B.TECH DEGREE (Computer Science and Business Systems) PROGRAMME

DEPARTMENT VISION AND MISSION

ACADEMIC YEAR 2026 – 2027 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING

(A Government Aided ISO 9001-2008 Certified

Autonomous Institution affiliated to Anna University)

MADURAI – 625 015, TAMILNADU

Phone: 0452 – 2482240, 41

Fax: 0452 2483427

Web:www.tce.edu

Passed in BoS Meeting on 22.05.2026 Approved in 71st Academic Council Meeting on 27.06.2026

Thiagarajar College of Engineering, Madurai – 625 015

Department of Computer Science and Business Systems

VISION AND MISSION OF THE DEPARTMENT

Name of the Programme: B.Tech Computer Science and Business Systems

Vision

A globally recognized centre of excellence in Computer Science and Business Systems.

Mission

- Equip students through innovative, industry-oriented curricula and hands-on learning.
- Engage students in ethical, leadership, and professional development through curricular and extracurricular activities.
- Advance research, consultancy, and industry collaboration across emerging areas of computing and business.
- Deploy emerging technologies and modern tools across teaching, learning, and research.
- Attain continuous improvement through infrastructure, industry partnerships, and committed faculty members.

CURRICULUM AND DETAILED SYLLABI

FOR

B.TECH DEGREE (Computer Science and Business Systems) PROGRAMME

CREDIT DISTRIBUTION

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SCHEDULING OF COURSES

ACADEMIC YEAR 2026 – 2027 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING

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Thiagarajar College of Engineering, Madurai - 625015

Credit Distribution for B.Tech (Computer Science and Business Systems) Programme – 2026 – 2027 Batch

S.No	Category of Courses	Credits Regular	Credits 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	Professional Core Courses (PCC)	75	62
E	Professional 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	

Thiagarajar College of Engineering, Madurai-625015
Department of Computer Science and Business Systems
Scheduling of Courses – for B.Tech (Computer Science and Business Systems) Programme - join in the year 2026 – 2027

Semester	1	2	3	4	5	6	7	8	9	10	CDIO Courses	Audit Courses (Mandatory Non- credit)	Credits
I	26CBSA0 Discrete Mathematics (BSC-4) 3-1-0	26PHSA0 Physics (BSC-3) 3-0-0	26EGHA0 Technical English (HSMC-3) TCP 1-0-2	26CBCA0 Fundamentals of Computer science + Laboratory (PCC–3) 2-0-2 (Practical)	26CBEA0 Essentials of Computing (ESC-3) 3-0-0					26PHSB0 Physics Laboratory (BSC-1.5)	26CCEA0 Introduction to Engineering (ESC-2) TCP 1-0-2	26TAAA0 Heritage of Tamil (AC-0) 26CCAA0 Vision and Speed Maths (AC-0)	19.5
II	26CBSB0 Statistics, Probability and Calculus (BSC-3) 2-1-0	26CHSB0 Applied Chemistry (BSC-3) 3-0-0	26CBCB0 Computer Organization and Architecture (PCC–3) 3-0-0	26CBCC0 Fundamentals of Economics (PCC–2) 2-0-0	26CBCD0 Computational Problem Solving using Python (PCC–4) 2-0-4(Practical)	26CBCE0 Business Communication & Value Science (PCC-1) 0-0-1	26CBEB0 Basic Electrical and Electronics Engineering (ESC-3) 3-0-0		26CCEB0 Biology for Engineers (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	26CBSC0 Linear Algebra (BSC-3) 2-1-0	26CBCF0 Data Structures & Algorithms (PCC-3) 3-0-0	26CBCG0 Object Oriented Programming with Java + Laboratory (PCC-4) 2-0-4 (Practical)	26CBCH0 Database Management Systems (PCC-3) 3-0-0	26CBCJ0 Fundamentals of Management (PCC-3) 3-0-0	26CBCK0 Data Structures & Algorithms Laboratory (PCC-1) 0-0-1	26CBCL0 Database Management Systems Laboratory (PCC-1) 0-0-1	26CBEC0 Formal Languages and Automata Theory (ESC–3) 3-0-0		26CCLA0 Building Communication Skills (EEC-1)	26CCEC0 Design Thinking (ESC-3)	26CCAC0 Constitution of India (AC-0)	25
IV	26CBSD0 Statistical methods (BSC-3) 2-1-0	26CBCM0 Operating Systems (PCC-3) 3-0-0	26CBCN0 Design and Analysis of Algorithms (PCC-3) 3-0-0	26CBCP0 Computer Networks (PCC-3) 3-0-0	26CBCQ0 Software Engineering with UML+ Laboratory (PCC-4) 2-0-4	26CBCR0 Marketing Research and Marketing Management (PCC-3) 3-0-0	26CBCS0 Computer Networks Laboratory (PCC-1.5) 0-0-1.5	26CBCT0 Design and Analysis of Algorithms Laboratory (PCC-1.5) 0-0-1.5	26CCED0 Environment and Sustainability (ESC-3)	26EGHB0 Professional Communication Laboratory (HSMC-2)	26CCLB0 Numerical Skills and Quantitative Problem Solving (EEC-1)	26CCAD0 Indian Knowledge System (AC-0)	28
V	26CCHA0 Project Management (HSMC-3)	26CBED0 Vibe Coding (ESC-3) 3-0-0	26CBCU0 Full stack development+ Laboratory (PCC-3) 2-0-2	26CBCV0 Cloud Microservices + Laboratory (PCC-3) 2-0-2	26CBCW0 Digital Business (PCC-3) 3-0-0	26CBCX0 Innovation, IP Management & Entrepreneurship (PCC-3) 3-0-0	26CBCY0 Operational Research + Laboratory (PCC-3) 2-0-2		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	26CBHA0 Computational Finance (HSMC-3)	26CBCZ0 Cryptography and Network Security (PCC-3) 3-0--0	26CBDA0 Machine Learning (PCC-3) 3-0-0	26CBDB0 Embedded Systems and IoT + Laboratory (PCC-3) 2-0-2	26CBDC0 Human Resource Management (PCC-3) 3-0-0	26CBDD0 Machine Learning Laboratory (PCC-1) 0-0-1	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
													174

Mandatory requirement: First year category-wise credits are fixed i.e., HSMC: 3 | BSC: 16 | ESC: 11 | PCC: 13 | OEC: 0 | PEC: 0 | PW: 0 | Total: 43

BSC HSMC ESC PCC PEC OEC EEC AC

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B.Tech (Computer Science and Business Systems) Programme

Categorization of Courses

List of Humanities and Social Science Courses (11)

26EGHA0 - Technical English (3)
26EGHB0 - Professional Communication Lab (2)
26CCHA0 - Project Management (3)
26CBHA0 - Computational Finance (3)

List of Basic Science Courses (22)

26CBSA0 - Discrete Mathematics (4)
26PHSA0 - Physics (3)
26PHSB0 - Physics Laboratory (1.5)
26CBSB0 - Statistics, Probability and Calculus (3)
26CHSB0 - Applied Chemistry (3)
26CHSC0 - Chemistry Laboratory (1.5)
26CBSC0 - Linear Algebra (3)
26CBSD0 - Statistical Methods (3)

List of Engineering Science Courses (23)

26CBEA0 - Essentials of Computing (3)
26CCEA0 - Introduction to Engineering (2)
26CBEB0 - Basic Electrical and Electronics engineering (3)
26CCEB0 - Biology for Engineers (3)
26CBEC0 - Formal Language & Automata Theory (3)
26CCEC0 - Design Thinking (3)
26CCED0 - Environment and Sustainability (3)
26CBED0 - Vibe Coding (3)

List of Professional Core Courses (75)

26CBCA0 - Fundamentals of Computer Science + Laboratory (3)
26CBCB0 - Computer Organization and Architecture (3)
26CBCC0 - Fundamentals of Economics (2)
26CBCD0 - Computational Problem Solving using Python (4)
26CBCE0 - Business Communication & Value Science (1)
26CBCF0 - Data Structures and Algorithms (3)
26CBCG0 - Object Oriented Programming with Java + Laboratory (4)
26CBCH0 - Database Management Systems (3)
26CBCJ0 - Fundamentals of Management (3)
26CBCK0 - Data Structures and Algorithms Laboratory (1)
26CBCL0 - Database Management Systems Laboratory (1)
26CBCM0 - Operating Systems (3)
26CBCN0 - Design and Analysis of Algorithms (3)
26CBCP0 - Computer Networks (3)
26CBCQ0 - Software Engineering with UML + Laboratory (4)

26CBCR0 - Marketing Research and Marketing Management (3)
26CBCS0 - Computer Networks Laboratory (1.5)
26CBCT0 - Design and Analysis of Algorithms Laboratory (1.5)
26CBCU0 - Full Stack Development + Laboratory (3)
26CBCV0 - Cloud Microservices + Laboratory (3)
26CBCW0 - Digital Business (3)
26CBCX0 - Innovation, IP Management & Entrepreneurship (3)
26CBCY0 - Operations Research + Laboratory (3)
26CBCZ0 - Cryptography and Network Security (3)
26CBDA0 - Machine Learning (3)
26CBDB0 - Embedded Systems and IoT + Laboratory (3)
26CBDC0 - Human Resource Management (3)
26CBDD0 - Machine Learning Laboratory (1)

Programme Elective Courses

Honours				**Minor**
Vertical I Enterprise Systems	**Vertical II AI for Business**	**Vertical III Product and Innovation**	**Vertical IV FinTech and Industry Domains**	**Vertical V Analytics and Intelligent Systems**
Enterprise Resource Planning	Artificial Intelligence	Product Management	FinTech Systems	Predictive Analytics
Enterprise Digital Systems	AI for Business Decision Making	Product Innovation and Development	Computational Modelling	Customer Analytics
IT Service Management	Deep Learning for Business	Digital Twin Technologies	Blockchain Technology	Marketing Analytics
Business Process Management	Generative AI for Enterprises	Platform Business Models	Ethics in AI and Data Privacy	HR Analytics
Customer Relationship Management	Natural Language Processing	Agile Product Engineering	Healthcare Information Systems	Supply Chain Analytics
Enterprise Architecture	Computer Vision Applications	IT Product Management	Retail and E-Commerce Analytics	Data Visualization
Digital Transformation Strategies	Explainable AI for Business	Compiler Design	Business Ethics	Edge Computing for Enterprises
Supply Chain Information Systems	Intelligent Automation and Chatbots	Quantum Computing Applications	Industry 5.0 Technologies	Business Intelligence Applications

Open Elective Courses (6)
Basic Science Elective / Language Elective (3)
Interdisciplinary Elective (3)

Employability Enhancement Courses (EEC) (16)
26CCLA0 - Building Communication Skills (1)
26CCLB0 - Numerical Skills and Quantitative Problem Solving (1)
26CCLC0 - Aptitude Skills (2)
26ITLA0 - Project -I (3)
26ITLB0 - Project -II (3)
26ITLC0 - Project -III (3)
26ITLD0 - Project -IV (3)

Multi-disciplinary Elective Courses (3)
Business Analytics (3)
Digital Marketing (3)

CURRICULUM AND DETAILED SYLLABI

FOR

B.TECH DEGREE (Computer Science and Business Systems) PROGRAMME

FIRST SEMESTER

FOR THE STUDENTS ADMITTED FROM THE

ACADEMIC YEAR 2026 – 2027 ONWARDS

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THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.Tech (Computer Science and Business Systems) Programme

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

FIRST SEMESTER

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	No.of Hours / Week			Credits
				L	T	P	
THEORY COURSES							
1	26CBSA0	Discrete Mathematics	BSC	3	1	0	4
2	26CBEA0	Essentials of Computing	ESC	3	0	0	3
3	26PHSA0	Physics	BSC	3	0	0	3
THEORY CUM PRACTICAL COURSES							
4	26CBCA0	Fundamentals of Computer Science	PCC	2	0	2	3
5	26CCEA0	Introduction to Engineering	ESC	1	0	2	2
6	26EGHA0	Technical English	HSMC	2	0	2	3
PRACTICAL COURSES							
7	26PHSB0	Physics Laboratory	BSC	0	0	1.5	1.5
AUDIT COURSES							
8	26TAAA0	Heritage of Tamil	AC	-	-	-	-
9	26CCAA0	Vision + ESAT	AC	-	-	-	-
TOTAL							**19.5**

BSC : **Basic Science Courses**
HSMC : Humanities and Social Sciences including Management Courses
ESC : Engineering Science Courses
PCC : Programme Core Courses
PEC : Programme Elective Courses
OEC : Open Elective Courses
EEC : Employability Enhancement Courses
AC : Audit Courses

L : Lecture
T : Tutorial
P : Practical

Note:
1 Hour Lecture is equivalent to 1 credit
1 Hour Tutorial is equivalent to 1 credit
1 Hours Practical is equivalent to 0.5 credit

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.Tech (Computer Science and Business Systems) 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	26CBSA0	Discrete Mathematics	3	40	60	100	27	50
2	26CBEA0	Essentials of Computing	3	40	60	100	27	50
3	26PHSA0	Physics	3	40	60	100	27	50
THEORY CUM PRACTICAL								
4	26CBCA0	Fundamentals of Computer Science	3 (TCP-P)	50	50	100	25	50
5	26CCEA0	Introduction to Engineering	3	50	50	100	25	50
6	26EGHA0	Technical English	3	50	50	100	25	50
PRACTICAL								
7	26PHSB0	Physics Laboratory	3	60	40	100	18	50
AUDIT COURSES								
8	26TAAA0	Heritage of Tamil	-	-	-	-	-	-
9	26CCAA0	Vision + ESAT	-	-	-	-	-	-

26CBEA0	ESSENTIALS OF COMPUTING

Category	L	T	P	Credit
ESC	3	0	0	3

Preamble

Computer Science introduces the fundamentals of computing, computational thinking, and problem solving through logical reasoning and visual programming. The course develops essential programming skills and builds a foundation for understanding modern digital technologies and their real-world applications.

Prerequisite

NIL

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, characteristics, and applications of computers.	TPS2	1.3.1	12%	8	1
CO2	Solve problems using computational thinking, number systems, and Boolean logic.	TPS3	1.3.1	20%	8	1
CO3	Apply decomposition, abstraction, and pattern recognition to solve problems and design suitable algorithms.	TPS3	1.3.1	18%	8	1
CO4	Demonstrate programming concepts using appropriate programming paradigms and tools.	TPS3	1.3.1	20%	4	1
CO5	Implement simple Scratch programs using variables, decisions, loops, lists, and searching concepts.	TPS3	1.4.1	16%	4	1
CO6	Develop applications using modular and iterative problem-solving approaches.	TPS3	1.4.1	14%	9	1

Assessment Pattern

CO	CAT1	Assignment 1	CAT2	Assignment 2	Terminal Exam
	% of Marks	% of Marks	% of Marks	% of Marks	% of Marks
CO1	**20**				**12**

CO2	**40**	**50**			**20**
CO3	**40**	**50**			**18**
CO4			**40**	**40**	**20**
CO5			**30**	**30**	**16**
CO6			**30**	**30**	**14**
Total	**100**	**100**	**100**	**100**	**100**

Syllabus

Introduction to Computers: Computer-Characteristics, History, Classification, Applications. Basic Organization of a Computer. Data Representation, Using spread sheets for basic operations on data and visualize the data.

Activities: 1. Office Software for documentation and presentation
2. Spread sheets for calculations and data. Visualization

Computational Thinking: Definition, Basic model of computation, Number Systems, Conversions among Number systems, Logic- Boolean Logic, Applications of Propositional Logic

Activities: 1. Solving problems based on number systems and logics.
2. Virtual Demonstration of Computational thinking

Problem Solving Basics & Algorithms: Problem Definition, Logical Reasoning, Decomposition, pattern recognition, abstraction, Real-world problem modelling, Notion of Algorithm – Iterative vs Recursive Styles - Implementation of Algorithms - Design and implementation of fundamental computational algorithms.

Activities: Algorithm Development for simple mathematical problems

Programming Languages: Program Development Life Cycle, Program Design Tools, Flowcharts, Pseudocodes, Programming Languages, Programming Paradigms, Traditional Programming Concepts, Procedural Units, Language Implementation, Declarative Programming.

Activities: Flowchart design for simple mathematical problems

Scratch Programming: Data Types, Variables, Getting Input from Users. Making Decisions, Comparison Operators, Decision Structures, Logical Operators, Repetition, Loop Blocks, Stop Commands, Counters, Nested Loops, String Processing, String Manipulation, Lists, Numerical Lists, Searching and Sorting Lists.

Activities: 1. Creation of Functional Block for simple mathematical problems
2. Scratch Animation for understanding Conditional and Loop statements.
3. Scratch Programs for applied scientific computing and data manipulations

Application Development: Building Apps using problem, solving techniques on any app development platform, Modelling, incremental and iterative, reuse, modularization, algorithmic thinking, abstracting and modularizing, decomposition, testing and debugging. Activities: Sample App Developments for societal problems.

Learning Resources

Text Book

1. Brookshear, J. G., & Brylow, D. "Computer Science: An Overview*",* 13th ed.. Pearson.2022.
2. Thareja, R., "Fundamentals of computers". Oxford University Press, 2020.
3. Riley, D. D., & Hunt, K. A., "Computational thinking for the modern problem solver", CRC Press, 2014.

Reference Books&Web resources

1. Marji, M., “Learn to program with Scratch: A visual introduction to programming with games”, art, science and math. No Starch Press, 2014.
2. Scratch software: https://scratch.mit.edu/
3. MIT APP INVENTOR software: https://appinventor.mit.edu/
4. app.diagrams.net

Course Contents and Lecture Schedule

Module No	Topics	No of Periods	Course Outcomes
1	**Introduction to Computers**		CO1
1.1	Computer-Characteristics, History, Classification.	1	CO1
1.2	Applications, Basic Organization of a Computer.	1	CO1
1.3	Data Representation, Using spread sheets for basic operations on data and visualize the data.	2	CO1
2	**Computational Thinking**		CO2
2.1	Definition, Basic model of computation,	1	CO2
2.2	Number Systems	1	CO2
2.3	Conversions among Number systems,	2	CO2
2.4	Logic- Boolean Logic, Applications of Propositional Logic	2	CO2
3	**Problem Solving Basics & Algorithms**		CO3
3.1	Problem Definition, Logical Reasoning, Decomposition	2	CO3
3.2	pattern recognition, abstraction, Real-world problem modelling	2	CO3
3.3	Notion of Algorithm – Iterative vs Recursive Styles - Implementation of Algorithms	2	CO3
3.4	Design and implementation of fundamental computational algorithms.	2	CO3
4	**Programming Languages**		CO4
4.1	Program Development Life Cycle, Program Design Tools,	1	CO4
	Flowcharts, Pseudocodes, Programming Languages,	2	CO4
	Programming Paradigms, Traditional Programming Concepts, Procedural Units	2	CO4
4.2	Language Implementation, Declarative Programming.	2	CO4
5	**Scratch Programming**		CO5
5.1	Data Types, Variables, Getting Input from Users. Making Decisions	1	CO5
5.2	Comparison Operators, Decision Structures, Logical Operators	1	CO5
5.3	Repetition, Loop Blocks, Stop Commands, Counters, Nested Loops,	2	CO5
5.4	String Processing, String Manipulation, Lists, Numerical Lists, Searching and Sorting Lists.	2	CO5
6	**Application Development**		CO6
6.1	Building Apps using problem, solving techniques on any app development platform	1	CO6
6.2	Modelling, incremental and iterative, reuse, modularization, algorithmic thinking,	2	CO6
6.3	abstracting and modularizing, decomposition, testing and debugging.	2	CO6
	Total Periods	**36**	

Course Designer(s):

1. Mrs.R.Subhashni, Assistant Professor, Department of CSBS rsica@tce.edu
2. Mr.M.Venkatesh, Assistant Professor, Department of CSBS mvhca@tce.edu

26CBCA0	FUNDAMENTALS OF COMPUTER SCIENCE

Category	L	T	P	Credits	TE Type
PCC	2	0	2	3	TCP-P

Preamble

This course introduces computational problem solving and structured programming using the C programming language. It develops algorithmic thinking, logical reasoning, and fundamental programming skills to solve real-world computational problems.

Prerequisite

NIL

Course Outcomes

On 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	Apply fundamental ANSI C programming concepts and control structures to develop computational solutions for problem-solving tasks	3	1.3.1	15%	4	1
CO2	Demonstrate functions, recursion, parameter passing, and arrays to develop modular data-processing programs	3	1.8.1	20%	8	1
CO3	Solve programming problems using pointer concepts and string operations involving arrays,	3	1.4.1	20%	8	1

	strings, and functions.					
CO4	Use structures, unions, pointers, and file operations to solve complex data organization and processing problems.	3	1.4.1	25%	8	1
CO5	Demonstrate effective technical communication skills through structured documentation, code presentation, and problem-solving activities.	3	9.1.2	5%	NC	-
CO6	Apply teamwork skills to develop, and test, C programming projects collaboratively	3	8.1.1	10%	NC	-
CO7	Evaluate C programming solutions based on professional ethics, software reliability, and sustainable computing practices aligned with relevant SDGs.	3	7.2.1	5%	NC	-

Assessment Pattern

CO	Theory		Practical		Terminal Exam % of Marks Practical
	CAT1	CAT2	OCR/Continuous Assessment	Model Test CO-wise	
	% of Marks	% of Marks	% of Marks	% of Marks	
CO1	40		15	15	

CO2	60		20	20	100
CO3		50	20	20	
CO4		50	25	25	
CO5			5	5	
CO6			10	10	
CO7			5	5	
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)	25	Rubrics covering all Domains of learning
Total Internal Marks		**100**	
End Semester Examination	CO-wise (Cognitive)	100	Rubrics covering all Domains of learning

Syllabus

Problem Solving Concepts: Fundamentals of ANSI C Programming – Structure of a C program – Compilation and execution process – variables, constants, data types – scope and lifetime of variables - Operators, Expressions and Type conversion – Precedence and Order of Execution - break, continue, exit, goto labels – Basic Syntax and Logical Errors in compilation, source, object and executable code

Control Structures: Statements and blocks – if, if-else, else-if ladder and switch – while, do-while and for loops – Nested loops

Functions: Function prototype, function definition, function call, Built-in functions – Recursion – Parameter passing: Pass by value, Pass by reference - Preprocessor directives and macros – Standard library functions

Arrays and Strings: Declaration, Initialization – One-dimensional array –Two-dimensional arrays – Passing arrays to functions - maximum and minimum value – Selection Sort – Linear and Binary search techniques - Character Array - String operations (length, concat, compare, copy)

Pointers: Pointer arithmetic – Arrays and pointers – Character pointers and strings – Pointer arrays and pointer to pointer – Pointers to functions

Structures and Union: Structures and functions – Arrays and pointers to structures – Self-referential structures – Array of Structures - typedef and bit-fields

Files: Introduction to files - Types of file processing: Sequential access, Random access - Command line arguments– Error handling

Text Book

1. Yashavant Kanetkar, "Let Us C", BPB Publications, 21st edition, 2025.

Reference Books & web resources

1. Jens Gustedt, Modern C, 3rd Edition, Manning Publications, 2025.
2. Herbert Schildt, “C: The Complete Reference”, Fourth Edition, McGraw Hill, 2017
3. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, 2nd Edition, Prentice Hall / Pearson Education, 1988.
4. NPTEL – “ Problem Solving through Programming in C” - https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_cs53

SDG Alignment

Activities aligned with SDGs addressed:

1. SDG 4 – C Programs that enables the students to convert the mathematical concepts into digital codes
2. SDG 8 – Programs using arrays, pointers and string will help to analyze the utilization of systems memory and improvise it effectively.

Course Contents and Lecture Schedule

Module No	Topics	No. of Periods	Course Outcomes
1	**Problem Solving Concepts & Control Structures**		
1.1	Fundamentals of ANSI C Programming – Structure of a C program – Compilation and execution process - variables, constants, data types	1	CO1
1.2	Scope and lifetime of variables		
1.3	Operators, Expressions and Type conversion – Precedence and Order of Execution - break, continue, exit, goto labels	1	CO1
1.4	Basic Syntax and Logical Errors in compilation, source, object and executable code		
1.5	Statements and blocks – if, if-else, else-if ladder and switch	1	CO1
1.6	while, do-while and for loops – Nested loops	1	CO1, CO7
2	**Functions and Arrays:**		
2.1	Function prototype, function definition, function call, Built-in functions – Recursion	1	CO2
2.2	Parameter passing: Pass by value, Pass by reference -	1	CO2
2.3	Preprocessor directives and macros – Standard library functions	1	CO2
2.4	Declaration, Initialization – One-dimensional array –Two-dimensional arrays - Passing arrays to functions	1	CO2, CO6
2.5	Maximum and minimum value, Selection Sort – Linear and Binary search techniques	1	CO2, CO5
3	**Strings and Pointers**		
3.1	Character Array - String operations (length, concat, compare, copy)	1	CO2
3.2	Pointer arithmetic – Arrays and pointers	1	CO3
3.3	Character pointers and strings	1	CO3
3.4	Pointer arrays and pointer to pointer	1	CO3, CO6
3.5	Pointers to functions	1	CO3
4	**Structures, Union and Files:**		

4.1	Structures and functions	1	CO4, CO5
4.2	Arrays and pointers to structures – Self-referential structures	2	CO4
4.3	Array of Structures - typedef and bit-fields	1	CO4
4.4	Introduction to files - Types of file processing: Sequential access, Random access -	1	CO4, CO6
4.5	Command line arguments– Error handling	1	CO4, CO7
	Total Periods	**24**	

List of Experiments with CO Mapping

Sl. No.	Name of the Experiment	Level of Experiment	Objective(s)	COs Addressed
1	Develop a C program to perform arithmetic and relational operations on different data types and analyze the effect of type conversion and operator precedence	1	3- Experimentation	CO1
2	Construct a menu-driven application using conditional statements to perform different operations based on user choice.	1	3- Experimentation	CO1, CO5
3	Develop a C program using loops to generate number patterns and perform mathematical computations such as factorial and Fibonacci series.	1	2- Models	CO1
4	Design a C program to solve mathematical problems using both user-defined functions and recursive techniques.	2	3- Experimentation	CO2
5	Develop a C program to compare pass by value and pass by reference methods for performing data manipulation operations.	2	3- Experimentation	CO2, CO5
6	Construct a C program to perform matrix operations and determine the maximum and minimum elements in arrays.	2	2- Models	CO2
7	Develop a C program to sort a dataset and search for a specific element using suitable searching techniques.	2	2- Models	CO2
8	Design a C program to perform string operations such as concatenation, comparison,	2	3- Experimentation	CO3, CO7

	and copying without using built-in library functions.			
9	Develop a C application using pointers and function pointers to process arrays and perform dynamic function execution.	3	3- Experimentation	CO3, CO6
10	Construct a file-based C application using structures to store, retrieve, and manage records efficiently.	3	3- Experimentation	CO4, CO6, CO7
11	MINI PROJECT*	3	9 - Design	CO1 – CO7

*__Assessment__: The Mini Project carries a 10% weightage in the Test marks. Starting from Exercise 9, students will do the exercises based on their chosen Mini Project. Students must work in teams of three members for the Mini Project. It will be evaluated based on all CO's.

Course Designer(s):

1. Dr. J. Felicia Lilian, Assistant Professor, Department of CSBS jflcse@tce.edu
2. Mrs. Priya Thiagarajan, Assistant Professor, Department of CSBS ptica@tce.edu

CURRICULUM AND DETAILED SYLLABI

FOR

B.TECH DEGREE (Computer Science and Business Systems) PROGRAMME

SECOND SEMESTER

FOR THE STUDENTS ADMITTED FROM THE

ACADEMIC YEAR 2026 – 2027 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING

(A Government Aided ISO 9001-2008 Certified

Autonomous Institution affiliated to Anna University)

MADURAI – 625 015, TAMILNADU

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Passed in BoS Meeting on 22.05.2026 Approved in71st Academic Council Meeting on 27.06.2026

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.Tech (Computer Science and Business Systems) Programme
COURSES OF STUDY
(For the candidates admitted from 2026 - 27 onwards)

SECOND SEMESTER

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	No.of Hours / Week			Credits
				L	T	P	
THEORY COURSES							
1	26CBSB0	Statistics, Probability and Calculus	BSC	3	0	0	3
2	26CHSB0	Applied Chemistry	BSC	3	0	0	3
3	26CBCB0	Computer Organization and Architecture	PCC	3	0	0	3
4	26CBCC0	Fundamentals of Economics	PCC	2	0	0	2
5	26CBEB0	Basic Electrical and Electronics Engineering	ESC	3	0	0	3
6	26CCEB0	Biology for Engineers	ESC	3	0	0	3
THEORY CUM PRACTICAL COURSES							
7	26CBCD0	Computational Problem Solving using Python	PCC	2	0	4	4
PRACTICAL COURSES							
8	26CBCE0	Business Communication & Value Science	PCC	0	0	1	1
9	26CHSC0	Chemistry Laboratory	BSC	0	0	1.5	1.5
AUDIT COURSES							
10	26TAAB0	Tamil and Technology	AC	-	-	-	-
11	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
PEC : Programme Elective Courses
OEC : Open Electives
EEC : Employability Enhancement Courses
AC : Audit Courses

L : Lecture
T : Tutorial
P : Practical

Note:
1 Hour Lecture is equivalent to 1 credit
1 Hour Tutorial is equivalent to 1 credit
1 Hours Practical is equivalent to 0.5 credit

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.Tech (Computer Science and Business Systems) 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 COURSES								
1	26CBSB0	Statistics, Probability and Calculus	3	40	60	100	27	50
2	26CHSB0	Applied Chemistry	3	40	60	100	27	50
3	26CBCB0	Computer Organization and Architecture	3	40	60	100	27	50
4	26CBCC0	Fundamentals of Economics	3	40	60	100	27	50
5	26CBEB0	Basic Electrical and Electronics Engineering	3	40	60	100	27	50
6	26CCEB0	Biology for Engineers	3	40	60	100	27	50
THEORY CUM PRACTICAL COURSES								
7	26CBCD0	Computational Problem Solving using Python	3 (TCP-P)	40	60	100	25	50
PRACTICAL COURSES								
8	26CBCE0	Business Communication & Value Science	Only Internal	60	40	100	18	50
9	26CHSC0	Chemistry Laboratory	3	60	40	100	18	50
AUDIT COURSES								
10	26TAAB0	Tamil and Technology	-	-	-	-	-	-
11	26CCAB0	Foundations of Problem Solving-1	-	-	-	-	-	-

26CBCB0	COMPUTER ORGANIZATION AND ARCHITECTURE

Category	L	T	P	Credit
PCC	3	0	0	3

Preamble

The course enables students to understand the basic organization and functional components of computer systems. It covers instruction sets, arithmetic operations, memory hierarchy, cache design, and I/O organization. The syllabus also emphasizes memory mapping techniques used in modern computer architecture.

Prerequisite

- NIL

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 structure, functional units, bus structures, and instruction execution cycle of computer systems.	2	1.3.1	12%	4	1
CO2	Solve computing problems using data representation techniques, addressing modes, instruction formats, and CPU organization concepts.	3	1.3.1	18%	9	1
CO3	Apply arithmetic operations and control unit concepts in binary and floating-point computations.	3	1.3.1	18%	4	1
CO4	Apply hardwired and microprogrammed control unit concepts to execute and control instruction processing in computer systems.	3	1.3.1	12%	9	1
CO5	Use memory organization, cache memory, interrupts, DMA, and I/O interfacing techniques in computer system design.	3	1.3.1	20%	9	1

CO6	Implement pipelining and parallel processing concepts to improve processor performance in multiprocessor systems.	3	1.3.1	20%	9	1

Assessment Pattern

CO	CAT1	Assignment 1	CAT2	Assignment 2	Terminal Exam
	% of Marks	% of Marks	% of Marks	% of Marks	% of Marks
CO1	30				12
CO2	30	50			18
CO3	40	50			18
CO4			20	20	12
CO5			40	40	20
CO6			40	40	20
Total	**100**	**100**	**100**	**100**	**100**

Syllabus

Basic Structure of Computer Systems: Evolution of Computer Systems, Functional Units of a Computer, Bus Structures, Performance Measures, Instruction Execution Cycle.

Number Systems and Data Representation: Fixed Point and Floating Point Representation, Character Representation, Addressing Modes, Instruction Formats, Instruction Set Architecture, CPU Registers and Instruction Cycle.

Arithmetic Operations: Integer Arithmetic Operations, Addition and Subtraction Algorithms, Multiplication and Division Algorithms, Floating Point Arithmetic Operations, ALU Organization,

Processor Control Unit: Control Unit Fundamentals, Hardwired and Microprogrammed Control Unit.

Memory Organization and I/O Interfacing: Memory Hierarchy, RAM, ROM, Cache Basics, Associative Memory I/O Organization, Interrupts, DMA, Peripheral Interfacing Techniques

Parallel Processing and Pipeline Architecture: Parallel Processing Concepts, Flynn's Classification, Pipelining Fundamentals, Arithmetic and Instruction Pipeline, Pipeline Hazards, RISC and CISC Architecture, Multiprocessor Systems, Cache Coherency Problems.

Assignment Topic:

- Next Generation Computer Architecture – GPU, NPU, Intel Core, etc.,

Learning Resources

Text Book

1. William Stallings, "Computer Organization and Architecture: Designing for Performance", Pearson Education, 11th Edition, 2022.
2. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Morgan Kaufmann Publishers, 6th Edition, 2021.

Reference Books & Web resources

1. Kai Hwang and Faye A. Briggs, “Computer Architecture and Parallel Processing”, McGraw Hill Education, 2019.
2. John P. Shen and Mikko H. Lipasti, “Modern Processor Design: Fundamentals of Superscalar Processors”, Tata McGraw Hill, 2018.
3. Kai Hwang, “Advanced Computer Architecture”, McGraw Hill Education, 2nd Edition, 2017.
4. Sarangi, S. R. ”Next-gen computer architecture”. White Falcon Publishing. 2023.
5. https://onlinecourses.nptel.ac.in/noc22_cs88/preview?utm_source=chatgpt.com
6. https://www.coursera.org/learn/comparch
7. https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=fBYckQKJvP3a/8Vd3L08tQ.
8. https://www.coursera.org/learn/build-a-computer

Course Contents and Lecture Schedule

Module No	Topics	No of Periods	Course Outcomes
1	**Basic Structure of Computer Systems:**	**5**	
1.1	Evolution of Computer Systems	1	CO1
1.2	Functional Units of a Computer	1	CO1
1.3	Bus Structures, Performance Measures	2	CO1
1.4	Instruction Execution Cycle	1	CO1
2	**Number Systems and Data Representation :**	**7**	
2.1	Fixed Point and Floating Point Representation, Character Representation	2	CO2
2.2	Addressing Modes, Instruction Formats	2	CO2
2.3	Instruction Set Architecture	1	CO2
2.4	CPU Registers and Instruction Cycle	1	CO2
3	**Arithmetic Operations:**	**7**	
3.1	Integer Arithmetic Operations	1	CO3
3.2	Addition and Subtraction Algorithms	2	CO3
3.3	Multiplication and Division Algorithms	2	CO3
3.4	Floating Point Arithmetic Operations	1	CO3
3.5	ALU Organization	1	CO3
4	**Processor Control Unit:**	**4**	
4.1	Control Unit Fundamentals	1	CO4
4.2	Hardwired Control Unit.	1	CO4
4.3	Microprogrammed Control Unit	2	CO4
5	**Memory Organization and I/O Interfacing:**	**6**	
5.1	Memory Hierarchy	1	CO5
5.2	RAM, ROM	1	CO5
5.3	Cache Basics, Associative Memory I/O Organization	1	CO5

5.4	Interrupts, DMA	1	CO5
5.5	Peripheral Interfacing Techniques	2	CO5
6	**Parallel Processing and Pipeline Architecture:**	**7**	
6.1	Parallel Processing Concepts, Flynn's Classification	1	CO6
6.2	Pipelining Fundamentals, Arithmetic and Instruction Pipeline	1	CO6
6.3	Pipeline Hazards	1	CO6
6.4	RISC and CISC Architecture, Multiprocessor Systems	1	CO6
6.5	Cache Coherency Problems	2	CO6
	Next Generation Computer Architecture	1	CO6
	Total Periods	**36**	

Course Designer(s):

1. Dr. P. Suganthi, Associate Professor, Department of CSBS psica@tce.edu
2. Mr.T.Siva, Assistant Professor, Department of CSBS tsca@tce.edu

26CBCC0	FUNDAMENTALS OF ECONOMICS

Category	L	T	P	Credit
PCC	2	0	0	2

Preamble

The objective of this course is to provide the basic knowledge on micro and macroeconomics to analyse the market structure and demand-supply in real time economy. Further it imparts the knowledge of economic decision making by exploring the performance and behaviour of an economy

Prerequisite

NIL

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 principles and concepts of microeconomics for economic decision making	TPS2	1.2.1	10%	4	1
CO2	Demonstrate the application of microeconomic demand–supply concepts for solving business problems.	TPS3	1.3.1	18%	8	2
CO3	Apply systematic methods to measure and interpret consumer behaviour in decision making.	TPS3	1.2.1	18%	12	2
CO4	Use production and cost concepts to determine firm equilibrium under different market structures.	TPS3	2.4.1	18%	9	2
CO5	Solve real-time economic problems using macroeconomic components and the Keynesian multiplier.	TPS3	1.3.1	18%	8	3
CO6	Demonstrate monetary policy instruments to support economic development.	TPS3	2.4.1	18%	16	3

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			18
CO3	40	50			18
CO4			30	30	18
CO5			35	30	18
CO6			35	40	18
Total	**100**	**100**	**100**	**100**	**100**

Syllabus

Microeconomics: The themes of microeconomics, Elasticity of Supply, Elasticity of Demand, Microeconomics versus Macroeconomics, Behavior of Firm and Household.

Principles of Demand and Supply: Supply Curves of Firms - Elasticity of Supply; Demand Curves of Households - Elasticity of Demand; Equilibrium and Comparative Statics (Shift of a Curve and Movement along the Curve); Welfare Analysis - Consumers' and Producers' Surplus - Price Ceilings and Price Floors;

Consumer Behaviour: Axioms of Choice -Budget Constraints and Indifference Curves; Consumer's Equilibrium - Effects of a Price Change, Income and Substitution Effects -Derivation of a Demand Curve; Applications - Tax and Subsidies- Intertemporal Consumption - Suppliers' Income Effect;

Theory of Production: Production Function and Iso-quants - Cost Minimization; Cost Curves - Total, Average and Marginal Costs -Long Run and Short Run Costs; Equilibrium of a Firm Under Perfect Competition; Monopoly and Monopolistic Competition.

Macroeconomics: National Income and its Components - GNP, NNP, GDP, NDP; Consumption Function; Investment; Simple Keynesian Model of Income Determination and the Keynesian Multiplier; Government Sector - Taxes and Subsidies;

Monetary Policy: External Sector; Money - Demand for Money, Supply of Money - Bank's Credit Creation Multiplier; Integrating Money and Commodity Markets – Overview of IS, LM Model; Business Cycles and Stabilization - Monetary and Fiscal Policy; The Classical Paradigm.

Case Study:

- Minimum Support Price (MSP) for Farmers,
- LPG Gas Subsidy Scheme,
- Dairy Production and Cost Management,
- COVID-19 and Indian GDP,
- Central Bank and the Government.

Learning Resources

Text Book

1. Pindyck, Robert S., and Daniel L. Rubinfeld, "Microeconomics 9th edition" Pearson Education, 2020.

2. RudigerDornbusch, Stanley Fischer, Richard Startz, “Macroeconomics 13th edition” McGraw Hill, 2018.
3. T.R. Jain, V.K. Ohri, “Introductory to Microeconomics and Macroeconomics” VK Global Publications, 2023.

Reference Books & Web resources

1. Varian, Hal R., *“*Intermediate Microeconomics: A Modern Approach*”* 10th edition, W.W. Norton & Company, 2024.
2. Mankiw, N. Gregory, “Principles of Macroeconomics*”* 9th edition, Cengage Learning, 2021”
3. Greco, Anthony N., “Fundamentals of Economics: A Book of Readings”, Cognella Academic Publishing, 2023.
4. Bade, Robin, and Parkin, Michael, “Foundations of Economics”, 9th Global Edition, Pearson Education, 2024.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods	Course Outcomes
1.	**Introduction to Microeconomics**	**2**	
1.1	The themes of microeconomics, Elasticity of Supply, Elasticity of Demand	1	CO1
1.2	Microeconomics versus Macroeconomics, Behaviour of firm and House hold	1	CO1
2.	**Principles of Demand and Supply**	**4**	
2.1	Supply Curves of Firms, Demand Curves of Households	1	CO2
2.2	Market Equilibrium & Comparative Statics	1	CO2
2.3	Consumers’ and Producers’ Surplus	1	CO2
2.4	Price Ceilings and Price Floors, Case Study: Minimum Support Price (MSP) for Farmers	1	CO2
3.	**Consumer Behaviour**	**4**	
3.1	Axioms of Choice, Budget Constraints and Indifference Curves, Consumer’s Equilibrium, Effects of a Price Change	1	CO3
3.2	Income and Substitution Effects, Derivation of a Demand Curve	1	CO3
3.3	Applications: Tax and Subsidies, Inter-temporal Consumption, Case Study: LPG Gas Subsidy Scheme	1	CO3
3.8	Suppliers’ Income Effect	1	CO3
4.	**Theory of Production**	**4**	
4.1	Production Function and Iso-quants, Cost Minimization, , Case Study: Dairy Production and Cost Management	1	CO4
4.2	Cost Curves: Total, Average and Marginal Costs	1	CO4
4.3	Long Run and Short Run Costs	1	CO4
4.4	Equilibrium of a Firm Under Perfect Competition, Monopoly and Monopolistic Competition	1	CO4
5.	**Introduction to Macroeconomics**	**6**	
5.1	National Income and its Components, GNP, NNP, GDP, NDP, Case Study: COVID-19 and Indian GDP	1	CO5
5.2	Consumption Function, Investment	1	CO5

5.3	Simple Keynesian Model of Income Determination	1	CO5
5.4	Keynesian Multiplier	1	CO5
5.5	Government Sector, Taxes and Subsidies,	1	CO5
6.	**Monetary Policy**	**5**	
6.1	External Sector, Money- Demand for Money, Supply of Money	1	CO6
6.2	Bank's Credit Creation Multiplier, Integrating Money and Commodity Markets	1	CO6
6.3	Overview of IS, LM Model	1	CO6
6.4	Case Study: Central Bank and the Government	1	CO6
6.5	Business Cycles and Stabilization - Monetary and Fiscal Policy, The Classical Paradigm	1	CO6
	Total Hours	**24**	

Course Designer(s):

1. Mrs.D.Yuvasini, Assistant Professor, Department of CSBS, dyica@tce.edu
2. Mr.V.Janakiraman, Assistant Professor, Department of CSBS, vjncse@tce.edu

26CBCD0	COMPUTATIONAL PROBLEM SOLVING USING PYTHON

Category	L	T	P	Credit	TE Type
PCC	2	0	4	4	TCP-P

Preamble

This course introduces problem solving and programming using Python with emphasis on practical applications. It covers programming fundamentals, python collections, file handling, and modular programming, along with foundations of data science, visualization, and exploratory data analysis using Python libraries.

Prerequisite

Nil

Course Outcomes

On 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	Apply control structures, Python collections, and searching and sorting techniques to solve computational problems.	3	1.3.1	20%	4	1
CO2	Demonstrate modular programming, recursion, file handling, and exception handling in programming applications.	3	1.4.1	20%	9	1
CO3	Compute and analyze data using NumPy and Pandas libraries for data science applications.	3	5.1.1	20%	9	1
CO4	Demonstrate the use of visualization and exploratory data analysis techniques using Matplotlib and Scikit-learn	3	5.1.1	20%	9	1

CO5	Demonstrate effective communication of data analysis results using visualizations and technical reports.	3	9.1.2	8%	NC	-
CO6	Apply ethical principles in data collection, analysis, and interpretation.	3	7.1.1	16%	NC	-
CO7	Apply teamwork skills to develop and present data-driven solutions collaboratively.	3	8.2.1	17%	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	50	-	20	25	100
CO2	50	-	20	25	
CO3	-	50	20	25	
CO4	-	50	20	25	
CO5	-	-	05	-	
CO6	-	-	05	-	
CO7	-	-	10	-	
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

Python Fundamentals and Problem Solving: Variables and Data Types – Input and Output Operations – Operators and Expressions – Conditional Statements – Iterative Statements

Python Collections: String Operations – Ordered data with Lists and Tuples – Complex data mappings using Dictionaries and Sets – Searching & Sorting Techniques

Functions and Modular Programming: Function Definition and Invocation – Parameters and Return Values – Scope of Variables – Recursive Functions – Modules and Packages – Introduction to Classes and Objects

File Handling and Exception Handling: File Operations – Reading and Writing Files – File Processing Techniques – Exception Handling using try and except – Assertions – Regular Expressions – Basic Text Processing and Logging

Foundations of Data Science using Python: Data Science Workflow – Introduction to NumPy and Pandas – Series and DataFrames – Importing Data from Files – Data Cleaning and Transformation – Filtering and Aggregation – Basic Statistical Analysis

Data Visualization and Exploratory Data Analysis: Data Visualization using Matplotlib – Line, Bar, Pie and Scatter Plots – Exploratory Data Analysis Techniques – Correlation and Data Interpretation – Introduction to Scikit-learn – Basic Machine Learning Workflow - Real-world and Industrial Applications

Real-World Industrial Applications

1. **Predictive Maintenance:** Clean, analyze, and visualize equipment sensor data to detect abnormal operating patterns and reduce machine downtime.
2. **Energy Consumption Analysis:** Analyze industrial energy usage data to identify consumption patterns and recommend efficiency improvements.

Learning Resources

Text Book

1. Eric Matthes, “Python Crash Course”, 3rd Edition, No Starch Press, 2023.
2. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, 3rd Edition, O’Reilly Media, 2024.

Reference Books & web resources

1. Wes McKinney, “Python for Data Analysis”, 3rd Edition, O’Reilly Media, 2022.
2. NPTEL, “Joy of Computing” https://nptel.ac.in/courses/106106182
3. NPTEL “Python for Data Science”, https://nptel.ac.in/courses/106106212

SDG Alignment

Activities aligned with SDGs addressed:

1. SDG 4 - Python programming activities that enable students to translate mathematical concepts into computational solutions, encouraging problem-solving, computational thinking, and digital literacy skills.
2. SDG 9 – Use modern data science tools to generate insights that drive innovation, industrial efficiency, and technological advancement.

Course Contents and Lecture Schedule

Module No	Topics	No of Periods	Course Outcomes
1	**Python Fundamentals and Problem Solving:**	**3**	
1.1	Variables and Data Types, Input and Output Operations	1	CO1
1.2	Operators and Expressions, Conditional Statements	1	CO1
1.3	Iterative Statements	1	CO1
2	**Python Collections:**	**4**	
2.1	String Operations, Ordered data with Lists and Tuples	1	CO1
2.2	Complex data mappings using Dictionaries and Sets	1	CO1
2.3	Searching & Sorting Techniques	2	CO1
3	**Functions and Modular Programming:**	**4**	
3.1	Function Definition and Invocation, Parameters and Return Values, Scope of Variables, Recursive Functions	2	CO2
3.2	Modules and Packages, Introduction to Classes and Objects	2	CO2
4	**File Handling and Exception Handling:**	**4**	
4.1	File Operations, Reading and Writing Files, File Processing Techniques	2	CO2
4.2	Exception Handling using try and except, Assertions, Regular Expressions, Basic Text Processing and Logging	2	CO2
5	**Foundations of Data Science using Python:**	**4**	
5.1	Data Science Workflow, Introduction to NumPy and Pandas, Series and DataFrames, Importing Data from Files	2	CO3
5.2	Data Cleaning and Transformation, Filtering and Aggregation, Basic Statistical Analysis	2	CO3
6	**Data Visualization and Exploratory Data Analysis:**	**5**	
6.1	Data Visualization using Matplotlib – Line, Bar, Pie and Scatter Plots	1	CO4, CO6
6.2	Exploratory Data Analysis Techniques, Correlation and Data Interpretation, Introduction to Scikit-learn	1	CO4
6.3	Basic Machine Learning Workflow	1	CO4
6.4	Real-world and Industrial Applications	2	CO4, CO5, CO6
	Total Periods	**24**	

List of Experiments with CO Mapping

Sl. No.	Name of the Experiment	Level of Experiment	Objective(s)	COs Addressed
1	Develop a Python program to perform arithmetic, relational, and logical operations on different data types and analyze the effect of type conversion and operator precedence.	1	3 - Experimentation	CO1

2	Construct a Python program using conditional and iterative statements to perform operations such as factorial, Fibonacci series, and prime number generation.	1	3 - Experimentation	CO1
3	Develop a Python program using lists, tuples, dictionaries, and sets to store, retrieve, and manipulate student or employee records.	2	3 - Experimentation	CO1
4	Construct a Python program to sort datasets and search for specific elements using suitable searching and sorting techniques.	2	3 - Experimentation	CO1
5	Design a Python program using user-defined functions and recursive techniques to solve mathematical problems such as factorial and Fibonacci computation.	2	3 - Experimentation	CO2
6	Construct a Python application to read, write, and process files for maintaining structured records.	1	3 - Experimentation	CO2
7	Develop a Python program using exception handling and regular expressions to validate and process user input data efficiently.	2	3 - Experimentation	CO2
8	Develop a Python program using NumPy arrays to perform array creation and manipulation operations.	2	4 - Data Analysis	CO3
9	Develop a Python program to perform basic statistical analysis on datasets.	3	4 - Data Analysis	CO3
10	Construct a Pandas-based program to import, clean, transform, and analyze structured data from CSV files.	3	4 - Data Analysis	CO4

11	Develop a Python program to perform data visualization and exploratory data analysis using Matplotlib and Scikit-learn on real-world datasets.	3	4 - Data Analysis	CO4, CO5, CO6
12	Mini project	3	5 - Design	CO1 - CO7

Course Designer(s):

1. Mrs. Priya Thiagarajan, Assistant Professor, Department of CSBS ptca@tce.edu