networks Lab	-	-	2	2	40	60	3	1
8	SPC413CM	Operating Systems Lab	-	-	2	2	40	60	3	1
9	SPC414CM	Database Management Systems Lab	-	-	2	2	40	60	3	1
Internship-1(SPW411CM)			The students must undergo Internship for 4 week duration summer vacation which will be assessed in the forthcoming V semester							
Total			**17**	**03**	**06**	**26**	**370**	**480**		**21**

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CME SEMESTER - V

No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	P/D	Contact Hrs/Wk	CIE	SEE	SEE Duration	
		Theory Courses								
	SPC501CM	Design and Analysis of Algorithms	3	1	-	4	40	60	3	4
	SPC502CM	Internet of Things	3	-	-	3	40	60	3	3
	SPC503CM	Compiler Design	3	-	-	3	40	60	3	3
	PE-I	PE-I	3	-	-	3	40	60	3	3
	OE-I	OE-I	3	-	-	3	40	60	3	3
		Practical/ Laboratory Courses								
	SPC512CM	Internet of Things Lab	-	-	2	2	40	60	3	1
	SPC513CM	Compiler Design Lab	-	-	2	2	40	60	3	1
	SPC514CM	Web Technology Applications Lab	-	-	2	2	40	60	3	1
	SPW511CM	Technical Seminar	-	-	2	2	50	-	-	1
0	SPW411CM	Internship-1	-				50	-	-	1
		Total	17	01	08	26	460	540		21

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CME: SEMESTER - VI

No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	P/D	Contact Hrs/Wk	CIE	SEE	SEE Duration	
		Theory Courses								
1	SHS902BM	Entrepreneurship and Startups	3	-	-	3	40	60	3	3
2	SPC601CM	Software Engineering	3	-	-	3	40	60	3	3
3	SPC602CM	Machine Learning	3	1	-	4	40	60	3	4
4	SPC603CM	Introduction to AI	3	-	-	3	40	60	3	3
5	PE-II	Professional Elective-II	3	-	-	3	40	60	3	3
		Practical/Laboratory Courses								
6	SPC612CM	Machine Learning Lab	-	-	2	2	40	60	3	1
7	SPC613CM	Artificial Intelligence Lab	-	-	2	2	40	60	3	1
8	SPW611CM	Mini Project Lab (Independent Project)	-	-	4	4	50	-	-	2
	Internship-II(SPW612CM)		The students must undergo Internship for 4 week duration summer vacation which will be assessed in the forthcoming VII semester							
	Total		**15**	**01**	**08**	**24**	**330**	**420**	-	**20**

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CME SEMESTER - VII

No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	P/D	Contact Hrs/Wk	CIE	SEE	SEE Duration	
		Theory Courses								
1	SPC701CM	Deep Learning	3	-	-	3	40	60	3	3
2	PE-III	Professional Elective-III	3	-	-	3	40	60	3	3
3	PE-IV	Professional Elective-IV	3	-	-	3	40	60	3	3
4	PE-V	Professional Elective-V	3	-	-	3	40	60	3	3
5	OE-II	Open Elective-II	3	-	-	3	40	60	3	3
		Practical/Laboratory Courses								
6	SPC711CM	Deep Learning Lab	-	-	2	2	40	60	3	1
7	SPE71XCM	Professional Elective Lab	-	-	2	2	40	60	3	1
8	SPW711CM	Project Work-I	-	-	6	6	50	-	3	3
9	SPW612CM	Internship-II	-				50	-	-	1
		Total	15	00	10	25	380	420	-	21

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CME: SEMESTER - VIII

No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	P/D	Contact Hrs/Wk	CIE	SEE	SEE Duration	
		Theory Courses								
1	OE-III	Open Elective-III	3	-	-	3	40	60	3	3
		Practical/Laboratory Courses								
2	SPW811CM	Project Work-II	-	-	16	16	40	120	-	8
		Total	03	-	16	19	80	180	-	11

Dr. K. Vaddeli

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LIST OF PROFESSION ELECTIVES

PE-I	PE-II	PE-III	PE-IV	PE-V
Expert systems	Applications of AI	Augmented reality &virtual reality	Speech Processing	Video Processing
Natural language processing	Computer Vision	Soft Computing	Deep learning	GPU Computing
Data Warehouse & Data Mining	Data Science	Data visualization	Big Data Analytics	NOSQL Database
Distributed Systems	Cloud Computing	Scalable Architecture for Large Applications	Mining Massive Datasets	Programming with SPARK
Cyber security	Embedded Systems	Block chain technology	Web Security	Cloud application development

OPEN ELECTIVE OFFERED TO OTHER BRANCHES

S. No	Subject Code	Subject Name
1.	OEXXXCM	Machine Learning
2.	OEXXXCM	Web Application Development

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COMPARISON BETWEEN GATE & CME SYLLABUS

GATE SUBJECT	CME Subject Names and Semester
Discrete Mathematics	Discrete Mathematics(Sem-III)
Digital Logic	Logic and Switching Theory(Sem-III)
Computer Organization and Architecture	Concepts in Computer Organization & Microprocessor (Sem-III)
Programming and Data Structures	Data Structures (Sem-II)
Algorithms	Design and Analysis of Algorithms(Sem-V)
Theory of Computation & Compiler Design	Automata Language and Computation (Sem-IV) Compiler Design(Sem-V)
Operating Systems	Operating Systems(Sem-IV)
Databases	Database Management Systems (Sem-IV)
Computer Networks	Data Communication & Computer Networks (Sem-IV)

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CME: SEMESTER – III

S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	P/D	Cr Hr	CIE	SEE	Duration	
Theory Courses										
1.	SBSX01MT	Mathematics-III(Probability & Statistics)	3	1	-	4	40	60	3	4
2.	SESX01EC	Digital Electronics	3	-	-	3	40	60	3	3
3.	SPC301CM	Discrete Mathematics	3	-	-	3	40	60	3	3
4.	SPC302CM	OOPs Using Java	3	1	-	4	40	60	3	4
5.	SPC303CM	Concepts in Computer Organization & Microprocessors	3	1	-	4	40	60	3	4
6	SMC901HS	Indian Constitution	2	-	-	2	40	60	3	0
Practical/ Laboratory Courses										
7.	SHS912EG	Advanced Communication Skills Lab	-	-	2	2	40	60	3	1
8.	SPC312CM	OOPs using Java Lab	-	-	2	2	40	60	3	1
9.	SPC313CM	Concepts in Computer Organization & Microprocessors Lab	-	-	2	2	40	60	3	1
10.	SPC314CM	Python Programming Lab	-	-	2	2	40	60	3	1
Total			**17**	**03**	**08**	**28**	**360**	**540**	**-**	**22**

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HEAD

Department of Computer Science & Engineering
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Osmania University
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OU-NOMINEE

Course Code	Course Title						Core/Elective
SPC301CM	DISCRETE MATHEMATICS (Common to AI & DS, CME)						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	-	-	-	40	60	3

Course Objectives: The course should enable the students to:

1. Solve the practical examples of sets, functions and relations.
2. Describe the logical and mathematical foundations, and study abstract models of computation.
3. Illustrate the limitations of predicate logic.
4. Define modern algebra for constructing and writing mathematical proofs.
5. Recognize the patterns that arise in graph problems and use this knowledge for constructing the trees and spanning trees.

Course Out comes: At the end of this course, the student will be able to

1. Use logical notation to define and reason about fundamental mathematical concepts such as sets, relations, and functions
2. Apply mathematical Logic to solve problems.
3. Apply and formulate problems using predicate logic.
4. Analyze and solve Algebraic Structures and counting problems on finite & discrete structures
5. Apply graphs and trees in solving computing problems.

UNIT I

Sets, Relation and Function: Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation, lattices, Hasse diagram, Image of a Set, Sum and Product of Functions, Bijective functions, Inverse and Composite Function, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets, Recurrence Relations.

UNIT II

Mathematical logic: Statements and notations, connectives, well-formed formulas, truth tables, tautology, equivalence implication; Normal forms: Disjunctive normal forms, conjunctive normal forms, principle disjunctive normal forms, principle conjunctive normal forms.

UNIT III

Predicate calculus: Predicative logic, statement functions, variables and quantifiers, free and bound variables, rules of inference, consistency, proof of contradiction, automatic theorem proving.

UNIT IV

Algebraic structures: Algebraic systems, examples and general properties, semi groups and monoids, groups, sub groups, homomorphism, isomorphism, rings.

Combinatory: The fundamental counting principles, permutations, disarrangements, combinations, permutations and combinations with repetitions, the binomial theorem, multinomial theorem, Principle of inclusion exclusion, pigeon hole principle.

UNIT V

Graphs: Basic concepts of graphs, isomorphic graphs, Euler graphs, Hamiltonian graphs, planar graphs, graph coloring, digraphs, directed acyclic graphs, weighted digraphs, region graph, chromatic numbers

Trees: Trees, spanning trees, minimal spanning trees.

Text Books:

1. J. P. Tremblay, R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill, India, 1st Edition, 1997.
2. Kenneth H. Rosen, "Discrete Mathematics and Its Applications", Tata Mcgraw-Hill, New Delhi, India, 6th Edition, 2012.

Reference Books:

1. Joe L. Mott, Abraham Kandel, Theodore P. Baker, "Discrete Mathematics for Computer Scientists and Mathematics", Prentice Hall of India Learning Private Limited, New Delhi, India, 2nd Edition, 2010.
2. D S Chandra shekaraiah," Mathematical Foundations of Computer Science", Prism Books Pvt. Ltd., 2nd Reprint, 2007.
3. C.L.Liu, D.P.Mohapatra, "Elements of Discrete Mathematics", Tata Mcgraw-Hill, India, 3rd Edition, 2008.
4. Ralph P.Grimaldi, B.V.Ramana,"Discrete and Combinatorial Mathematics-An Applied Introduction", Pearson Education, India, 5th Edition,2011.
5. D. S. Malik, M. K. Sen, "Discrete Mathematical Structures: Theory and Applications",Thomson Course Technology, India, 1st Edition,2004.

Course Code	Course Title						Core / Elective
SPC302CM	OOPS Using JAVA (Common to AI & DS, CSE & IT, CME)						Core
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
Programming for Problem Solving	3	1	–	–	40	60	4

Course Objectives:

1. To understand fundamentals of object-oriented programming in Java and create Java application programs using core concepts of OOP like interfaces, exception handling, multithreading, polymorphism, packages.
2. Use I/O streams for Input output operations in various streams and also perform serialization.
3. Explore Collection framework and also design GUI application with different layout managers with event handling.

Course Outcomes: At the end of this course, the student will be able to

1. Understand the concepts of classes, objects, and polymorphism.
2. Apply concepts of interfaces, user-defined packages during application development.
3. Develop Java Applications using Exception Handling and Multithreading concepts.
4. Compose programs using the Java Collection API.
5. Design GUI Application with Event Handling & Layout Designing concepts

UNIT-I

Introduction: OOP concepts, benefits of OOP, history of Java, data types, variables, scope and life time of variables, operators, expressions, control statements, type conversion and casting.

Classes and Objects: Concept of classes, objects, constructors, methods, this keyword, super keyword, garbage collection, overloading methods and constructors, parameter passing, Arrays

String handling: String, String Buffer, String Builder

UNIT -II

Inheritance: Base class object, subclass, member access rules, super uses, using final with inheritance, method overriding, abstract classes.

Interfaces: Defining and implementing an interface, differences between classes and interfaces and extending interfaces Polymorphism.

P. V. Sudha

Packages: Defining, creating and accessing a package, importing packages, exploring packages

UNIT -III

Exception handling: Concepts and benefits of exception handling, exception hierarchy, checked and unchecked exceptions, usage of-try, catch, throw, throws and finally, built in exceptions, creating User defined exceptions.

Multithreading: Difference between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, daemon threads, thread groups.

UNIT -IV

Basic I/O Streams: Java I/O classes and interfaces, Files, Stream and Byte classes, Character streams, Serialization Exploring java.lang: Object class, Wrapper classes Exploring java.util: Scanner, String Tokenizer.

Collections: Overview of Java Collection frame work, commonly used Collection classes –Array List, Linked List, Hash Set, Tree Set, Collection Interfaces – Collection, List, Set. Accessing Collection via iterator, working with Map.

UNIT -V

GUI Programming with Java: The AWT class hierarchy, MVC architecture.

Exploring Swing: JLabel, ImageIcon, JTextField, the Swing buttons, JTabbedpane, JScrollPane, JList, JComboBox.

Layout manager: Border, Grid, Flow, Card and Grid Bag layouts.

Event Handling: Delegation Event Model, Event Classes, Source of Events, Event Listener Interfaces, Handling mouse and keyboard events, Adapter classes.

New Features in Java: Major enhancement made in Java5, Java6, Java7 and Java8 like auto-boxing, generics, var-args, java annotations, enum, lambda expressions, functional interface, method references.

Text Books:

1. Schildt and Herbert, Java The complete reference, McGraw, 9th edition, TMH.
2. E. Balagurusamy, Programming with Java, seventh edition, Tata McGraw Hill.
3. H. M. Dietel and P. J. Dietel, Java How to Program, Sixth Edition, Pearson Education / PH
4. James M Slack, Programming and Problem Solving with JAVA, Thomson Learning, 2002.

References Books:

1. Dr R. Nageswara Rao, dreamtech Core Java: An Integrated Approach.
2. Prem Kumar, Getting Inside Java - Beginners Guide : Programming with Java by,Notion Press.

3. Bert Bates, Kathy, Head First Java, Sierra Publisher: O'Reilly Media, Inc, 2nd Edition.
4. T. Budd, An Introduction to OOP, Pearson Education, second edition.

Course Code	Course Title						Core/Elective
SPC 303 CM	Concepts in Computer Organization and Microprocessor (Common to AI&DS & CME, CSE)						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	1	-	-	40	60	4

Course Objectives

1. To impart the basic concepts of computer organization and design.
2. To understand the difference between microprocessor and micro controller.
3. To understand 8085, 8051 architectures.

Course Outcomes Students will be able to

1. To understand various ways of representing data and data transfer through bus and register
2. To explore basic organization of computer components, various computer instructions and memory hierarchy.
3. To understand Micro programmed Control unit, Central processing unit and Pipelining Process.
4. To differentiate Micro Processor and Micro Controller.
5. To analyze 8085 and 8051 architectures, with their addressing modes and programming techniques.

UNIT-I

Data Representation: Fixed and Floating Point representations. Overview of Computer Function and Interconnections: Computer components, Interconnection structures, Bus interconnection, Bus structure, and Data transfer.

Register Transfer Micro operations: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic, Logic and Shift micro operations, Arithmetic Logic Shift Unit.

UNIT-II

Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory reference instruction, Input-Output and Interrupt.

Micro programmed Control: Control memory, Address Sequencing, Micro program example, Design of Control Unit.

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UNIT-III

Central Processing Unit: General Register Organization, Stack Organization, Instruction formats, Addressing modes, Data Transfer and Manipulation, and Program control

Pipeline Processing: Arithmetic, Instruction and RISC Pipelines.

Memory Organization: Cache memory, Virtual memory, Memory Management hardware

UNIT-IV

Assembly Language Programming: Introduction to microprocessors and microcontrollers, 8085 Processor Architecture, Internal operations, Instructions, and timings, 8085 instructions, Addressing modes. Assembly Language Programming in 8085. 8086 Processor Architecture and Pin diagram. Basic Interfacing concepts with 8085, Programmable Interrupt Controller (8259A). Direct Memory Access (DMA) - DMA Controller (Intel 8257)

UNIT-V

Introduction to Micro controllers: 8051 – Architecture, Instruction set, Addressing modes and Programming techniques. Comparison of various families of 8-bit micro controllers. Parallel Communication Interface (8255), Keyboard/ Display Controller (8279).

TEXT BOOKS:

1. M Morris Mano, Computer System Architecture - Third Edition, Pearson Education Limited
2. Ramesh S Gaonkar, Micro Processor and Peripherals - Sixth Edition, Penram Publications
3. A Kay Ray, K M Bhurchandi, Advanced Microprocessors and Peripherals – Second Edition, Mcgraw Hill Education.
4. Mohammed Ali Mazidi, Janice GillispeMazidi, Rolin D. McKinlay, The 8051 Micro Controller and Embedded Systems - Second Edition, Pearson

REFERENCE BOOKS:

1. William Stallings, Computer Organization and Architecture – Sixth Edition, Pearson/PHI
2. Carl Hamacher, ZvonkoVranesic, SafwatZaky, Computer Organization, Fifth Edition, McGraw Hill, 2002
3. P. Pal Chaudhuri, Computer Organization and Design - Third edition, PHI Publications

Course Code	Course Title						Core / Elective
SPC312CM	OOPS Using JAVA Lab (Common to AI & DS, CSE, IT & CME)						Core
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
	–	–	–	2	40	60	1

Course Objectives:

1. To understand fundamentals of object-oriented programming in Java and create Java application programs using core concepts of OOP like interfaces, exception handling, multithreading, polymorphism, packages.
2. Use I/O streams for Input output operations in various streams and also perform serialization.
3. Explore Collection framework and also design GUI application with different layoutmanagers with event handling.

Course Outcomes: At the end of this course, the student will be able to

1. Understand the concepts of classes, objects, and polymorphism.
2. Apply concepts of interfaces, user-defined packages during application development.
3. Develop Java Applications using Exception Handling and Multithreading concepts.
4. Compose programs using the Java Collection API.
5. Design GUI Application with Event Handling & Layout Designing concepts

List of Experiments:

Write Programs using Java Language

1. To implement the concept of class with method overloading
2. To implement the concept of Single level and Multi level Inheritance.
3. To create an interface Shape with the getArea() method. Create three classes Rectangle, Circle, and Triangle that implement the Shape interface. Implement the getArea() method for each of the three classes. (Using the concept of Interfaces).
4. To create an abstract class Shape with abstract methods calculateArea() and calculatePerimeter(). Create subclasses Circle and Triangle that extend the Shape class and implement the respective methods to calculate the area and perimeter of each shape. (Using the Abstract Class concept).
5. To implement Checked Exception (IOException).
6. To implement Unchecked Exceptions. (ArithmeticException, Null Pointer Exception, Array Index Out Of Bounds Exception).
7. To implement User defined exception handling. (ex: when user enters marks for a subject beyond the minimum and maximum range).

8. To create and start multiple threads that increment a shared counter variable concurrently. (Using the Multithreading Concept).
9. To implement the concept of Thread synchronization.
10. To create an Array List for adding, removing, printing, searching employee names.
11. To create a Linked List for adding, removing, printing, searching student names that are ordered by index position. (addFirst(), addLast(), add(), remove(), removeLast(), peekLast()).
12. To create TreeMap of employee name and their age, print sorted employee data by employee name.
13. To create a Hash map that maps employee names to employee salary.
14. To execute iteration over Collection using Iterator interface and List Iterator Interface.
15. To read a file name from the user, and display information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.
16. To copy contents of one file into another file using command line arguments. (simulation of copy command).
17. To create an (Employee) object, serializes it, and then deserializes (serialization concept).

Additional Experiments-(Optional)

1. To implement event handler concept using mouse and key board events.
2. To design a simple application using swings, layout, event handling (basic calculator or sign-in screen or billing screen etc.).

Text Books:

1. Schildt and Herbert, Java The complete reference, McGraw, 9th edition, TMH.
2. E. Balagurusamy, Programming with Java, seventh edition, Tata McGraw Hill.
3. H. M. Dietel and P. J. Dietel, Java How to Program, Sixth Edition, Pearson Education / PH
4. James M Slack, Programming and Problem Solving with JAVA, Thomson Learning, 2002.

References:

Dr R. Nageswara Rao, Core Java: An Integrated Approach, dreamtech.

1. Prem Kumar, Getting Inside Java - Beginners Guide : Programming with Java by,Notion Press.
2. Bert Bates, Kathy, Head First Java, Sierra Publisher: O'Reilly Media, Inc, 2nd Edition.
3. T. Budd, An Introduction to OOP, Pearson Education, second edition.

Software Required: Java 8

P.V. Sridhar

Course Code	Course Title						Core/Elective
SPC313CM	**CONCEPTS IN COMPUTER ORGANIZATION AND MICROPROCESSOR LAB (Common to AI&DS, CME)**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	**2**	**40**	**60**	**1**

Course Objectives : The objectives of the course are to impart knowledge of the:

1. To become familiar with the architecture and Instruction set of Intel 8085 microprocessor.
2. To provide practical hands on experience with Assembly Language Programming.
3. To familiarize the students with interfacing of various peripheral devices with 8085 microprocessors

Course Outcomes : After the completion of the course, the student will be able to:

1. Interpret the principles of Assembly Language Programming, instruction set in developing microprocessor based applications.
2. Develop Applications such as: 8-bit Addition, Multiplication, Division, array operations, swapping, negative and positive numbers.
3. Analyze the interfaces like serial ports, digital-to-analog Converters and analog-to-digital converters etc.
4. Build interfaces of Input-output and other units like stepper motor.
5. Analyze the function of traffic light controller.

List of Experiments

PART A:

Programs using VERILOG

1. Review of the different logic design circutis., a) Gates b) Flip/Flop (RS, JK, D, T)
2. Familiarity with state of art IC-chips, e.g. a) Multiplexer , b) Decoder, c) Encoder, d) Counter, e)Shift-Register, f)adder Truth Table verification and clarification from Data-book.
3. Design a BCD adder.
4. Design an Adder/ Subtracter composite unit
5. Design a carry-look ahead Adder
6. Design ALU and 4-bit processor

PART B

8085 Programming using Microprocessor Trainer Kit

1. Sample programming examples using 8085 instruction set. To understand the use of various instructions and addressing modes.
2. Interfacing Traffic Light Controller using 8255.
3. Interfacing seven segment LED using 8255.
4. Interfacing keyboard & Displaying controller using 8279

PART C

8051 Programming (Additional Experiments -optional)

1. Simple programming examples using 8051 Microcontroller
2. A/D and D/A converter interface
3. Stepper motor interface

Software Required:
DOSbox
MASM 8086 ASSEMBLER

TEXT BOOKS:

1. Samir Palnitkar,"Verilog HDL A Guide to Digital Design and Synthesis", 2nd Edition,PearsonEducation,2006.
2. Muhammad Ali Mazidi, Janice GillispieMazidi, Rolin D, McKinlay,"The 8051 Microcontroller and Embedded Systems",2nd Edition,Pearson Education.

REFERENCE BOOKS:

1. A Kay Ray, K M Bhurchandi, Advanced Microprocessors and Peripherals –Second Edition, Mcgraw Hill Education.
2. Ramesh S Gaonkar, Micro Processor and Peripherals - Sixth Edition, PenramPublications

Course Code	Course Title						Core/Elective
SPC314CM	PYTHON PROGRAMMING LAB						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	2	40	60	2

Course Objectives The students will be able to:

1. Learn basic Programming using Python
2. Perform File Operations
3. Learn Object Oriented Programming principles

Course Outcomes: After completing this course, the student will be able to:

1. Understand basic programming concepts such as variables, data types, operators, and control structures in Python.
2. Apply conditional control structures for problem solving
3. Analyze functions and recursive techniques to solve complex problems in Python.
4. Explore various data structures in Python according to the problem
5. Solve the complex problems using advanced Python concepts

1) **Python Installation and Environment Setup**
   a) Conduct the installation of Python and configure the development environment.
   b) Verify the installation by executing a simple Python command in IDLE and Command Prompt.
2) **Working with Data Types and Operators**
   a) Display the following information: Your name, Full Address, Mobile Number, College Name, Subjects
   b) Perform all arithmetic operations with minimum two numbers
   c) Compute distance between two points taking input from the user
3) **Control Structures in Python**
   a) Check whether a given number is even or odd.
   b) Find the largest three integers using if-else
   c) To read a number (1-7) and display corresponding day using if_elif_else?

d) Receives a series of positive numbers and display the numbers in an ascending order and calculate the sum.
e) Get any number from user, Generate the series with reverse order (n to 1) using While loop

4) **Functions and Recursion**
   a) Write a program to find mean, median, mode for the given set of numbers in a list
   b) Write a program to check whether two strings are nearly equal or not. Display how many characters are matching.
   c) Write a progam to print Fibonacci Sequence up to a given number n
   d) Write a function to find GCD of two integers.
   e) Write a program to display prime number from 2 to n.
   f) Write a Function that accept a string as an argument and return the number of vowels and consonants that the string contains.

5) **String Operations and Regular Expressions**
   a) Execute various string manipulation techniques.
   b) To check whether the given string is palindrome or not.
   c) To remove the nth index character from an nonempty string
   d) Write a python program to check the validity of a password given by the user. The password should satisfy the following criteria:
      1. Contain at least 1 letter between a and z
      2. Contain at least 1 number between 0 and 9
      3. Contain at least 1 letter between A and Z
      4. Contain at least 1 character from $, #, @
      5. Minimum length of password: 6
      6. Maximum length of password: 12

   Write a Python program to validate mobile number.

6) **List Operations**
   To create a list and perform the following methods 1) insert() 2) remove() 3) append() len() 5) pop() 6) clear()
   To remove duplicates from a list

7) **Dictionaries**
   Create a dictionary and apply the following methods 1) Print the dictionary items 2) access items 3) use get() 4)change values
   To count the number of characters in the string and store them in a dictionary data structure
   To convert nested list into dictionary

8) **Tuples**
   a) Create a program that uses tuples to store configuration settings that should not change during runtime.
   Example: config = ("localhost", 8080, "admin", "password")

P.V.S

b) Write a program to store employee records using tuples. Each record should contain an employee ID, name, and department. Implement a function to display all employee details.

9) Python Sets
   a) Write a program to find all unique words in a given text.
   b) Write a program to remove duplicate items from a list.

10) **File Handling Techniques**
   a) Generate 1 to n random numbers and write it in a file then read from a file.
   b) To display a list of all unique words in a text file
   c) To print each line of a file in reverse order.
   d) To count frequency of words in a given file.

11) **Exception Handling in Python**
   a) Read two numbers n1 and n2. Write a function to compute n1/n2 and use try/except to catch the exceptions.
   b) To detect and handle the exception while solving the quadratic equation.
   c) To handle the run time errors while doing the file handling operation.
   d) To create and raise user defined exceptions.

Additional Programs for Fast Learners

12) **Object-Oriented Programming (OOP) Concepts**
   Program to implement the inheritance
   Program to implement the polymorphism

13) **Numpy (Optional)**
   a) Write a basic array of operations on single array to add x to each element of array and subtract y from each element of array.
   b) Write a program to add, subtract and multiply two matrices.
   c) Create multi-dimensional arrays and find its shape and dimension.
   d) Create a null matrix and unit matrix.
   e) Reshape and flatten data in the array

14) **Introduction to GUI Programming with Tkinter (Optional)**
   a) Design a GUI based calculator to perform arithmetic operations like addition, subtraction, multiplication and division.
   b) Design a GUI based application to convert temperature from Celsius to Fahrenheit.
   c) thon program to perform various database operations (create, insert, delete, update)

Case Study: Library Management System

Problem Statement

You are tasked with developing a simple Library Management System (LMS) using Python. The LMS should allow librarians to manage books, patrons, and borrowing transactions. Your program should incorporate the following features:

1. Create a class Book to represent book information (title, author, ISBN, etc.) using appropriate data types.
2. Write a function to check if a book is available for borrowing.
3. Use if, if-else, and nested if statements to handle different scenarios (e.g., book availability, overdue books).
4. Maintain a list of borrowed books.
5. Use list comprehensions to filter books based on specific criteria (e.g., overdue books).

P.V.S

6. Dictionary Opetations:
7. Create a dictionary to store patron information (name, contact details).
8. Manipulate dictionary keys and values (e.g., adding new patrons).
9. Represent book genres using tuples (e.g., (1, 'Fiction'), (2, 'Non-Fiction')). Demonstrate tuple immutability
10. Maintain a list of borrowed books.
11. Implement try-except blocks to handle potential errors (e.g., invalid input).
12. Remember to design your LMS with user-friendly interfaces (text-based menus or prompts) for librarians to interact with

Text Books:

1. Martin C. Brown," PYTHON: The Complete Reference", McGraw-Hill, 2018
2. Monu Singh Rakesh K. Yadav, SrinivasArukonda "Zero To Mastery In Python Programming ", Vayu Education Of India, 2021
3. Allen Downey , "Learning with Python", Dreamtech Press; 1st edition , 2015

Reference Books:

1. Wesley J Chun," Core Python Applications Programming", Prentice Hall, 2012.
2. R. NageswaraRao , "Core Python Programming" Dreamtech Press India Pvt Ltd 2018.
3. Allen B Downey," Think Python", O'Reilly, 2012.

CME: SEMESTER – IV

S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	P/D	Contact Hrs/Wk	CIE	SEE	Duration in	
Theory Courses										
1	SHS901BM	Managerial Economics & Financial Accounting	3	-	-	3	40	60	3	3
2	SPC401CM	Automata Language and Computation	3	-	-	3	40	60	3	3
3	SPC402CM	Data Communication & Computer Networks	3	1	-	4	40	60	3	4
4	SPC403CM	Operating Systems	3	1	-	4	40	60	3	4
5	SPC404CM	Database Management Systems	3	1	-	4	40	60	3	4
6	SAC903CH	Environmental Science	2	-	-	2	50	-	-	0
Practical/ Laboratory Courses										
7	SPC412CM	Data Communication & Computer Networks Lab	-	-	2	2	40	60	3	1
8	SPC413CM	Operating Systems Lab	-	-	2	2	40	60	3	1
9	SPC414CM	Database Management Systems Lab	-	-	2	2	40	60	3	1
Internship-1(SPW411CM)		The students must undergo Internship for 4 week duration summer vacation which will be assessed in the forthcoming V semester								
Total			**17**	**03**	**06**	**26**	**320**	**480**		**22**

HEAD
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University
Hyderabad-500 007.

Course Code	Course Title						Core/Elective
SPC 401 CM	AUTOMATA LANGUAGE AND COMPUTATION						CORE
Prerequisite	Contact Hours per Week				CIE	SEE	CREDITS
	L	T	D	P			
Discrete Mathematics	3	-	-	-	40	60	3

Course Objectives: The students will be able to

1. To give an overview of the theoretical foundations of computer science from the perspective offormal languages
2. To illustrate finite state machines and push down automata to solve problems in computing
3. To familiarize Regular grammars, context frees grammar and context sensitive grammar

Course Outcomes:

After completion of this course, students will be able to

1. Gain the knowledge of basic kinds of finite automata and their capabilities.
2. Understand regular and context-free languages
3. Gain the knowledge to analyze regular expressions and grammars
4. Design finite automata, push down automata.
5. Constructing the Turing machine for Recursive languages.

UNIT-I

Automata: Introduction to Finite Automata, Central Concepts of Automata Theory.

Finite Automata: An informal picture of Finite Automata, Deterministic Finite Automata, Nondeterministic Finite Automata, An Application, Finite Automata with Epsilon Transitions, Equivalence and Minimization of Automata.

UNIT-II

Regular Expression and languages: Regular Expressions, Finite Automata and Regular Expression, Applications of Regular Expressions, Algebraic Laws for Regular Expression. **Properties of Regular Languages**: Proving Languages not to be Regular, Closure Properties of Regular Languages, Decision Properties of Regular Languages

UNIT-III

Context Free Grammars and Languages: Context-Free Grammars, Parse Trees, Applications, Ambiguity in Grammars and Languages

Properties of Context Free Languages: Normal Forms for Context-Free Grammars, Pumping Lemma, Closure Properties, Decision Properties of CFL 's.

UNIT-IV

Pushdown automata: Definition, Model, Acceptance of CFL, Acceptance by Final State and acceptance by Empty stack and its Equivalence, Equivalence of CFG and PDA. **TURING MACHINES (TM)**: Formal definition and behaviour, Languages of a TM, TM as accepters, and TM as a computer of integer functions, Types of TMs.

UNIT-V

Recursive and recursively enumerable languages (rel): Properties of recursive and recursively enumerable languages, Universal Turing machine, The Halting problem, Undecidable problems about TMs. Context sensitive language and linear bounded automata (LBA),Chomsky hierarchy, Decidability, Post's correspondence problem(PCP), undecidability of PCP.

TEXT BOOKS:

1. John Hopcroft, Rajeev Motwani, Jeffery D Ulman. Introduction to Automata Theory Languagesand Computation, third edition, Pearson Education, 2009.
2. John C. Martin, Introduction to Languages and the Theory of computation, third Edition, TataMcGrawHill,2003.
3. Thomas Sudkamp, *Languages and Machines: An Introduction to the Theory of Computer Science*.(Third Edition)

REFERENCE BOOKS:

1. K. L. P Mishra, N. Chandrashekaran (2003), Theory of Computer Science-Automata Languages andComputation, 4th edition, Prentice Hall of India, India.
2. kavi Mahesh, Theory of Computation A Problem solving approach, Wiley India Pvt. Ltd
3. Daniel I.A. Cohen, —Introduction to Computer Theory, John Wiley & Sons, 2ndEdition, 2004

Course Code	Course Title				CIE	SEE	Core/Elective
SPC402CM	DATA COMMUNICATION & COMPUTER NETWORKS						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	1	-	-	40	60	4

Course Objectives: The educational objectives of this course are

1. To introduce internet routing architecture and protocols.
2. To learn the flow control and congestion control algorithms in Transport Layer
3. To learn basic and advanced socket system calls.

Course Outcomes: At the end of this course, the student will be able to

1. Understand various networking components and function of different layers of OSI and TCP/IP protocol.
2. Compute Error detection and correction used in digital communications.
3. Categorize the principles of IP addressing and internet routing
4. Describe the working of various networked applications such as DNS, mail, file transfer and www.
5. Explore client-server socket-based networked applications.

UNIT I

DATA COMMUNICATIONS: Components, analog and digital signals and Encoders, Modems, RS232 Interfacing Switching: Circuit Switching, Message Switching and Packet Switching. Topologies – Concept of layering.-Protocols and Standards – ISO / OSI model, TCP/IP

UNIT II

DATA LINK LAYER: Error Control: Error detection and correction (CRC and Hamming code for single bit correction) Flow Control: stop and wait – - sliding window protocols-go back-N ARQ – selective repeat ARQ MAC LAYER: Ethernet IEEE 802.3LAN, Manchester encoding, ARP and RARP.

UNIT III

NETWORK LAYER: Internetworks – virtual circuit and Datagram approach Routing – Distance Vector Routing, Link State Routing , OSPF and BGP IPv4 , addressing, Sub netting, IPv6, CIDR, ICMP and IGMP protocols.

UNIT IV

TRANSPORT LAYER: Services of transport layer, Multiplexing and crash recovery Transmission Control Protocol (TCP) – TCP window management Congestion Control, timer management and User Datagram Protocol (UDP)

UNIT V

APPLICATION LAYER: Domain Name Space (DNS) – SMTP – FTP – HTTP.

SOCKET PROGRAMMING: Primitive and advanced system calls, client/server iterative and concurrent programs.

TEXT BOOKS:

1. Computer Networks, Andrew S. Tanenbaum, David J. Wetherall, 5th Edition, Pearson
2. Computer Networks: A Systems Approach, Authors: Larry Peterson and Bruce Davie, Elsevier
3. Computer Networking: A Top-Down Approach James F. Kurose , Keith W. Ross ,6th Edition, Pearson

REFERENCES BOOKS:

1. Data Communications and Networking, Behrouz A Forouzan, Tata McGraw Hill, 4th edition, 2007.
2. Data and Computer Communication, William Stallings, 8th edition, Pearson Prentice Hall India.

Course Code	Course Title						Core/Elective
SPC403CM	OPERATING SYSTEMS						Core
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
	3	1	–	–	40	60	4

Course Objectives: Students will be able:

1. To learn fundamentals of Operating Systems.
2. To understand the functions of Operating Systems.
3. To learn memory management.

Course Outcomes: After completion of this course, students will be able to:

1. Understand functional architecture of operating systems and file systems.
2. Analyze various algorithms for CPU Scheduling
3. Implement programs on multi-threading libraries for an OS.
4. Explore application programs using system calls.
5. Solve synchronization problems.

UNIT–I

Introduction: Batch, iterative, time sharing, multiprocessor, distributed, cluster and real- time systems, UNIX system introduction and commands.

Operating system structures: Computer system structure, Network structure, I/O Structure, Storage Structure, Dual mode operation, System components, Operating-System Services, System Calls, System Programs, System structure, Virtual Machines, System Design and Implementation, System Generation.

UNIT–II

Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching.

Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads.

Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling Criteria, Scheduling algorithms, multi processor scheduling.

UNIT-III

Process Synchronization: Inter- process Communication: Critical Section, Race Conditions, Mutual Exclusion, Peterson's Solution, classical problems of synchronization: The Bounded buffer problem,

Producer/Consumer Problem, reader's & writer problem, Dinning philosopher's problem. Semaphores, Event Counters, Monitors, Message Passing.

Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Methods for Handling deadlocks: Deadlock prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

UNIT–IV

Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation, fragmentation, and Compaction; Paging: Principle of operation–Page allocation–Hardware support for paging, structure of page table, Protection and sharing, Disadvantages of paging.

Virtual Memory: Basics of Virtual Memory–Hardware and control structures–Locality of reference, Page fault, Working Set, Dirty page/Dirty bit–Demand paging, Page Replacement algorithms, Trashing.

UNIT–V

File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods, Free-space management, directory implementation, efficiency, and performance.

Secondary-Storage Structure : Disk structure, Disk scheduling algorithms, Disk Management, RAID structure.

TEXTBOOKS:

1. Avi Silberschatz, Peter Galvin, Greg Gagne, Operating System Concepts Essentials, 9thEdition, Wiley Asia Student Edition,2017.
2. William Stallings, Operating Systems: Internals and Design Principles, 5th Edition, Prentice Hall of India, 2016.
3. Maurice Bach, Design of the Unix Operating Systems, 8th Edition, Prentice-Hall of India, 2009.
4. Daniel P.Bovet, Marco Cesati, Understanding the Linux Kernel, 3rdEdition, O' Reilly and Associates.
5. Naresh Chauhan, Principles of Operating Systems, Oxford University Press,2014.

REFERENCE BOOKS:

1. Dhananjay Dhamdhere, Operating Systems A Concept approach, 3rdEdition,McGrawHillEducation.
2. Deitel & Deitel(2008), Operating systems, 3rd edition, Pearson Education, India.

Course Code	Course Title						Core/Elective
SPC404CM	DATABASE MANAGEMENT SYSTEMS						Core
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
	3	1	–	–	40	60	4

Course Objectives:

1. Understand the basic concepts and the applications of database systems.
2. Master the basics of SQL and construct queries using SQL.
3. Understand the relational database design principles.
4. Become familiar with the basic issues of transaction processing and concurrency control, database storagestructure and recovery mechanisms

Course Outcomes:

At the end of this course, the student will be able to:

1. Understand concepts and the applications of database systems and implement in real time applications.
2. Construct an Entity-Relationship (E-R) model from specifications and transform to relational model.
3. Demonstrate the concepts of relational database management system
4. Apply normalization on database.
5. Understand principles of database transaction management, storage and recovery of database.

UNIT 1:

Introduction: Database System Applications, Purpose of Database Systems, View of Data, Database Languages–DDL, DML, Relational Databases, Data Storage and Querying, Transaction Management, Database Architecture, Database Users and Administrators.

Introduction to the Relational Model: Structure of Relational Databases, Database Schema, Schema Diagrams, The Relational Algebra.

UNIT 2:

Introduction to SQL: Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Integrity Constraints, Set Operations, Null Values, Aggregate Functions, Nested Sub queries.

Advanced SQL: Join Expressions, Views, Triggers, Cursors, Procedures and Functions

UNIT 3:

Database Design and the E-R Model: The Entity- Relationship Model, Constraints, Removing Redundant Attributes in Entity Sets, Entity-Relationship Diagrams, Reduction to Relational schemas, Entity-Relationship Design Issues, Extended E-R Features.

Normalization: Functional Dependencies, Lossless decomposition,1NF, 2NF, 3NF, Dependency Preservation, BCNF, Multi -valued dependencies, 4NF. De normalization.

UNIT 4:

Indexing:
File Structures: Sequential files, Sparse index and dense index, B and B+ trees.
Transaction Management: Transaction Concept, A Simple Transaction Model, Storage Structure, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Transaction Isolation and Atomicity, Transaction Isolation Levels.

UNIT 5:

Concurrency Control: Lock-Based Protocols, Multiple Granularity, Timestamp- Based Protocols, Validation-Based Protocols.
Backup and Recovery System: Failure Classification, Recovery Algorithm, Failure with loss of non-volatile storage, Remote Backup systems.

Overview and History of NoSQL Databases: Definition of the Four Types of NoSQL Database, NoSQL databases

TEXT BOOKS:

1. A. Silberschatz, Henry. F. Korth and S. Sudarshan, Database System Concepts,6thEdition, McGraw Hill Education (India) Private Limited.
2. C.J.Date, A. Kannan, and S. Swami Nadhan, An Introduction to Databasesystems, 8th Edition, Pearson Education.

REFERENCE BOOKS:

1. Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems,3rdEdition, McGraw Hill Education (India) Private Limited.
2. R Elmasri, Shamkant B. Navathe, DatabaseSystems,6th Edition, Pearson Education.

Course Code	Course Title						Core/Elective
SPC412CM	DATA COMMUNICATION & COMPUTER NETWORKS LAB						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	-	-	-	2	40	60	1

Course Objectives:

1. Learn to implement the different protocols.
2. Be familiar with the various routing algorithms, socket programming and simulation tools.
3. To use simulation tools to analyze the performance of various network protocols

Course Outcomes: At the end of this course, the student will be able to

1. Explore various protocols using TCP and UDP.
2. Describe Program using sockets.
3. Analyze the performance of various network protocols using simulation tools.
4. Analyze various routing algorithms.
5. Explore client-server socket-based networked applications.

List of Experiments:

1. Configuration of hub. (using real devices or simulators)

2. Configuration of switch, router. (using real devices or simulators)

3. Configuration of Home Automation System using Cisco Packet tracer Tool

4. Running and using services/commands like tcpdump, nets tat, ifconfig, nslookup

5. TELNET and trace route. Capture ping and trace route PDUs using a network protocol analyzer and examine.

6. Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS. Performance evaluation of Routing protocols using Simulation tools.

7. Network packet analysis using tools like Wireshark, tcpdump, etc.

8. Network simulation using tools like Cisco Packet Tracer, NS3, etc.

9. Socket programming using UDP (e.g., simple DNS, data & time client/server, echo client/server, iterative & concurrent servers)

10. Socket programming using TCP (e.g., simple DNS, data & time client/server, echo client/server, iterative & concurrent servers)

Hardware: 1. Standalone desktops

Software:

1. C / C++ / Java / Python / Equivalent Compiler

2. Network simulator like NS2/NS3/OPNET/ CISCO Packet Tracer / Equivalent

Course Code	Course Title						Core/Elective
SPC413CM	OPERATING SYSTEM LAB						Core
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
	–	–	–	2	40	60	1

Course Objectives: Students will be able:

1. Understand Unix commands.
2. Implement Process management related techniques.
3. Implement memory management techniques

Course Outcomes: After completion of this course, students will be able to:

1. Explore applications programs using system calls.
2. Implement CPU scheduling algorithms.
3. Apply the Banker's algorithm for deadlock avoidance.
4. Implement page replacement and disk scheduling techniques.
5. Solve producer-consumer problem, reader-writer problem, dinning philosophers problem.

1. Program to implement Unix system calls(fork(),wait(),exec(),sleep())and file management.
2. Program to implement multithread concepts.
3. Program to implement CPU scheduling algorithms:(i)FCFS(ii)SJF(iii)Round Robin
4. Program to implement Shared memory and Inter Process Communication (IPC) techniques.
5. Program to implement Process Synchronization for Dining Philosopher problem
6. Program to implement Process Synchronization for Producer-Consumer problem.
7. Program to implement Process Synchronization for Readers-Writers problem.
8. Program to implement deadlock detection.
9. Program to implement Bankers Algorithm for Deadlock Avoidance.
10. Program to implement Page Replacement Algorithm using FIFO
11. Program to implement the following Page Replacement Algorithms using LRU and LFU.
12. Program to implement FCFS Disk Scheduling Algorithm.
13. Program to implement SSTF Disk Scheduling Algorithms
14. Case Study on Linux Systems

Additional programs (Optional):

Memory Management Simulator:

Develop a simulator that demonstrates the effects of different memory allocation strategies (e.g., first fit, best fit, and worst fit) and shows how fragmentation occurs.

Include a visualization of memory blocks and their allocation status.

Priority-based Process Scheduling Algorithm:

Implement a priority-based scheduling algorithm with a real-world scenario, such as scheduling tasks in a hospital emergency room where patients are treated based on the severity of their condition.

Text Books:

1. Avi Silberschatz, Peter Galvin, Greg Gagne, Operating System Concepts Essentials, 9thEdition, Wiley Asia Student Edition,2017.
2. Naresh Chauhan,Principles of Operating Systems,OxfordUniversityPress,2014

Programming Language: C programming

Course Code	Course Title						Core / Elective
SN 414 M	DATABASE MANAGEMENT SYSTEMS LAB						Core
	Contact Hours per Week				CIE	SEE	Credits
Pre Requisite	L	T	D	P			
-	-	-	-	2	40	60	1

Course Objectives:

The course should enable the students to :

1. To understand the fundamental concepts of database systems and database management.
2. To apply SQL for database creation, manipulation, and querying and to handle complex queries, joins, sub queries and set operations.
3. To understand create and use stored procedures, functions, and triggers.
4. To become familiar with the basic transaction processing and concurrency control, database storage.
5. To provide a basic understanding of NoSQL databases and their operations.

Course Outcomes:

1. Design and implement databases using relational schemas.
2. Write and execute basic to advanced SQL queries.
3. Implement and manage constraints and indexes for data integrity and performance.
1. Perform basic CRUD operations in NoSQL databases.

Lists of Experiments:

1. Introduction to SQL

a) Creating a simple database.
b) Basic SQL Queries,
c) Writing basic SQL queries using SELECT, FROM, WHERE, ORDER BY, and DISTINCT.

2. Data Definition Language (DDL)

a) Creating and Managing Tables
b) Creating tables with different data types.
c) Adding constraints such as PRIMARY KEY, FOREIGN KEY, UNIQUE, and NOT NULL.
d) Altering and dropping tables.

3. Data Manipulation Language (DML)

a) Inserting, Updating, and Deleting Data
b) Inserting records into tables.
c) Updating existing records.
d) Deleting records from tables.

4. Advanced SQL Queries

a) Complex Queries
b) Writing queries using JOIN operations (INNER JOIN, LEFT JOIN, RIGHT JOIN).
c) Using sub queries and nested queries.
d) Performing set operations (UNION, INTERSECT, EXCEPT).

5. Aggregate Functions and Grouping

a) Using aggregate functions like COUNT, SUM, AVG, MAX, MIN.
b) Grouping data using GROUP BY.
c) Filtering groups with HAVING.

6. Constraints and Indexes

a) Working with Constraints and Indexes
b) Implementing and managing different constraints.
c) Creating and using indexes to improve query performance.

7. Transactions and Concurrency Control

a) Understanding and implementing transactions.
b) Using COMMIT and ROLLBACK.

8. Stored Procedures and Functions

a) Creating Stored Procedures
b) Writing and executing stored procedures.
c) Passing parameters to stored procedures.
d) Writing and executing user-defined functions.

9. Triggers

a) Implementing Triggers
b) Creating and testing triggers.
c) Implementing triggers for insert, update, and delete operations.

10.NoSQL Databases (Optional)

a. Introduction to NoSQL
b. Basic CRUD operations in a NoSQL database (e.g., MongoDB).
c. Understanding document-based data modeling.

Text Books:

1. Silberschatz, Henry. F. Korth and S. Sudarshan, Database System Concepts, 6thEdition, McGraw Hill Education (India) Private Limited.
2. C.J.Date, A. Kannan, and S. Swami Nadhan, An Introduction to Database systems, 8th Edition, Pearson Education.

Reference Books:

1. Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, 3rdEdition, McGraw Hill Education (India) Private Limited.
2. R Elmasri, Shamkant B. Navathe, DatabaseSystems,6th Edition, Pearson Education.

Course Code	Course Title						Core/Elective
SPW411CM	INTERNSHIP-I						Core
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
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Objectives:

1. To give an experience to the students in solving real life practical problems with all its constraints.
2. To give an opportunity to integrate different aspects of learning with reference to real life problems.
3. To enhance the confidence of the students while communicating with industry engineers and give an opportunity for useful interaction with them and familiarize with work culture and ethics of the industry

Outcomes: Student will be able to:

1. Able to design/develop a small and simple product in hardware or software.
2. Able to complete the task or realize a pre-specified target, with limited scope, rather than taking up a complex task and leave it.
3. Able to learn to find alternate viable solutions for a given problem and evaluate these alternatives with reference to pre-specified criteria.
4. Able to implement the selected solution and document the same.

Summer Internship is an important activity of an engineering programme where a student is provided a skill based training. This is introduced as a part of the curriculum for encouraging students to work on problems of interest that is specific to an industry. Internship-I is aimed at providing a primary exposure of industrial project work. This offers the student an opportunity to use the knowledge, gained through fundamental theory and laboratory courses studied in classrooms, for real-time implementation.

Every individual student must enrol for internship in an industry for a period of 4 weeks. The student must submit the internship enrolment details like name and address of the industry, broad area of internship etc. to the Internship Coordinator at the end of the first month after commencement of Semester-IV. The industry must be a Government/Private or any designated R&D organization. This will be during the summer vacation following the completion of the Semester-IV of the B.E. programme. One faculty member (Internal Guide) will be provided to each student to monitor the continuous progress of the project work and to interact with the industry co-ordinator.

After the completion of the Internship-I, each student will be required to submit technical (i) report and (ii) presentation of the work carried out to the Internship Review Committee (IRC) of the department for evaluation.

A Continuous Internal Evaluation (CIE) of Internship-I for total 50 marks will be done by the Internal Guide (25 Marks) followed by the IRC of the department (25 Marks). One faculty member will co-ordinate the overall activities related to Internship-I.

Note: Credits of Internship-I will be awarded after evaluation in V Semester.