B.Tech. INFORMATION TECHNOLOGY DEGREE PROGRAMME

CREDIT DISTRIBUTION
&
SCHEDULING OF COURSES

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2026-27 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING
(A Government Aided Autonomous Institution affiliated to Anna University)
MADURAI – 625 015, TAMILNADU

Phone: 0452 – 2482240, 41
Fax: 0452 2483427
Web: www.tce.edu

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015

B. E./ B.Tech. DEGREE PROGRAMMES

CREDIT DISTRIBUTION

(For the students admitted from the Academic Year 2026-27 onwards)

Sl. No.	Category	Credits	
		Regular	**Lateral Entry**
A.	Humanities and Social Sciences including Management Courses (HSMC)	11	8
B.	Basic Science Courses (BSC)	22	6
C.	Engineering Science Courses (ESC)	23	12
D.	Program Core Courses (PCC)	75	62
E.	Program Elective Courses (PEC)	21	21
F.	Open Elective Courses (OEC)	6	6
G.	Employability Enhancement Courses (EEC)	16	16
H.	Internship and Mandatory Audit Courses (AC) as per Regulatory authorities (Non-Credit and not included in CGPA)	-	-
	Minimum Credits to be earned for the award of the Degree	**174**	**131**
		From A to G and the successful completion of H	

Passed in BoS Meeting 23.05.2026

Approved in 71st Academic Council Meeting 27.06.2026

B.TECH IT- SCHEDULING OF COURSES FOR STUDENTS JOINED FROM ACADEMIC YEAR 2026-27 ONWARDS

Sem	Theory / Theory cum Practical / Practical									CDIO Courses	Audit Courses (Mandatory Non- credit)	Credit
I	26MASA0 Maths-I (BSC-4) Applied Calculus for Engineers	26PHSA0 Physics (BSC-3)	26EGHA0 Technical English (TCP) (HSMC-3)	26ITCA0 Programming for Problem Solving (PCC-3) TCP				26ITEA0 Digital System Design (ESC-3)	26PHSB0 Physics Laboratory (BSC-1.5)	26CCEA0 Introduction to Engineering (TCP) (ESC-2)	26TAAA0 Heritage of Tamil (AC-0) 26CCAA0 Vision and Speed Maths (AC-0)	19.5
II	26ITSA0 Maths-II Computational Linear Algebra and Numerical Methods (BSC-3)	26CHSB0 Applied Chemistry (BSC-3)	26ITCB0 Operating Systems (PCC-3)	26ITCC0 IT Infrastructure Management (PCC-3)	26ITCD0 Web Essentials (PCC-2.5) (TCP)		26ITCE0 Python Programming Lab (PCC-1.5)	26ITEB0 Computer Organisation (ESC-3)	26CCEB0 Biology for Engineer (ESC-3)	26CHSC0 Chemistry Laboratory (BSC-1.5)		26TAAB0 Tamil and Technology (AC-0) 26CCAB0 Foundations of Problem Solving-1 (AC-0)	23.5
III	26ITSB0 Maths-III (Discrete Mathematics) (BSC-3)	26ITCF0 Object Oriented Programming (PCC-4)	26ITCG0 Data Structures (PCC-4)	26ITCH0 IT Operations and Management (PCC-3)	26ITCJ0 Object Oriented Programming Lab (PCC-1.5)		26ITCK0 Data Structures Lab(PCC-1.5)	26ITCL0 System Admin Lab (PCC-1)	26ITEC0 Software Engineering (ESC-3)	26CCLA0 Building Communication Skills (EEC-1)	26CCEC0 Design Thinking (ESC-3)	26CCAC0 Constitution of India (AC-0)	25
IV	26ITSC0 Maths-IV (Probability and Queuing theory)(BSC-3)	26ITCM0 Networks (PCC-4)	26ITCN0 DBMS (PCC-4)	26ITCP0 Algorithm Design Principles (PCC-4)	26ITCQ0 Data Analytics (PCC-4) (TCP)	26ITCR0 Computer Networks Lab (PCC-1.5)	26ITCS0 DBMS LAB (PCC-1.5)	26CCED0 Environment and Sustainability (ESC-3)	26EGHB0 Professional Communication Lab (HSMC-2)	26CCLB0 Numerical Skills and Quantitative Problem Solving (EEC-1)		26CCAD0 Indian Knowledge System (AC-0)	28
V	26CCHA0 Project Management (HSMC-3)	26ITCT0 Information and Security (PCC-3)	26ITCU0 Cloud Computing (PCC-3)	26ITCV0 Machine Learning (PCC-4) (TCP)	26ITCW0 Cloud Computing Lab (PCC-1.5)	26ITCX0 Information Security Lab (PCC-1.5)	26ITCY0 Mobile Application Development Lab (PCC-2)	26ITED0 IoT System Design (ESC-3) (TCP)	26CCLC0 Aptitude Skills (EEC-2)	Basic Science Elective / Language Elective (OEC-3)	26ITLA0 Project-I (EEC-3)	26CCAE0 Universal Human Values and Ethics (AC-0)	29
VI	26CCHB0 Accounting and Finance (HSMC-3)	26ITCZ0 Generative AI Modelling (PCC-3)	26ITDA0 Full Stack Application Development (PCC-3) TCP	26ITDB0 Human Factors in Interface Design PCC-4 TCP		26ITDC0 Cloud Native Engineering (PCC-3) TCP	PEC-1 (3)	PEC-2 (3)		Interdisciplinary Elective (OEC-3)	26ITLB0 Project-II (EEC-3)	26CCAF0 Disaster Management (AC-0)	28
VII	PEC-3 (3)	PEC-4 (3)	PEC-5 (3)	PEC-6 (3)		PEC-7 (3)					26ITLC0 Project-III (EEC-3)		18
VIII											26ITLD0 Project-IV (EEC-3)		3
Total Credits													**174**

Passed in BoS Meeting 23.05.2026

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Programme Elective Courses

Vertical I	Vertical II	Vertical III	Vertical IV	Vertical V
Artificial Intelligence	**Cloud Technologies**	**Cyber Security**	**Mobile and IoT Systems**	**Cognitive Science**
Deep Learning	Edge Computing for Smart Systems	Blockchain Technologies	Mobile Communication	Assistive Technology Design
Quantum Machine Learning	Fog Computing	Ethical Hacking	Next Generation Wireless Networks	Cognitive Science
Business Analytics	Microservices Design Patterns	AI for Cybersecurity	Adhoc and Wireless Sensor Networks	Augmented Reality and Virtual Reality
Natural Language Processing	Cloud Adoption and Economics	Information Security Auditing and Management	Computational Intelligent Networks	Game Design
Social Network Analysis	AI Infrastructure	Security Operations (SecOps)	Wearable and Mobile Computing	
AI Engineering		Secure Agent Design	Digital Twin Technologies	
Reinforcement Learning				
Information Retrieval				
Generative AI				
Spatio Temporal Data Mining				
Large Language Models				

B.Tech. INFORMATION TECHNOLOGY DEGREE PROGRAMME

CURRICULUM AND DETAILED SYLLABI

FOR

FIRST SEMESTER

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2026-27 ONWARDS

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THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.E. / B.Tech. Degree Programmes

COURSES OF STUDY
(For the candidates admitted from 2026-27 onwards)

FIRST SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			credits
			L	T	P	
THEORY						
26MASA0	Applied Calculus for Engineers	BSC	3	1	-	4
26PHSA0	Physics	BSC	3	-	-	3
26ITEA0	Digital System Design	ESC	3	-	-	3
THEORY CUM PRACTICAL						
26EGHA0	Technical English	HSMC	2	-	2	3
26ITCA0	Programming for Problem Solving	PCC	2	-	2	3
26CCEA0	Introduction to Engineering	ESC	1	-	2	2
PRACTICAL						
26PHSB0	Physics Laboratory	BSC	-	-	3	1.5
AUDIT COURSES						
26TAAA0	Heritage of Tamil	AC				-
26CCAA0	Vision and Speed Maths	AC				-
		Total				**19.5**

BSC : Basic Science Courses
HSMC : Humanities and Social Sciences including Management Courses
ESC : Engineering Science Courses
PCC : Programme Core Courses

L : Lecture
T : Tutorial
P : Practical

Note:
1 Lecture Period/week is equivalent to 1 credit
1 Tutorial Period/week is equivalent to 1 credit
1 Practical Period/week is equivalent to 0.5 credit

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.E. / B.Tech. Degree Programme

SCHEME OF EXAMINATIONS
(For the candidates admitted from 2026-27 onwards)

FIRST SEMESTER

S.No	Course Code	Name of the Course	Duration of Terminal Exam. in Hrs.	Marks			Minimum Marks for Pass	
				Continuous Assessment *	Terminal Exam **	Max. Marks	Terminal Exam	Total
THEORY								
1	26MASA0	Applied Calculus for Engineers	3	40	60	100	27	50
2	26PHSA0	Physics	3	40	60	100	27	50
3	26ITEA0	Digital System Design	3	40	60	100	27	50
THEORY CUM PRACTICAL								
4	26EGHA0	Technical English	3 (Terminal Exam Type : Theory)	50	50	100	22.5	50
5	26ITCA0	Programming for Problem Solving	3 (Terminal Exam Type : Practical)	50	50	100	22.5	50
6	26CCEA0	Introduction to Engineering	3 (Terminal Exam Type : Practical)	50	50	100	22.5	50
PRACTICAL								
7	26PHSB0	Physics Laboratory	3	60	40	100	18	50

26ITCA0	PROGRAMMING FOR PROBLEM SOLVING	Category	L	T	P	Credits	TE Type
		PCC	2	0	2	3	TCP-P

1. Preamble

This course introduces computational thinking and structured problem-solving techniques using programming concepts. It focuses on problem analysis, algorithm design, flowcharts, pseudocode and implementation of computational solutions. The course emphasizes logical reasoning, systematic problem solving and modular program development using C language as a tool for solving computational problems.

2. Prerequisite

- Nil

3. Course Outcomes

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

No.	Course Outcome	TPS Level	Performance Indicator	CO Weightage	SDG addressed	SDG Level
CO1	Apply computational, analytical and creative thinking techniques to analyse problems and design algorithmic solutions.	TPS 3	1.3.1	10%	NC	
CO2	Use flowcharts and structured pseudocode to represent algorithmic solutions from given problem specifications.	TPS 3	1.3.1	10%	NC	
CO3	Apply sequence, selection, iteration and appropriate data representation techniques to develop solutions for computational problems.	TPS 3	1.3.1	20%	NC	
CO4	Demonstrate modular program development using functions, recursion, scope rules and file processing concepts.	TPS 3	1.3.1	20%	SDG4	1
CO5	Operate programming environments and development tools to write, compile, debug and test C programs for structured problem solving	TPS 3	5.2.1	10%	NC	
CO6	Demonstrate ethical responsibility in developing original C programs and reporting execution results	TPS 3	7.2.1	10%	NC	

	accurately without fabrication					
CO7	Prepare well-documented C programs with inline comments, and structured laboratory reports communicating program design, implementation details, and test result	TPS 3	8.1.1	10%	NC	
CO8	Implement assigned roles effectively during collaborative C programming, joint debugging, and paired application development activities.	TPS 3	9.1.1	10%	NC	

4. Assessment Pattern

CO	Theory		Practical		Terminal Exam - Practical
	CAT 1	CAT 2	OCR Continuous Assessment	Model Test CO-wise	
	% of Marks	% of Marks	% of Marks	% of Marks	% of Marks
CO1	30	30	100	100	100
CO2	20				
CO3	50	20			
CO4		50			
CO5					
CO6					
CO7					
CO8					
Total	**100**	**100**	**100**	**100**	**100**

Assessment Pattern: Practical Component

Type of Assessment	Component	Marks	Remarks
Continuous Assessment	Pre-lab, In-lab, Post-lab	75	Conducted throughout the semester
Model Test	CO-wise (Cognitive, Psychomotor, Affective)	25	Rubrics covering all Domains of learning
Total Internal Marks		**100**	
End Semester Examination	CO-wise (Cognitive, Psychomotor, Affective)	100	Rubrics covering all Domains of learning

5. Syllabus

Problem Solving Techniques Computational Thinking: decomposition, pattern recognition, abstraction, algorithmic thinking - Analytical Techniques: solving by analogy, means-ends analysis, divide and conquer, building block approach, trace and verify - Creative Thinking Techniques: brainstorming, reverse brainstorming, generation of alternatives, mindmapping, SCAMPER

Problem Analysis and Algorithm Design Characteristics of a well-defined problem - Problem Specification - Input-Output Analysis - Constraints and Assumptions - Top Down Design and Stepwise Refinement - Algorithms and Procedures - Flowcharts and Pseudo

code - Fundamental Algorithms**:** exchange of variables, counting and accumulation, Fibonacci sequence, factorization methods

Introduction to Programming Evolution and role of programming languages - High-level and low-level languages - Programming paradigms: structured, object oriented, scripting - Language translators: compiler, assembler, interpreter – Structure of a program - Syntax and semantics - Program compilation and execution - Integrated Development Environments (IDEs) - Programming errors: syntax, runtime, logical

Programming Constructs and Program Development Variable and constants - Data types and type Conversions - Expressions and operators – Operator precedence and associativity - Conditional constructs – Iterative constructs, break continue statements - Boolean expressions and logical reasoning - Debugging, testing, program verification - Coding standards and documentation

Data Organization One-dimensional and multidimensional arrays - Strings - Array Techniques, Searching and Sorting techniques, Matrix Operations - Structures and array of structures – Pointers and Dynamic Memory Allocation - Unions - Enumerations – Bit fields

Modular Programming and File Processing Functions: definition, declaration, invocation, parameter passing – Recursion – Scope rules, lifetime of variables, storage classes - File concepts and need for persistent storage – Opening and closing files – File read and write operations – Text and binary files – Sequential file processing – Error handling in file operations - Functional Decomposition - Reusability and Abstraction

6. Learning Resources

Text Book

1. R.G.Dromey, “How to solve it by Computers”, Pearson Education India , First Edition, 2008
2. B. L. Juneja, Anita Seth, “Programming for Problem Solving”, Cengage Learning India Pvt. Ltd., 2019.
3. A.P. Godse, “Programming for Problem Solving”, Amazon Digital Services, 2020.

Reference Books & Web resources

1. https://www.theodinproject.com/lessons/foundations-problem-solving
2. https://www.geeksforgeeks.org/c/c-language-introduction/
3. Herbert Schildt, "C: The Complete Reference", McGraw Hill, Fourth Edition, 2017.
4. Yashvant Kanetkar, “Let us C”, BPB Publications, 21st Edition, 2025
5. NPTEL Course “Problem Solving through Programming in C”, IIT Kharagpur
6. NPTEL Course “Introduction to programming in C”, IIT Kanpur

7. Course Contents and Lecture Schedule

Module No	Topics	No of Periods	COs
1	**Problem Solving Techniques**		
1.1	Computational Thinking: Decomposition, Pattern Recognition, Abstraction, Algorithm design	1	CO1
1.2	Analytical Techniques: Solving by Analogy, Means-ends analysis, Divide and Conquer, Building Block Approach, Trace and Verify	1	
1.3	Creative Thinking Techniques: Brainstorming, Reverse Brainstorming, Generation of alternatives, Mindmapping, SCAMPER	1	

2	**Problem Analysis and Algorithm Design**		
2.1	Characteristics of a well-defined problem - Problem Specification - Input-Output Analysis - Constraints and Assumptions	1	CO2
2.2	Top Down Design and Stepwise Refinement		
2.3	Algorithms and Procedures	1	
2.4	Flowcharts and Pseudocode		
2.5	Fundamental Algorithms – Exchange of variables - Counting and Accumulation – Fibonacci sequence – Factorization Methods	1	
3	**Introduction to Programming**		
3.1	Evolution and role of programming languages - High-level and low-level languages	1	CO3, CO5
3.2	Programming paradigms: structured programming, object oriented programming, scripting languages		
3.3	Language translators: Compiler, Assembler, Interpreter		
3.4	Syntax and semantics - Program compilation and execution	1	
3.5	Integrated Development Environments (IDEs)		
3.6	Programming errors: syntax, runtime, and logical errors -		
4	**Programming Constructs and Program Development**		
4.1	Variable and Constants - Data Types and Type Conversions	1	CO3, CO5
4.2	Expressions and Operators – Operator Precedence and Associativity		
4.3	Conditional Constructs, Iterative Constructs, break continue statements	2	
4.4	Boolean Expressions and Logical reasoning		
4.5	Debugging, Testing, Program Verification - Coding Standards and Documentation	1	
5	**Data Organization**		
5.1	One-dimensional arrays and multidimensional arrays	3	CO3, CO5
5.2	Strings		
5.3	Array Techniques, Matrix Problems, Searching and Sorting		
5.4	Structures and Array of Structures	3	
5.5	Pointers and Dynamic Memory Allocation		
5.6	Unions, Enumerations, Bitfields		
6	**Modular Programming and File Processing**		
6.1	Functions: definition, invocation, parameter passing	2	CO4, CO5
6.2	Recursion		
6.3	Scope rules, lifetime of variables, storage Classes	1	
6.4	File concepts: persistent storage, opening and closing files, file read and write operations, text and binary files	2	
6.5	Sequential file processing, Error handling in file operations		
6.6	Functional Decomposition	1	
6.7	Reusability and Abstraction		
	Total Periods	**24**	

8. List of Experiments with CO Mapping

Sl. No.	Name of the Experiment	Level of Experiment	Objective(s)	COs Addressed
0	Study Experiment – Setting up Programming Environment and IDE Usage	Level 0	Obj. 1 - Instrumentation	CO5

1	Problem Specification and Flowchart Design Using Tools	Level 2	Obj. 1 - Instrumentation, Obj. 13 - Ethics & Integrity, Obj. 12 - Communication	CO2, CO5 CO6, CO7
2	Execution of Simple C Programs	Level 2	Obj. 1 - Instrumentation, Obj. 7 - Computational Sensing, Obj. 13 - Ethics & Integrity, Obj. 11 - Communication	CO3, CO5 CO6, CO7
3	Programs using Conditional Statements	Level 2	Obj. 1 - Instrumentation, Obj. 7 - Computational Sensing, Obj. 13 - Ethics & Integrity, Obj. 11 - Communication	CO3, CO5 CO6, CO7
4	Programs using Looping Statements	Level 2	Obj. 1 - Instrumentation, Obj. 7 - Computational Sensing, Obj. 13 - Ethics & Integrity, Obj. 11 - Communication	CO3, CO5 CO6, CO7
5	Applications using functions	Level 2	Obj. 1 - Instrumentation, Obj. 7 - Computational Sensing, Obj. 13 - Ethics & Integrity, Obj. 11 - Communication	CO4, CO5 CO6, CO7
6	Applications using 1D Array and functions	Level 2	Obj. 1 - Instrumentation, Obj. 7 - Computational Sensing, Obj. 13 - Ethics & Integrity, Obj. 11 - Communication	CO4, CO5 CO6, CO7
7	Applications using 2D Array and functions	Level 2	Obj. 1 - Instrumentation, Obj. 7 - Computational Sensing, Obj. 13 - Ethics & Integrity, Obj. 11 - Communication	CO4, CO5 CO6, CO7
8	Applications using Strings and String functions	Level 2	Obj. 1 - Instrumentation, Obj. 7 - Computational Sensing, Obj. 13 - Ethics & Integrity, Obj. 11 - Communication	CO4, CO5 CO6, CO7
9	Applications using Structures and Array of Structures	Level 2	Obj. 1 - Instrumentation, Obj. 7 - Computational Sensing, Obj. 13 - Ethics & Integrity, Obj. 11 - Communication	CO4, CO5 CO6, CO7

10	Applications using Pointers and Dynamic Memory Allocation mechanism	Level 2	Obj. 1 - Instrumentation, Obj. 7 - Computational Sensing, Obj. 13 - Ethics & Integrity, Obj. 11 - Communication	CO4, CO5 CO6, CO7
11	Applications using File Handling mechanism	Level 2	Obj. 1 - Instrumentation, Obj. 7 - Computational Sensing, Obj. 13 - Ethics & Integrity, Obj. 11 - Communication	CO4, CO5 CO6, CO7
12	Integrated Application Development using C Programming Concepts – Mini Project	Level 3	Obj. 5 - Design, Obj. 7 - Computational Sensing, Obj. 13 - Ethics & Integrity, Obj. 11 - Communication, Obj. 12 - Teamwork	CO4, CO5 CO6, CO7 CO8

9. Course Designer(s):

1. Dr. A.M.Abirami, Professor, IT abiramiam@tce.edu
2. Ms. C.V.Nisha Angeline, Assistant Professor, IT cvnait@tce.edu
3. Ms. R. Saraswathi Meena, Assistant Professor, IT rsmca@tce.edu
4. Ms. A. Indirani, Assistant Professor, IT aiica@tce.edu

26ITEA0	DIGITAL SYSTEM DESIGN	Category	L	T	P	Credits
		ESC	3	0	0	3

1. Preamble

The main objective of this course is to enable students to understand the fundamental concepts of digital electronics and the basic building blocks of computer systems. The course covers logic gates, Boolean algebra, combinational circuits, sequential circuits, memory elements, and digital system design techniques, providing a strong foundation for the design and analysis of modern digital systems.

2. Prerequisite

Nil

3. Course Outcomes

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

No.	Course Outcome	TPS Level	Performance Indicator	CO Weightage	SDG addressed	SDG Level
CO1	Explain different number systems, representation and number base conversions.	TPS2	1.3.1	10	NC	
CO2	Apply laws and theorems of Boolean algebra to formulate and realize switching functions using truth tables, algebraic forms, and standard logic gates.	TPS3	1.3.1	20	SDG9	1
CO3	Apply Karnaugh map and Quine-McCluskey methods to minimize Boolean functions and convert them into canonical Sum-of-Products and Product-of-Sums forms.	TPS3	1.3.1	20	SDG9	1
CO4	Demonstrate Combinational circuits such as adders, subtractors, multipliers, comparators, decoders, encoders, and multiplexers for given functional specifications.	TPS3	1.3.1	20	SDG9	1
CO5	Apply characteristic and excitation tables of latches and flip-flops to design sequential circuits.	TPS3	1.3.1	20	SDG9	1
CO6	Explain different types of counters and shift registers.	TPS2	1.3.1	10	NC	

4. Assessment Pattern

CO	CAT1	Assignment 1	CAT2	Assignment 2	Terminal Exam
	% of Marks	% of Marks	% of Marks	% of Marks	% of Marks
CO1	20				10
CO2	40	50			20
CO3	40	50			20
CO4			40	50	20
CO5			40	50	20
CO6			20		10
Total	**100**	**100**	**100**	**100**	**100**

5. Syllabus

Module 1: Digital Systems and Binary Numbers

Number Base Conversions-Octal and Hexadecimal Numbers-Complements and Signed Numbers-Floating-point representation-Binary Codes-Registers and Binary Storage

Module 2: Switching Theory

Laws of Boolean algebra, Theorems of Boolean algebra, Switching functions, Methods for specification of switching functions - Truth tables and Algebraic forms, Canonical and Standard forms of Boolean functions, Realization of functions using logic gates.

Module 3: Simplification of Boolean Expressions and Functions

Minimization of functions using Karnaugh maps, Minimization of functions using Quine-McClusky method, Don't care conditions, NAND, NOR Implementation

Module 4: Combinational Logic

Combinational Circuits - Analysis and Design Procedure - Binary Adder- Subtractor - Binary Multiplier - Magnitude Comparator - Decoders and Encoders – Multiplexers.

Module 5: Sequential Logic

Sequential Circuits- Latches and its types, flip-flops and its types - Characteristic tables and excitation tables – Analysis and Design of clocked sequential circuits – Moore /Mealy models.

Module 6: Registers and Counters

Shift Registers, Universal Shift Register, Synchronous Counters- Ring Counter- Johnson Counter, Asynchronous Ripple Counters.

6. Learning Resources

6.1 Text Book

1. M. Morris Mano, Michael D. Ciletti, "Digital Design", Sixth Edition, Pearson Education, 2018

6.2 Reference Books and Web resources

1. Harris, Sarah, and David Harris. Digital Design and Computer Architecture, RISC-V Edition. Morgan Kaufmann, 2021.
2. Donald D. Givone, "Digital Principles and Design", Tata McGraw Hill, 2003
3. https://onlinecourses.nptel.ac.in/e-learning/preview/noc21_ee39

7. Course Contents and Lecture Schedule

Module No	Topics	No of Periods	Course Outcomes
Module 1: Digital Systems and Binary Systems			
1.1	Number Base Conversion	1	CO1

1.2	Octal and Hexadecimal Numbers	1	CO1
1.3	Complements and Signed Numbers	1	CO1
1.4	Floating-point representation	1	CO1
1.5	Binary Codes	1	CO1
1.6	Registers and Binary Storage	1	CO1
Module 2: Switching Theory			
2.1	Laws of Boolean algebra	1	CO2
2.2	Theorems of Boolean algebra	1	CO2
2.3	Switching functions	1	CO2
2.4	Methods for specification of switching functions- Truth tables and Algebraic forms	1	CO2
2.5	Canonical and Standard forms of Boolean functions	1	CO2
2.5	Realization of functions using logic gates	1	CO2
Module 3: Simplification of Boolean Expressions and Functions			
3.1	Minimization of functions using Karnaugh maps	2	CO3
3.2	Minimization of functions using Quine-McClusky method	2	CO3
3.3	Don't care conditions	1	CO3
3.4	NAND ,NOR Implementation	1	CO3
Module 4: Combinational Logic			
4.1	Combinational Circuits- Analysis and Design Procedure	2	CO4
4.2	Binary Adder- Subtractor	1	CO4
4.3	Binary Multiplier	1	CO4
4.4	Magnitude Comparator	1	CO4
4.5	Decoders and Encoders	1	CO4
4.6	Multiplexers	1	CO4
Module 5: Sequential Logic			
5.1	Sequential Circuits- Latches and its types	1	CO5
5.2	Flip-flops and its Type	1	CO5
5.3	Characteristic tables and excitation tables	1	CO5
5.4	Analysis and Design of clocked sequential circuits	2	CO5
5.5	Moore /Mealy models	1	CO5
Module 6: Registers and Counters			
6.1	Shift Registers	1	CO6
6.2	Universal Shift Register	1	CO6
6.3	Synchronous Ripple Counters	1	CO6
6.4	Ring Counter- Johnson Counter	1	CO6
6.5	Asynchronous ripple Counters	1	CO6
	Total Periods	**36**	

8.Course Designer(s):

1. Dr.K.V.Uma, Associate Professor, IT, kvuit@tce.edu
2. Dr.R.Kirubahari, Assistant Professor, IT, rkiit@tce.edu
3. Dr.M.Suguna, Associate Professor, IT, mscse@tce.edu
4. Ms.S.Sujitha, Assistant Professor, IT, ssiit@tce.edu

B.Tech. INFORMATION TECHNOLOGY DEGREE PROGRAMME

CURRICULUM AND DETAILED SYLLABI

FOR

SECOND SEMESTER

FOR THE STUDENTS ADMITTED IN THE

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B.E. / B.Tech. Degree Programmes

COURSES OF STUDY
(For the candidates admitted from 2026-27 onwards)

SECOND SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			credits
			L	T	P	
THEORY						
26ITSA0	Computational Linear Algebra and Numerical Methods	BSC	2	1	-	3
26CHSA0	Chemistry	BSC	3	-	-	3
26ITCB0	Operating Systems	PCC	3	-	-	3
26ITCC0	IT Infrastructure Management	PCC	3	-	-	3
26ITEB0	Computer Organisation	ESC	3	-	-	3
26CCEB0	Biology for Engineers	ESC	3	-	-	3
THEORY CUM PRACTICAL						
26ITCD0	Web Essentials	PCC	1	-	3	2.5
PRACTICAL						
26ITCE0	Python Programming Laboratory	PCC	-	-	3	1.5
26CHSB0	Chemistry Laboratory	BSC	-	-	3	1.5
AUDIT COURSES						
26TAAB0	Tamil and Technology	AC				-
26CCAB0	Foundations of Problem Solving-1	AC				-
		Total				**23.5**

BSC : Basic Science Courses
HSMC : Humanities and Social Sciences including Management Courses
ESC : Engineering Science Courses
PCC : Programme Core Courses

L : Lecture
T : Tutorial
P : Practical

Note:
1 Lecture Period/week is equivalent to 1 credit
1 Tutorial Period/week is equivalent to 1 credit
1 Practical Period/week is equivalent to 0.5 credit

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.E. / B.Tech. Degree Programme

SCHEME OF EXAMINATIONS
(For the candidates admitted from 2026-27 onwards)

SECOND SEMESTER

S.No	Course Code	Name of the Course	Duration of Terminal Exam. in Hrs.	Marks			Minimum Marks for Pass	
				Continuous Assessment *	Terminal Exam **	Max. Marks	Terminal Exam	Total
THEORY								
1	26ITSA0	Computational Linear Algebra and Numerical Methods	3	40	60	100	27	50
2	26CHSA0	Chemistry	3	40	60	100	27	50
3	26ITCB0	Operating Systems	3	40	60	100	27	50
4	26ITCC0	IT Infrastructure Management	3	40	60	100	27	50
5	26ITEB0	Computer Organisation	3	40	60	100	27	50
6	26CCEB0	Biology for Engineers	3	40	60	100	27	50
THEORY CUM PRACTICAL								
7	26ITCD0	Web Essentials	3 (Terminal Exam Type : Practical)	50	50	100	22.5	50
PRACTICAL								
8	26ITCE0	Python Programming Laboratory	3	60	40	100	18	50
9	26CHSB0	Chemistry Laboratory	3	60	40	100	18	50

26ITSA0	COMPUTATIONAL LINEAR ALGEBRA AND NUMERICAL METHODS	Category	L	T	P	Credits
		BSC	2	1	0	3

1. Preamble

Linear algebra addresses the mathematical structures of vector spaces, linear transformations, orthogonality, and matrix eigenvalue problems that underpin computational methods in Information Technology. It integrates Fourier transform techniques for frequency domain signal analysis and numerical methods for solving mathematical equations, directly connecting to applications in data compression and image processing. These mathematical tools equip students to model, analyze, and solve problems encountered in fields such as machine learning and scientific computing.

2. Prerequisite

Nil

3. Course Outcomes

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

No.	Course Outcome	TPS Level	Performance Indicator	CO Weightage	SDG addressed	SDG Level
CO1	Compute basis and dimension of vector spaces.	TPS3	1.1.1	17%	SDG4	2
CO2	Apply linear transformation to solve problems involving similarity of transformations.	TPS3	1.1.1	16%	SDG4	2
CO3	Apply Gram-Schmidt process to construct an orthonormal basis.	TPS3	1.1.1	17%	SDG4	2
CO4	Use eigenvalues and eigenvectors to perform Singular value decomposition.	TPS3	1.1.1	17%	SDG4	2
CO5	Apply Fourier transform techniques to analyze and process discrete signals.	TPS3	1.1.1	17%	SDG4	2
CO6	Apply numerical techniques to solve mathematical equations.	TPS3	1.1.1	16%	SDG4	2

4. Assessment Pattern

CO	CAT1	Assignment 1	CAT2	Assignment 2	Terminal Exam
	% of Marks	% of Marks	% of Marks	% of Marks	% of Marks
CO1	34	34			17
CO2	32	32			16
CO3	34	34			17
CO4			34	34	17
CO5			34	34	17
CO6			32	32	16
Total	100	100	100	100	100

5. Syllabus

Vector Space: Vector space – Definition and Examples – Subspaces – Linear independence – Basis and Dimension.

Linear Transformations: Definitions and Examples – Matrix Representations of Linear Transformations – Similarity of transformations.

Orthogonality: Orthogonal Subspaces – Inner Product spaces – Orthonormal sets – The Gram-Schmidt Orthogonalization Process.

Matrix Eigen Value Problem: Eigenvalues and Eigenvectors – Diagonalization – The Singular Value Decomposition.

Fourier Transform: The Fourier Integral – The Fourier transform pair – The discrete Fourier Transform – The fast Fourier Transform.

Numerical Methods: Solution of algebraic and Transcendental Equations: Iteration method – Newton-Raphson method – Solution of Linear Simultaneous Equations: Gauss-Jordan method – Gauss-Seidel iteration method.

6. Learning Resources

6.1 Text Books

1. Steven. J. Leon and Lisette G. de Pillis, "Linear Algebra with Applications", 10th edition, Pearson, 2021.
   Vector Space: 3.1, 3.2, 3.3, 3.4
   Linear Transformations and Orthogonality: 4.1, 4.2, 4.3.
   Orthogonality: 5.2, 5.4, 5.5, 5.6.
   Matrix Eigen Value Problem: 6.1, 6.3, 6.5.
2. Glyn James and Phil Dyke, "Advanced Modern Engineering Mathematics", 5th edition, Pearson, 2018.
   Fourier Transform: 8.2.1, 8.2.2, 8.6.3, 8.6.5.
3. B. S. Grewal, "Numerical Methods in Engineering and Science: C, C++ and MATLAB", 1st edition, Mercury Learning and Information LLC, 2014.
   Numerical Techniques: 2.11, 2.12, 3.4, 3.5.

6.2 Reference Books & Web resources

1. David C. Lay, Steven R. Lay and Judi J. McDonald, "Linear Algebra and its applications", 5th edition, Pearson, 2016.
2. B. S. Grewal, "Higher Engineering Mathematics", 42nd edition, Khanna Publishers, 2014.
3. https://onlinecourses.nptel.ac.in/noc23_ma05/preview
4. https://nptel.ac.in/courses/117105134
5. https://onlinecourses.nptel.ac.in/noc21_ma45/preview

7. Course Contents and Lecture Schedule

Module No	Topics	No. of Periods
1	**Vector space**	
1.1	Definition and Examples	1
1.2	Subspaces	1
	Tutorial	1

1.3	Linear independence	1
1.4	Basis and Dimension	1
	Tutorial	1
2	**Linear Transformations**	
2.1	Definitions and Examples	1
2.2	Matrix Representations of Linear Transformations	1
	Tutorial	1
2.3	Similarity of transformations	2
	Tutorial	1
3	**Orthogonality**	
3.1	Inner Product spaces	1
3.2	Orthonormal sets	1
	Tutorial	1
3.3	The Gram-Schmidt Orthogonalization Process	2
	Tutorial	1
4	**Matrix Eigen Value Problem**	
4.1	Eigenvalues and Eigenvectors	2
	Tutorial	1
4.2	Diagonalization	1
4.3	The Singular Value Decomposition	1
	Tutorial	1
5	**Fourier Transform**	
5.1	The Fourier Integral	1
5.2	The Fourier transform pair	1
	Tutorial	1
5.3	The discrete Fourier Transform	1
5.4	The fast Fourier Transform	1
	Tutorial	1
6	**Numerical Methods**	
6.1	Solution of algebraic and Transcendental Equations: Iteration method	1
6.2	Newton-Raphson method	1
	Tutorial	1
6.3	Solution of Linear Simultaneous Equations: Gauss-Jordan method	1
6.4	Gauss-Seidel iteration method	1
	Tutorial	1
	Total Periods	**36**

8. Course Designer(s):

1. Dr. M. Sundar, Assistant Professor, Mathematics msrmat@tce.edu
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3. Dr. A. Muneesh Kumar, Assistant Professor, Mathematics amkmat@tce.edu

		Category	L	T	P	Credit
26ITCB0	**OPERATING SYSTEMS**	PCC	3	0	0	3

1. Preamble

The course on Operating Systems provides a comprehensive foundation in operating system principles, synchronization mechanisms, scheduling strategies, and memory management techniques that support reliable and high-performance computing environments. It also explores contemporary operating systems such as Linux, Windows, distributed and mobile platforms, highlighting their significance in cloud computing, virtualization, AI-enabled systems, and real-world industrial applications.

2. Prerequisite

- Nil

3. Course Outcomes

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

No.	Course Outcome	TPS Level	Performance Indicator	CO Weightage	SDG addressed	SDG Level
CO1	Explain the functions, services, and structures of operating systems.	TPS2	1.3.1	10	NC	
CO2	Apply process management, inter-process communication, and synchronization concepts in operating system scenarios.	TPS3	1.3.1	20	SDG 9	1
CO3	Apply CPU scheduling algorithms to analyze process execution and scheduling performance.	TPS3	1.3.1	20	SDG 9	1
CO4	Solve deadlock problems using prevention, avoidance, detection, and recovery techniques.	TPS3	1.3.1	20	SDG 9	1
CO5	Demonstrate memory management techniques using paging, segmentation, virtual memory, page replacement and disk scheduling algorithms.	TPS3	1.3.1	20	SDG 9	1
CO6	Describe file system organization and modern operating system environments.	TPS2	1.3.1	10	NC	

4. Assessment Pattern

CO	CAT1	Assignment 1	CAT2	Assignment 2	Terminal Exam
	% of Marks	% of Marks	% of Marks	% of Marks	% of Marks
CO1	**20**				**10**

CO2	**40**	**30**			**20**
CO3	**40**	**70**			**20**
CO4			**40**	**50**	**20**
CO5			**40**	**50**	**20**
CO6			**20**		**10**
Total	**100**	**100**	**100**	**100**	**100**

5. Syllabus

Operating Systems Overview

Operating Systems Overview – Functions and Services of Operating Systems – Operating System Structures – Types of Operating Systems – System Calls and System Programs – Security: The Security Problem – Program Threats-System and Network Threats – Introduction to Open Source Operating Systems.

Process Management and Synchronization

Process Concept – Process States – Process Scheduling Basics – Inter Process Communication – Threads and Multithreading Concepts – Critical Section Problem – Mutex Locks – Semaphores – Classical Synchronization Problems - Bounded Buffer Problem, Reader's Writer's Problem, Dining Philosopher's Problem.

CPU Scheduling

Scheduling Criteria – Scheduling Algorithms (FCFS, SJF, SRTF, Priority Preemptive and Priority Non-Preemptive) – Multiple Processor Scheduling – Thread Scheduling – Real Time CPU Scheduling – Algorithm Evaluation Techniques.

Deadlock Handling

System Deadlock Model – Deadlock Characterization – Deadlock Detection – Deadlock Avoidance (Banker's Algorithm) – Deadlock Prevention – Deadlock Recovery.

Memory and Storage Management

Main Memory Management – Swapping – Continuous Memory Allocation – Paging – Segmentation – Page Tables – Virtual Memory – Demand Paging – Copy on Write – Page Replacement Algorithms (FIFO, Optimal and LRU) – File System Structure – Disk Scheduling (FCFS, SSTF, SCAN, C-SCAN, LOOK and C-LOOK) – Kernel I/O Subsystem.

Case Studies in Operating Systems

Linux Operating System – Components and Scheduling – Windows Operating System – File Systems and Terminal Services – Distributed Operating Systems – Design Goals – Mobile Operating Systems – Android OS and iOS Comparison

6. Learning Resources

6.1 Text Book

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, "Operating System Concepts", John Wiley & Sons Pvt. Ltd., 11th Edition, 2024.

6.2 Reference Books & Web resources

1. William Stallings, "Operating Systems: Internals and Design Principles", Pearson Education, 9th Edition2019.
2. Andrew S Tanenbaum, Herbert Bos , "Modern Operating Systems", Prentice Hall,5th Edition,2022.
3. Dhananjay M. Dhamdhere, "Operating Systems – A Concept Based Approach", McGraw Hill Education, 3rd Edition, 2019

7. Course Contents and Lecture Schedule

Module No	Topics	No of Periods
1	**Operating Systems Overview**	**7**
1.1	Operating Systems Overview	1
1.2	Functions and Services of Operating Systems	1
1.3	Operating System Structures	1
1.4	Types of Operating Systems	1
1.5	System Calls and System Programs	1
1.6	Security: The Security Problem – Program Threats-System and Network Threats	1
1.7	Introduction to Open Source Operating Systems.	1
2	**Process Management and Synchronization**	**6**
2.1	Process Concept – Process States	1
2.2	Process Scheduling Basics- Inter Process Communication	
2.3	Threads and Multithreading Concepts	1
2.4	Critical Section Problem – Mutex Locks	1
2.5	Semaphores -Classical Synchronization Problems	
2.6	Bounded Buffer Problem, Reader's Writer's Problem, Dining Philosopher's Problem.	3
3	**CPU Scheduling**	**6**
3.1	Scheduling Criteria	2
3.2	Scheduling Algorithms-FCFS, SJF	
3.3	Scheduling Algorithms-SRTF, Priority Preemptive and Priority Non-Preemptive	2
3.4	Multiple Processor Scheduling	1
3.5	Thread Scheduling -Real Time CPU Scheduling	
3.6	Algorithm Evaluation Techniques.	1
4	**Deadlock Handling**	**4**
4.1	System Deadlock Model – Deadlock Characterization	1
4.2	Deadlock Detection	1
4.3	Deadlock Avoidance (Banker's Algorithm)	1
4.4	Deadlock Prevention	1
4.5	Deadlock Recovery	
5	**Memory and Storage Management**	**9**
5.1	Main Memory Management – Swapping	1
5.2	Continuous Memory Allocation – Paging – Segmentation – Page Tables	1
5.3	Virtual Memory – Demand Paging – Copy on Write	1
5.4	Page Replacement Algorithms- (FIFO, Optimal and LRU)	2
5.5	File System Structure	1
5.6	Disk Scheduling (FCFS, SSTF, SCAN, C-SCAN, LOOK and C-LOOK)	2
5.7	Kernel I/O Subsystem.	1
6	**Case Studies in Operating Systems**	**4**
6.1	Linux Operating System – Components and Scheduling	1
6.2	Windows Operating System	1
6.3	File Systems and Terminal Services	1
6.4	Distributed Operating Systems – Design Goals	
6.5	Mobile Operating Systems – Android OS and iOS Comparison	1
	Total hours	**36**

8.Course Designer(s):

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26ITCC0	IT INFRASTRUCTURE MANAGEMENT	Category	L	T	P	Credits
		PCC	3	0	0	3

1. Preamble

This course introduces the core architectural building blocks and methodologies that power modern enterprise IT environments. This course provides a comprehensive foundation in fundamental computing infrastructure—covering compute, network, and storage environments for multi-tier applications. Further, the course provides exposure to reliability engineering principles and observability concepts.

2. Prerequisite

Nil

3. Course Outcomes

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

No.	Course Outcome	TPS Level	Performance Indicator	CO Weightage	SDG addressed	SDG Level
CO1	Explain the fundamentals of storage (HDD, SSD) and Network devices for IT applications	TPS2	1.3.1	10	NC	-
CO2	Demonstrate the role of load balancers, DNS, and other components in three-tier web architecture in IT application provisioning	TPS3	1.4.1	20	NC	-
CO3	Use enterprise and cloud storage technologies such as NAS, SAN, and storage virtualization to provide appropriate storage solutions for enterprise use cases	TPS3	1.4.1	20	SDG9	1
CO4	Determine suitable backup, recovery, and failover strategies incorporating redundancy and replication techniques for a given application scenario	TPS3	1.4.1	20	SDG9	1
CO5	Measure infrastructure availability and fault tolerance using reliability metrics such as MTTR, MTBF, and Five 9's	TPS3	1.4.1	20	SDG9	1
CO6	Describe the essential steps of infrastructure monitoring, observability, and incident management using appropriate metrics and tools for a given system environment	TPS2	1.3.1	10	SDG9	1

4. Assessment Pattern

CO	CAT1	Assignment 1	CAT2	Assignment 2	Terminal Exam
	% of Marks	% of Marks	% of Marks	% of Marks	% of Marks
CO1	20	10	-	-	10
CO2	40	40	-	-	20
CO3	40	50	-	-	20
CO4	-	-	40	50	20
CO5	-	-	40	40	20
CO6	-	-	20	10	10
Total	**100**	**100**	**100**	**100**	**100**

Assignments may include the following items:

- Personal Device Infrastructure Audit: Students analyze CPU, RAM, HDD/SSD, Operating system, Network adapter.
- Creating a VM in students PC
- Case Study: Enterprise Infrastructure Analysis – Eg. Amazon/ Netflix/ Youtube
- Field Visit to TCE Datacenter – Report writing
- Commands – nslookup, tracert, ping, displaydns
- HTTP Request/ Response inspection using Browser's Developer Tools

5. Syllabus

Infrastructure Fundamentals

IT Infrastructure and Management Architecture Model -Storage Infrastructure: Levels – Types - HDD – SSD - RAID -Network Infrastructure: Network Devices - Switches, Routers, Hub, Bridges, Network types-LAN, WAN, Wireless Networks – Global internet – DNS – OSI Model

Infrastructure for Application Provisioning

Client-Server Architecture – Three Tier Web Application Architecture –HTTP/HTTPS - Load Balancers – Firewalls - Infrastructure Design Goals – Green Computing

Enterprise Infrastructure Fundamentals

Data Center– Networked Storage Solutions (NAS, SAN) - Cloud Fundamentals – Cloud Service Models – Deployment Models – Virtualization : Definition – Types–Cloud Service Providers: Case Study – Cloud Storage Models - Well Architected Framework (AWS/Azure Pillars)

Reliability Engineering

Definition – Five 9's - Metrics: MTTR, MTBF, MTTD – Single Point of Failure – Redundancy – Replication – Fail Over & Recovery – Backup & Recovery – Considerations – Techniques – Business Continuity Planning

Infrastructure Monitoring and Observability

Server/ Network/ Storage/ Application Monitoring – Metrics – Logging – Monitoring Workflow - Tools – Incident Management

6. Learning Resources

6.1 Text Book

1. SJaak Laan, "IT Infrastructure Architecture – Infrastructure Building Blocks and Concepts", fourth Edition, Lulu Press Inc, 2023.
2. G.Somasundaram, A.Shrivastava, "EMC Corporation, Information Storage and Management: Storing, Managing and Protecting Digital Information in Classic, Virtualized and Cloud Environment", 2nd Edition, Wiley publication, 2012

6.2 Reference Books & Web resources

1. Niall Murphy, Betsy Beyer, Chris Jones, Jennifer Petoff, "Site Reliability Engineering: How Google Runs Production Systems", O'Reilly Media, 2016.

2. Thomas Erl, Zaigham Mahmood, Ricardo Puttini, “Cloud Computing: Concepts, Technology and Architecture”, Prentice Hall, 2024.
3. https://docs.aws.amazon.com/wellarchitected/latest/framework/welcome.html
4. https://learn.microsoft.com/en-us/azure/well-architected/
5. https://www.vmware.com/topics/glossary/content/virtualization
6. https://www.datadoghq.com/knowledge-center/observability
7. https://www.cisco.com/c/en_in/products/security/firewalls/what-is-a-firewall.html

7. Course Contents and Lecture Schedule

Module No	Topics	No of Periods
1	**Infrastructure Fundamentals**	
1.1	IT Infrastructure and Management Architecture Model	1
1.2	Storage Infrastructure: Levels and Types	1
1.3	HDD and SSD	1
1.4	RAID	1
1.5	Network Infrastructure : Network Devices- Switches, Routers, Hub, Bridges	1
1.6	Network Types- LAN, WAN, Wireless Networks	1
1.7	Global Internet and DNS	1
1.8	OSI Model	1
2	**Infrastructure for Application Provisioning**	
2.1	Client-Server Architecture	1
2.2	Three Tier Web Application Architecture	2
2.3	HTTP/HTTPS	1
2.4	Load Balancers and Firewalls	1
2.5	Infrastructure Design Goals	1
2.6	Green Computing	1
3	**Enterprise Infrastructure Fundamentals**	
3.1	Data Center	1
3.2	Networked Storage Solutions (NAS, SAN)	2
3.3	Cloud Fundamentals- Cloud Service Models	1
3.4	Deployment Models	1
3.5	Virtualization: Definition and Types	1
3.6	Cloud Service Providers: Case Study	1
3.7	Cloud Storage Models and Well Architected Framework (AWS/Azure Pillars)	2
4	**Reliability Engineering**	
4.1	Reliability Engineering Definition and Five 9’s	1
4.2	Metrics: MTTR, MTBF, MTTD	1
4.3	Single Point of Failure and Redundancy and Replication	1
4.4	Fail Over and Recovery	1
4.5	Backup and Recovery– Considerations – Techniques	2
4.6	Business Continuity Planning	1
5	**Infrastructure Monitoring and Observability**	

5.1	Server Monitoring and Network Monitoring	1
5.2	Storage Monitoring and Application Monitoring	1
5.3	Metrics and Logging	1
5.4	Monitoring Workflow and tools	1
5. 5	Incident Management	1
	Total Periods	**36**

8.Course Designer(s):

1. S. Pudumalar, Assistant Professor, IT, spmit@tce.edu
2. S. Thiruchadai Pandeeswari, Assistant Professor, IT, eshwarimsp@tce.edu
3. R. Saraswathi Meena, Assistant Professor, IT, rsmca@tce.edu
4. R. Kirubahari, Assistant Professor, IT, rkiit@tce.edu

26ITCD0	WEB ESSENTIALS	Category	L	T	P	Credits	TE Type
		PCC	1	0	1.5	2.5	TCP-P

Preamble

The course web essential introduces the fundamental technologies required for modern web application development. It covers HTML5, CSS3, JavaScript, and React for designing responsive, interactive, and component-based web applications. The course also includes deployment of web application using cloud tools setup.

Prerequisite

Nil

Course Outcomes

After the successful completion of the course, students will be able to

No.	Course Outcome	TCE Proficiency Scale	Performance Indicator	CO Weightage	SDG Addressed	SDG Level
CO1	Demonstrate dynamic web applications using HTML5 and CSS for the given scenario	TPS3	1.3.1	20%	NC	
CO2	Solve web application problems through client-side scripting with JS constructs	TPS3	1.4.1	20%	NC	
CO3	Apply React components to design front-end web applications for the business and societal problems	TPS3	5.1.1	20%	SDG4	1
CO4	Demonstrate web application deployment process using cloud tools	TPS3	2.4.1	10%	NC	
CO5	Demonstrate ethical responsibility in developing web application.	TPS3	7.2.1	10%	NC	
CO6	Demonstrate the individual and team skills through effective web application development	TPS3	8.2.1	10%	NC	
CO7	Demonstrate effective oral presentation and report preparation for the chosen web application	TPS3	9.2.1	10%	NC	

Assessment Pattern

CO	Theory		Practical		Terminal Exam - Practical
	CAT1	CAT2	OCR/ Continuous Assessment	Model Test CO-wise	
	% of Marks	% of Marks	% of Marks	% of Marks	% of Marks

CO1	40		100	100	100
CO2	60				
CO3		60			
CO4		40			
CO5					
CO6					
CO7					
Total	100	100	100	100	100

Assessment Pattern: Practical Component

Type of Assessment	Component	Marks	Remarks
Continuous Assessment	Pre-lab, In-lab, Post-lab	75	Conducted throughout the semester
Model Test	CO-wise (Cognitive, Psychomotor, Affective)	25	Rubrics covering all Domains of learning
Total Internal Marks		**100**	
End Semester Examination	CO-wise (Cognitive, Psychomotor, Affective)	100	Rubrics covering all Domains of learning

Syllabus

Web Design Essentials:
Internet Basics – Browser Fundamentals – HTML5 Tags – HTML5 Forms – Cascading Style Sheets (CSS3) Fundamentals - CSS Properties - CSS Styling - Working with Lists and Tables - CSS ID and Class – Box Model – Positioning

Scripting Essentials - Javascript:
Introduction to JavaScript - Conditional Branching – Loops – Arrays - Functions – Built-in functions and methods – Function Expressions – Arrow Functions – Objects – Promises - async/await - Modules – Error Handling – DOM tree – Bubbling and capturing - Event delegation - Capturing - Bubbling - Events.

Front End Development with React:
React, Components and Props, State Management, Styling in React, Routing and Navigation, Advanced React Concepts

Web Application Hosting:
Web hosting services - Production build generation - Cloud platform project creation - CLI installation and configuration - GitHub integration and auto-deployment – Postman API, Firebase

Text Book

1. Mayur Patil, React.js For Beginners, Notion Press, 2023.
2. Albert Tetteh Adjei, Full Stack Web Development: Building End-to-End Web Applications with Modern Technologies: A Comprehensive Guide to End-to-End Development Technologies, TechTales Chronicles, 2023.

Reference Books & web resources

- https://www.coursera.org/learn/react-fundamentals
- https://react.dev/learn

Course Contents and Lecture Schedule

Module No	Topics	No of Periods	Course Outcomes
1	**Web And Scripting Essentials**		
1.1	Internet Basics – Browser Fundamentals – HTML5 Tags – HTML5 Forms	1	CO1

1.2	Cascading Style Sheets (CSS3) Fundamentals – CSS Properties – CSS Styling – Working with Lists and Tables – CSS ID and Class – Box Model – Positioning	1	CO1
2	**Scripting Essentials – Javascript**		
2.1	JavaScript – Conditional Branching – Loops – Arrays – Functions – Built-in functions and methods – Function Expressions – Arrow Functions	1	CO2
2.2	Objects – Promises – async/await – Modules – Error Handling – DOM tree – Bubbling and capturing – Event delegation – Capturing – Bubbling – Events	2	CO2
3	**Front End Development with React**		
3.1	React, Components and Props, State Management	2	CO3
3.2	Styling in React, Routing and Navigation, Advanced React Concepts	1	CO3
3.3	Project Development	1	CO5, CO6, CO7
4	**Web Application Hosting**		
4.1	Web hosting services, Production build generation, Cloud platform project creation, CLI installation and configuration	1	CO4
4.2	GitHub integration and auto-deployment – Postman API, Firebase	2	CO4
	Total Hours	**12**	

List of Experiments with CO Mapping

Sl. No.	Name of the Experiment	Level of Experiment	Objective(s)	COs Addressed
1	Case Study on Enterprise Applications in domains like Healthcare, Finance, Transport, Education, Society, Agriculture, Governance	Level 1	3: Experimentation 11: Communication 12: Teamwork 13: Ethics & Integrity	CO1, CO5, CO6, CO7
2	Design of webpage with basic HTML & CSS properties.	Level 1	3: Experimentation	CO1
3	Add more styles for the webpage with advanced CSS properties.	Level 1	3: Experimentation	CO1
4	Form design and working with JS constructs for implementing test cases	Level 2	3: Experimentation	CO2
5	Mini Project - Problem Selection in SDG, identify technical requirements	Level 2	3: Experimentation 11: Communication 12: Teamwork 13: Ethics & Integrity	CO2, CO5, CO6, CO7
6	Practice React components for given problems	Level 2	3: Experimentation	CO3
7	Practice React probs and state management for given problems	Level 2	3: Experimentation	CO3
8	Work on React Router and Navigation for simple problems	Level 2	3: Experimentation	CO3

9	Deploy React Application in Firebase.	Level 2	3: Experimentation	CO4
10	Git Commands practice	Level 1	3: Experimentation	CO4
11	Develop a similar web application using AI Tools/Agents such as Google-Antigravity, Claude	Level 3	5: Design 9: Creativity 13: Ethics & Integrity	CO4, CO5
12	Compare applications with standard UI parameters and users experience	Level 3	8: Learn from Failure 11: Communication 12: Teamwork 13: Ethics & Integrity	CO5, CO6, CO7
13	Mini-project – Presentation & Report Submission	Level 3	5: Design 9: Creativity 11: Communication 12: Teamwork 13: Ethics & Integrity	CO5, CO6, CO7

Course Designer(s):

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4 Ms.R.Vaishnavi, , Assistant Professor, IT rviit@tce.edu

26ITCE0	PYTHON PROGRAMMING LABORATORY	Category	L	T	P	Credits
		PCC	0	0	3	1.5

1. Preamble

This laboratory course provides practical experience in Python programming for problem-solving, data handling, analysis, visualization, web and gaming application development. The course emphasizes logical thinking, computational skills, and real-world application development using modern Python libraries.

2. Prerequisite

Nil

3. Course Outcomes

On the successful completion of the course, students will be able to

COs	Course Outcomes	TCE Proficiency Scale	PI	Objective	SDG Addressed	SDG Level
CO1	Operate Python development environments such as Jupyter notebooks, libraries and packages to implement and test computational solutions.	TPS 3	5.2.1	1	NC	
CO2	Analyse computational solutions by relating algorithmic and mathematical models to program behaviour and outputs in Python, quantifying deviations where applicable.	TPS 4	2.4.2	3	NC	
CO3	Develop Python applications involving data processing, visualization, and web or game development against defined problem specifications.	TPS 5	5.3.1	4, 5	SDG4	1
CO4	Examine program outputs and performance data including plots, numerical results and execution profiles to interpret correctness and compare algorithmic efficiency.	TPS 4	4.1.2	7	NC	
CO5	Demonstrate ethical responsibility in developing original Python programs, attributing external libraries appropriately and reporting results accurately.	TPS 3	7.2.1	13	NC	
CO6	Prepare well-documented Python programs with inline documentation and structured laboratory reports, and assess the documentation and reports for clarity, completeness and reproducibility of results.	TPS 3	9.1.2	11	NC	

CO7	Implement assigned roles equitably in collaborative Python programming, shared debugging, and joint data science or application development activities	TPS 3	8.1.1	12	NC	

4. Assessment Pattern

Type of Assessment	Component	Marks	Remarks
Continuous Assessment	Pre-lab, In-lab, Post-lab	75	Conducted throughout the semester
Model Test	CO-wise (Cognitive, Psychomotor, Affective)	25	Mid/End semester internal test
Total Internal Marks		**100**	
End Semester Examination	CO-wise (Cognitive, Psychomotor, Affective)	100	As directed by COE or as per curriculum

5. List of Experiments with CO Mapping

Sl. No.	Name of the Experiment	Level of Experiment	Objective(s)	COs Addressed
0	Study Experiment – Setting up Python Environment and IDE Usage	Level 1	Obj. 1 - Instrumentation	CO1
1	Simple Python Programs using basic programming constructs	Level 1	Obj. 1 - Instrumentation, Obj. 7 - Computational Sensing, Obj. 13 - Ethics & Integrity, Obj. 11 - Communication	CO1, CO5, CO6
2	Modular Programming and Functions	Level 2	Obj. 1 - Instrumentation, Obj. 7 - Computational Sensing, Obj. 13 - Ethics & Integrity, Obj. 11 - Communication	CO1, CO5, CO6
3	Applications using Lists, Tuples, and Dictionaries	Level 2	Obj. 1 - Instrumentation, Obj. 7 - Computational Sensing, Obj. 13 - Ethics & Integrity, Obj. 11 - Communication	CO1, CO5, CO6
4	Applications using Sets and Comprehensions	Level 2	Obj. 3 - Experimentation, Obj. 7 - Computational Sensing, Obj. 13 - Ethics & Integrity, Obj. 11 - Communication	CO2, CO5, CO6
5	Applications using NumPy Arrays and Vector Operations	Level 2	Obj. 3 - Experimentation, Obj. 7 - Computational Sensing, Obj. 13 - Ethics & Integrity, Obj. 11 - Communication	CO2, CO5, CO6
6	Matrix Operations and Solving Linear Equations	Level 2	Obj. 3 - Experimentation, Obj. 7 - Computational Sensing, Obj. 13 - Ethics & Integrity,	CO2, CO4, CO5, CO6

			Obj. 11 – Communication	
7	Eigenvalues and Eigenvectors	Level 2	Obj. 3 - Experimentation, Obj. 7 - Computational Sensing, Obj. 13 - Ethics & Integrity, Obj. 11 - Communication	CO2, CO4, CO5, CO6
8	File Handling and Exception Handling	Level 2	Obj. 3 - Experimentation, Obj. 7 - Computational Sensing, Obj. 13 - Ethics & Integrity, Obj. 11 - Communication	CO3, CO4, CO5, CO6
9	Applications using Pandas for Data Handling	Level 2	Obj. 4 – Data Analysis, Obj. 7 - Computational Sensing, Obj. 13 - Ethics & Integrity, Obj. 11 - Communication	CO3, CO4, CO5, CO6
10	Data Visualization using Python libraries	Level 2	Obj. 4 – Data Analysis, Obj. 7 - Computational Sensing, Obj. 13 - Ethics & Integrity, Obj. 11 - Communication	CO3, CO4, CO5, CO6
11	Simple Gaming Application development using Python libraries	Level 3	Obj. 5 – Design, Obj. 7 - Computational Sensing, Obj. 13 - Ethics & Integrity, Obj. 11 – Communication, Obj. 12 – Teamwork	CO3, CO4, CO5, CO6, CO7
12	Simple Web Application Development using Flask or Django	Level 3	Obj. 5 – Design, Obj. 7 - Computational Sensing, Obj. 13 - Ethics & Integrity, Obj. 11 – Communication, Obj. 12 – Teamwork	CO3, CO4, CO5, CO6, CO7

List of problems (*but not limited to)*:

- Storage, retrieval, and processing of data using list, tuple, and user-defined functions.
- Dictionary operations such as merging dictionaries, and sorting based on keys and values; set operations for data analysis.
- Linear algebra computations including vector and matrix operations using numerical libraries such as NumPy.
- Reading from and writing to CSV and Excel files using data handling libraries such as pandas.
- Exploratory Data Analysis (EDA) including data cleaning, transformation, aggregation, and summary statistics using pandas.
- Data visualization using libraries such as Matplotlib, Seaborn, and Plotly.
- Development of simple game applications using Python libraries such as Turtle, Tkinter, PIL, NumPy, and Random

6. Course Designer(s):

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26ITEB0	COMPUTER ORGANIZATION	Category	L	T	P	Credits
		ESC	3	0	0	3

1. Preamble

The course on Computer Organization introduces the fundamental structure and operational concepts of a computer system. It explains the organization of major functional units and the execution of instructions within a processor. The course also covers techniques for improving system performance through pipelining and multicore processing. In addition, it discusses memory hierarchy concepts and the communication mechanisms between the processor and input/output devices.

2. Prerequisite

Nil

3. Course Outcomes

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

No.	Course Outcome	TPS Level	Performance Indicator	CO Weightage	SDG addressed	SDG Level
CO1	Explain the basic computer organization concepts, hardware/software interface, performance metrics, and multicore architecture principles.	TPS2	1.3.1	10	NC	
CO2	Apply instruction set architecture concepts including addressing modes, instruction formats, logical operations, and decision-making instructions using MIPS processor examples.	TPS3	1.3.1	20	SDG 9	1
CO3	Apply arithmetic algorithms for addition, subtraction, multiplication, division, and floating-point operations in computer systems.	TPS3	1.3.1	20	SDG 9	1
CO4	Apply pipelining and superscalar processing concepts to evaluate processor performance and to overcome pipeline-related issues.	TPS3	1.3.1	20	SDG 9	1
CO5	Apply memory hierarchy concepts to evaluate system performance, demonstrate different cache organization and mapping techniques with	TPS3	1.3.1	20	SDG 9	1

	examples.					
CO6	Explain parallel processing architectures including SIMD, MIMD, vector processing, multithreading, multicore processors, GPU computing, and domain-specific architectures.	TPS2	1.3.1	10	NC	

4. Assessment Pattern

CO	CAT1	Assignment 1	CAT2	Assignment 2	Terminal Exam
	% of Marks	% of Marks	% of Marks	% of Marks	% of Marks
CO1	20				10
CO2	40	70			20
CO3	40	30			20
CO4			40	50	20
CO5			40	50	20
CO6			20		10
Total	100	100	100	100	100

5. Syllabus

Module 1 : Computer Abstractions and Technology

Introduction -Seven great ideas in computer architecture-Hardware and software interface-Classic components of a computer -Processor and memory technologies -Performance evaluation-Power wall and multicore era

Module 2 : Instruction set architecture (ISA)

Operands and Operations – Instruction set -Addressing Modes -Representing Instructions in the computer - Logical Operations -Decision-making instructions – Case Study: RISC V processor

Module 3 : Arithmetic for Computers

Addition and subtraction – Multiplication – Refined version, Signed and Fast multiplication - Division- Improved version, signed and fast division, Floating-point representation and operations.

Module 4 : The Processor and Pipelining

Logic design convention – Building a datapath -Single-cycle processor - Multicycle implementation. Pipelining: Pipelined datapath and control - Structural hazards -Data hazards -Control hazards. Hazard handling techniques –Exceptions and Interrupts.

Module 5 : Memory

Memory Hierarchy – Technologies, Cache memory organization-Cache mapping techniques-Cache performance – Cache coherence

Module 6 : Parallel Processors

SISD, MIMD, SIMD, SPMD, and Vector architecture, Hardware Multithreading, Multi core processor, Shared memory Multiprocessor, GPU computing basics - Domain-specific architectures (DSA)principles.-Tensor Processing Unit basics - Superscalar processors

Case study of recent processors

6. Learning Resources

6.1 Text Books

1. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, 6th Edition, Morgan Kaufmann / Elsevier, 2021.

6.2 Reference Books and Web resources

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, and Naraig Manjikian, Computer Organization and Embedded Systems, 6th Edition, McGraw Hill Education, 2023.
2. William Stallings, Computer Organization and Architecture, 11th Edition, Pearson Education, 2019.

7. Course Contents and Lecture Schedule

Module No	Topics	No of Periods	Course Outcomes
Module 1 :Computer Abstractions and Technology			
1.1	Introduction : Seven Great Ideas in Computer Architecture	1	CO1
1.2	Hardware and Software Interface	1	CO1
1.3	Classic Components of a Computer	1	CO1
1.4	Processor Technologies and Memory Technologies	1	CO1
1.5	Performance Evaluation and Benchmarking	1	CO1
1.6	Power Wall, Energy Challenges, and Multicore Era	1	CO1
Module 2 : Instruction set architecture (ISA)			
2.1	Operands and Operations	1	CO2
2.2	Addressing Modes	1	CO2
2.3	Representing Instructions in Computers	1	CO2
2.4	Logical Operations and Decision-Making Instructions	1	CO2
2.5	Case Study: RISC V	1	CO2
Module 3 : Arithmetic for Computers			
3.1	Addition and Subtraction Algorithms	1	CO3
3.2	Multiplication Algorithms- Refined, Signed, and Fast Multiplication	2	CO3
3.3	Division Algorithms- Improved, Signed, and Fast Division	2	CO3
3.4	Floating-Point Representation and Operations	1	CO3
Module 4 : The Processor and Pipelining			
4.1	Logic Design Conventions	1	CO4
4.2	Building a Datapath	1	CO4
4.3	Single-Cycle Processor Design	1	CO4
4.4	Multicycle Processor Implementation	1	CO4
4.5	Pipelining: Pipelined datapath and control	1	CO4
4.6	Structural hazards -Data hazards	1	CO4
4.7	Control hazards - Hazard handling techniques	1	CO4
4.8	Exceptions and Interrupts	1	CO4
Module 5 :Memory			
5.1	Memory Hierarchy – Technologies	1	CO5
5.2	Cache memory organization	1	CO5
5.3	Cache mapping techniques	1	CO5
5.4	Cache performance – Cache coherence	1	CO5

Module 6 : Parallel Processors			
6.1	SISD, MIMD, SIMD, SPMD, and Vector architecture	1	CO6
6.2	Hardware Multithreading	1	CO6
6.3	Multi core processor- Shared memory Multiprocessor	1	CO6
6.4	GPU computing basics - Domain-specific architectures (DSA)principles	1	CO6
6.5	Tensor Processing Unit basics	1	CO6
6.6	Superscalar processors	1	CO6
6.7	Case study of recent processors	1	CO6
	Total Periods	**36**	

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