THIAGARAJARCOLLEGE OF ENGINEERING
(A Govt. Aided, ISO 9001:2000 Certified Autonomous Institution Affiliated to AnnaUniversity)
MADURAI-625 015
DEPARTMENT OF INFORMATION TECHNOLOGY
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VISION

Evolve into a **Centre of Excellence for Education and Research** in Information Technology.

MISSION

- Attaining academic excellence through well designed curriculum adaptable to dynamic technological needs, competent faculty and innovative teaching-learning process.
- Promoting collaborative research through special interest groups, state of the art research labs and Industry Institute Interactions.
- Facilitating value added courses to produce highly competent and socially conscious information technology professionals and entrepreneurs.

Programme Specific Outcomes

B.Tech (Information Technology) Programme

Upon the successful completion of B-Tech Information Technology, the students will be able to:

PSOs for B.Tech Information Technology		Corresponding POs
PSO1	Provide appropriate IT solutions in Data Engineering, Distributed Computing, Information Security and Mobile Technologies domains.	PO1, PO2, PO3, PO4
PSO2	Select suitable computer-based tools for the analysis, design and development of IT based systems adhering to professional standards and practices.	PO5, PO6
PSO3	Exhibit teamwork skills with professional ethics and serve as effective member of societal and multidisciplinary projects	PO7, PO8, PO9, PO10, PO11, PO12

Programme Educational Objectives

B.Tech (Information Technology) Programme

PEO 1. Graduates of the programme will provide IT solutions to address the business and societal needs.

PEO 2. Graduates of the programme will contribute significantly in the technological developments of Information Technology through research practices.

PEO 3. Graduates of the programme will hone their professional expertise in quest for improved career opportunities through sustained learning.

PEO 4. Graduates of the programme will lead a team of diversified professionals with good communication skills, leadership virtues and professional ethics.

PROGRAM OUTCOMES

1. **Engineering Knowledge:** Apply knowledge of Mathematics, Science, Engineering fundamentals and core Information Technology Skills to the solutions of complex engineering problems in Data Engineering, Distributed Systems, Information Security and Management, Mobile Technologies and Software Design and Development.
2. **Problem Analysis:** Identify, formulate, research literature and analyze complex engineering problems in Data Engineering, Distributed Systems, Information Security and Management, Mobile Technologies and Software Design and Development reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
3. **Design/Development of solutions:** Design software solutions for complex engineering problems in Data Engineering, Distributed Systems, Information Security and Management, Mobile Technologies for a given specification with appropriate consideration for the public health and safety, security, cultural, societal and environmental considerations.
4. **Conduct Investigation of complex problems:** Use research based knowledge and research methods in the design and conduct of experiments, organization, analysis and interpretation of data to identify patterns, produce meaningful conclusions and recommendations for complex problems in Data Engineering, Distributed Systems, Information Security and Management, Mobile Technologies and Software Design and Development.
5. **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities in Data Engineering, Distributed Systems, Information Security and Management, Mobile Technologies and Software Design and Development with an understanding of its limitations.
6. **The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice in Data Engineering, Distributed Systems, Information Security and Management, Mobile Technologies and Software Design and Development.
7. **Environment and Sustainability: U**nderstand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice in managing information technology resources and in providing IT solutions and services.

9. **Individual and Team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings to deliver reports, programs, projects, presentations and other deliverables related to information technology requirements of an organization.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a multidisciplinary team, to manage projects in Information Technology and related fields.
12. **Life Long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological changes.

PEO vs. PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEO1. Career accomplishments	S	S	S	M	S	M	M	S	S	S	S	S
PEO2. Research	S	S	S	S	S	M	M	S	S	S	M	S
PEO3. Sustained learning	S	S	S	S	S	L	S	L	L	L	L	S
PEO4. Transferable skills	L	L	L	L	L	M	M	S	S	S	S	S

Graduate Attributes defined by NBA

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialisation to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

GA vs. PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
GA1												
GA2												
GA3												
GA4												
GA5												
GA6												
GA7												
GA8												
GA9												
GA10												
GA11												
GA12												

B. TECH IT -SCHEDULING OF COURSES FOR STUDENTS JOINING FROM ACADEMIC YEAR 2022-23 ONWARDS

Sem	Theory / Theory cum Practical / Practical									CDIO courses	Audit Courses	Credit
	1	2	3	4	5	6	7	8	9			
I	22MA110 CALCULUS FOR ENGINEERS (BSC-4)	22PH120 PHYSICS (BSC-3)	22CH130 CHEMISTRY (BS-3)	22EG140 TECHNICAL ENGLISH (HSMC-2)	22IT150 ENGINEERING EXPLORATION (ESC-2)	22IT160 PROBLEM SOLVING USING COMPUTERS (ESC-3) (TCP)	22EG170 ENGLISH LABORATORY (HSMC-1)	22PH180 PHYSICS LABORATORY (BSC-1)	22CH190 CHEMISTRY LABORATORY (BSC-1)			20
II	22IT210 LINEAR ALGEBRA, ORDINARY DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS	22IT220 OPERATING SYSTEMS (PCC-3)	22IT230 COMPUTER ORGANISATION (PCC-3)	22IT240 IT INFRASTRUTURE MANAGEMENT (ESC-3)	22IT250 COMPUTER AIDED ENGINEERING GRAPHICS (ESC-3)	22IT260 Web Essentials (PCC-2) (TCP)	22IT270 COMPUTER PROGRAMMING (PCC-2) (TCP)				22CHAAO ENVIRONMENTAL SCIENCE	20
III	22IT310 DISCRETE MATHEMATICS (BSC-4)	22IT320 OBJECT ORIENTED PROGRAMMING (PCC-3)	22IT330 SOFTWARE ENGINEERING (PCC-3)	22IT340 DATA STRUCTURES (PCC-3)	22IT350 IT OPERATIONS AND MANAGEMENT (ESC-2)	22IT360 SYSTEM ADMINISTRATION LAB. (ESC-1)	22IT370 OBJECT ORIENTED PROGRAMMING LAB (PCC-1)	22IT380 DATA STRUCTURES LAB (PCC-1)		22ES390 DESIGN THINKING (ESC-3)		21
IV	22IT410 PROBABILITY AND STATISTICS (BSC-4)	22IT420 ALGORITHM DESIGN PRINCIPLES (PCC-3)	22IT430 COMPUTER NETWORKS (PCC-3)	22IT440 DATABASE MANAGEMENT SYSTEMS (PCC-3)	22IT450 PROGRAMMING FOR INTERNET OF THINGS (ESC-3)		22IT470 COMPUTER NETWORKS LAB (PCC-1)	22IT480 DATABASE MANAGEMENT SYSTEMS LAB (PCC-1)		22IT490 PROJECT MANAGEMENT (HSMC-3)	Audit Course 2	21
V	22IT510 INFORMATION SECURITY (PCC-3)	22IT520 MACHINE LEARNING (PCC-3)	22IT530 CLOUD COMPUTING (PCC-3)	22ITPX0 Programme Elective (PEC-3)	22IT550 WEB TECHNOLOGIES (PCC-3) (TCP)	22XXGX0 INTERDISCIPLINAR ELECTIVE (IEC-3)	22IT570 INFORMATION SECURITY LAB (PCC-1)	22IT580 CLOUD COMPUTING LAB (PCC-1)		22IT590 PROJECT -I (PW-3)		23
VI	22IT610 ACCOUNTING AND FINANCE HSMC-3	22IT620 ARTIFICIAL INTELLIGENCE (PCC-3)	22ITPX0 Programme Elective (PEC-3)	22ITPX0 Programme Elective (PEC-3)	22IT650 MOBILE APPLICATION DEVELOPMENT (PCC-3) (TCP)	22IT660 PROFESSIONAL COMMUNICATION HSMC-2	22XXBX0 BASIC SCIENCE ELECTIVE (BSE-3)	22IT680 DATA SCIENCE LAB (PCC-1)		22IT690 PROJECT -II (PW-3)		24
VII	22IT710 COGNITIVE SCIENCE (ESC-2)	22ITPX0 Programme Elective (PEC-3)	22ITPX0 Programme Elective (PEC-3)	22ITPX0 Programme Elective (PEC-3)	22ITPX0 Programme Elective (PEC-3)	22ITPX0 Programme Elective (PE-3)	22IT770 VIRTUALIZATION TECHNOLOGIES LAB (PCC-1)	22IT780 MULTIMEDIA LAB (PCC-1)		22IT790 PROJECT -III (PW-3)		22
VIII	22ITPX0 Programme Elective (PE-3)	22ITPX0 Programme Elective (PE-3)								22IT890 PROJECT -IV (PW-3)		9

HSMC	BSC	ESC	PCC	PEC	IE/BSE	PW	Total
11	24	22	55	30	6	12	160

Passed in Board of Studies Meeting on 27.04.2023

Approved in 65th Academic Council Meeting on 27.05.2023

CATEGORIZATION OF COURSES

Degree: B.Tech **Program:InformationTechnology**

Sl. No.	Category		Credits	
			Regular Admission	Lateral Entry Admission
A.	**Foundation Courses (FC)**		**54 - 66**	**24 - 36**
	a.	Humanities and Social Sciences including Management Courses (HSMC)	09 - 12	09 - 12
	b.	Basic Science Courses (BSC)	24 - 27	06 - 09
	c.	Engineering Science Courses (ESC)	21 - 27	12 - 15
B.	**Professional Core Courses (PCC)**		**55**	**45**
C.	**Professional Elective Courses (PEC)**		**24 - 39**	**24 - 39**
	a.	Programme Specific Elective (PSE)	15 - 24	15 - 24
	b.	Programme Elective for Expanded Scope (PEES)	09 - 15	09 - 15
D.	**Open Elective Courses (OEC)**		**06 - 12**	**06 - 12**
	a.	Interdisciplinary Elective (IE)	03 - 06	03 - 06
	b.	Basic Science Elective (BSE)	03 - 06	03 - 06
E.	**Project Work (PW)**		**12**	**12**
F.	**Internship and Mandatory Audit Courses as per Regulatory authorities**		Non-Credit and not included in CGPA	
	Minimum Credits to be earned for the award of the Degree		**160**	**120**
			From A to E and the successful completion of F	

Passed in Board of Studies Meeting on 11.06.2022

Approved in 63rd Academic Council Meeting on 25.06.2022

B. TECH INFORMATION TECHNOLOGY DEGREE PROGRAMME

SCHEDULING OF COURSES

&

CURRICULUM AND DETAILED SYLLABI

FOR

SECOND SEMESTER

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2022-23 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING
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Passed in Board of Studies on 2.12.2022 Approved in 64th Academic Council Meeting on 11.1.2023

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

COURSES OF STUDY
(For the candidates admitted from 2022-23 onwards)

SECOND SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			credits
			L	T	P	
THEORY						
22IT210	Linear Algebra, Ordinary Differential Equations and Laplace Transforms	BSC	3	1	-	4
22IT220	Operating systems	PCC	3	-	-	3
22IT230	Computer Organization	PCC	3	-	-	3
22IT240	IT Infrastructure Management	ESC	3	-	-	3
THEORY CUM PRACTICAL						
22IT250	Computer Aided Engineering Graphics	ESC	2	-	2	3
22IT260	Web Essentials	PCC	1	-	2	2
22IT270	Computer Programming	PCC	1	-	2	2
AUDIT COURSE						
22CHAA0	Environmental Science	AC	1	-	-	-
Total			**17**	**1**	**6**	**20**

BSC : Basic Science
HSC : Humanities and Social Science
ESC : Engineering Science

L : Lecture
T : Tutorial
P : Practical

Note:
1 Hour Lecture is equivalent to 1 credit
1 Hour Tutorial is equivalent to 1 credit
2 Hours Practical is equivalent to1credit

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

SCHEME OF EXAMINATIONS
(For the candidates admitted from 2022-23 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	22IT210	Linear Algebra, Ordinary Differential Equations and Laplace Transforms	3	40	60	100	27	50
2	22IT220	Operating systems	3	40	60	100	27	50
3	22IT230	Computer Organization	3	40	60	100	27	50
4	22IT240	IT Infrastructure Management	3	40	60	100	27	50
THEORY CUM PRACTICAL								
5	22IT250	Computer Aided Engineering Graphics	3	50	50	100	25	50
6	22IT260	Web Essentials	3	50	50	100	25	50
7	22IT270	Computer Programming	3	50	50	100	25	50
Audit course								
8	22CHAA0	Environmental Science	-	100	-	-	-	-

* CA evaluation pattern will differ from course to course and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.

22IT210	LINEAR ALGEBRA, ORDINARY DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS

Category	L	T	P	Credit
BSC	3	1	0	4

Preamble

Linear algebra is a mathematical subfield concerned with vectors, matrices, and linear transforms. This course provides the knowledge about linear transformations, matrix types, Eigen values, and Eigen vectors. Differential equations have numerous applications in engineering and science. This course teaches students the fundamentals of Linear Algebra and ordinary differential equations enabling them to understand the mathematics applied in modelling real-time engineering problems.

Prerequisite

Nil

Course Outcomes

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

COs	Course Outcome	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Identifybasis, row space, column space, null space and dimension of a vector space	TPS3	70	65
CO2	Represent linear transformations by a matrix and vice - versa	TPS2	75	70
CO3	Compute the orthonormal basis of an inner product space	TPS3	70	65
CO4	Apply matrix algebra techniques for transformations to diagonalize and to produce single value decomposition	TPS3	70	65
CO5	Solve homogeneous and non-homogeneous second-order ordinary differential equations	TPS3	70	65
CO6	Apply the concept of the Laplace transform to engineering problems.	TPS3	70	65

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**S**	**M**	**L**										**S**		
CO2	**M**	**L**											**M**		
CO3	**S**	**M**	**L**										**S**		
CO4	**S**	**M**	**L**										**S**		
CO5	**S**	**M**	**L**										**S**		
CO6	**S**	**M**	**L**										**S**		

Assessment Pattern: Cognitive Domain

CO	Assessment 1						Assessment 2						Terminal		
	CAT 1			Assignment 1			CAT 2			Assignment 2					
TPS	**1** 10	**2** 30	**3** 60	**1** -	**2** -	**3** 100	**1** 10	**2** 30	**3** 60	**1** -	**2** -	**3** 100	**1** -	**2** 30	**3** 70
CO1	3	10	34	-	-	60	-	-	-	-	-	-	-	9	14
CO2	7	10	-	-	-	-	-	-	-	-	-	-	-	9	-
CO3	-	10	26	-	-	40	-	-	-	-	-	-	-	3	15
CO4	-	-	-	-	-	-	3	10	20	-	-	33	-	3	14
CO5	-	-	-	-	-	-	3	10	20	-	-	33	-	3	13
CO6	-	-	-	-	-	-	4	10	20	-	-	34	-	3	14
TOTAL	10	30	60	-	-	100	10	30	60	-	-	100	-	30	70

Tutorials: Program Using Python / Matlab

Syllabus

Vector Space: Vector space - Definition and Examples, Subspaces, Null spaces, The span of a set of vectors, Linearly independent, dependent, Basis and Dimension, Row spaces, The rank Nullity theorem, Column spaces.

Linear Transformations and Orthogonality: Definitions and Examples - Linear Operators on $\mathbf{R^2}$, Linear Transformations from $\mathbf{R^n}$ to $\mathbf{R^m}$ **-** Linear Transformations from **V** to **W-**Matrix Representations of Linear Transformations, Matrix representation theorem. **Orthogonality:** The scalar Product in $\mathbf{R^2}$ and $\mathbf{R^3}$ **-** Scalar and Vector Projections-Orthogonality in $\mathbf{R^n}$ **-** Orthogonal Subspaces-Fundamental Subspaces - Inner Product spaces, Basic properties of Inner product Spaces-Norms, Orthonormal sets, Orthogonal Matrices, Gram-Schmidt process.

Matrix Eigen Value Problem: Eigen values and Eigen vectors –Some Applications of Eigen value Problems – Symmetric, Skew symmetric and orthogonal matrices – Eigen bases, Diagonalization -Singular Value Decomposition - Quadratic forms.

Ordinary Differential Equations: Homogeneous Linear ODEs of second order – Homogeneous Linear ODEs with constant coefficients – Euler Cauchy Equation – Existence and uniqueness of solutions, Wronskian - Nonhomogeneous ODE - Solution by Variation of Parameters.

Laplace Transforms: Laplace transform, Linearity, First Shifting theorem – Transforms of derivatives and integrals, ODEs – Unit step function, Second shifting theorem – Short Impulses, Dirac's delta function, partial fractions – Convolution, Integral Equations – Differentiation and integration of transforms.

Text Book

1. Steven J. Leon., "Linear Algebra with Application" Ninth Edition, Pearson, 2015.
2. ERWIN KREYSZIG., "Advanced Engineering Mathematics" 10th Edition, John Wiley & Sons, INC. 2011
3.

Reference Books

1. DAVID C.LAY., "Linear Algebra and its Applications" 4th Edition, 2012.
2. GILBERT STRANG., "Introduction to Linear Algebra" 5th Edition, 2016.

Course contents and Lecture Schedule

Module No.	Topic	No. of. Lectures
1	**VECTOR SPACE**	
1.1	Definition and Examples	1
1.2	Subspaces, Null spaces, The span of a set of vectors	2
	Tutorial	1
1.3	Linearly independent, dependent	2
1.4	Basis, Dimension	1
	Tutorial	1
1.5	Row spaces, The rank Nullity theorem, Column spaces	2
	Tutorial	1
2	**LINEAR TRANSFORMATION AND ORTHOGONALITY**	
2.1	Linear transformation: Definition and Examples, Linear Operators on $\mathbf{R^2}$, Linear Transformations from $\mathbf{R^n}$ to $\mathbf{R^m}$	1
2.2	Linear Transformations from **V** to **W**	1
2.3	Matrix Representations of Linear Transformations, Matrix representation theorem	1
	Tutorial	1
2.4	Orthogonality: The scalar Product in $\mathbf{R^2}$ and $\mathbf{R^3}$, Scalar and Vector Projections, Orthogonality in $\mathbf{R^n}$	1
2.5	Orthogonal Subspaces, Fundamental Subspaces	1
2.6	Inner Product spaces, Basic properties of Inner product Spaces	1
	Tutorial	1
2.7	Norms, Orthonormal sets, Orthogonal Matrices,	2
2.8	Gram-Schmidt process	2
	Tutorial	1
3	**MATRIX EIGEN VALUE PROBLEM**	
3.1	Eigenvalues and Eigen vectors	1
3.2	Some Applications of Eigen value Problems	1
3.3	Symmetric, Skew symmetric and orthogonal matrices	1
3.4	Tutorial	1
3.5	Eigen bases, Diagonalization	1
3.6	The Single Value Decomposition	1
3.7	Quadratic forms	1
	Tutorial	1
4	**ORDINARY DIFFERENTIAL EQUATION**	
4.1	Homogeneous Linear ODEs of second order – Homogeneous Linear ODEs with constant coefficients	1
4.2	Euler Cauchy Equation	1
4.3	Existence and uniqueness of solutions	2
	Tutorial	1

4.4	Wronskian - Nonhomogeneous ODE	1
4.5	Solution by Variation of Parameters.	1
	Tutorial	1
5	**LAPLACE TRANSFROMS**	
5.1	Laplace transform, Linearity	1
5.2	First Shifting theorem - Transforms of derivatives and integrals	1
5.3	ODEs – Unit step function, Second shifting theorem	1
	Tutorial	1
5.4	Short Impulses, Dirac's delta function, partial fractions	1
5.5	Convolution, Integral Equations	1
5.6	Differentiation and integration of transforms	1
5.7	Tutorial	1
	Total	48

Course Designer(s):

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2. Ms. H. Sri Vinodhini srivinodhini@tce.edu
3. Dr. P. Victor pvmat@tce.edu

22IT220	OPERATING SYSTEMS

Category	L	T	P	Credit
PCC	3	0	0	3

Preamble

This course provides a strong foundation on basic operating systems components, mechanisms and implementations. The core focus is on the various algorithms and implementation approaches used for process management, memory management, deadlock handling and Virtualization. The course also elaborates on implementations of these techniques in Linux, Windows and Android OS.

Prerequisite

- Nil

Course Outcomes

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

COs	Course Outcomes	TPS	Expected Proficiency in %	Expected Attainment Level %
CO1	Explain the essential types, features, components, services and structure of Operating systems - Understand	TPS2	70	75
CO2	Use process synchronization and scheduling mechanisms to handle deadlocks	TPS3	70	65
CO3	Report various memory management techniques such as paging and segmentation	TPS3	70	65
CO4	Summarize the Virtualization implementation approaches and hypervisor types	TPS2	70	65
CO5	Demonstrate file systems, process and memory management approaches of Linux and Windows systems	TPS3	70	65
CO6	Review the architecture, Components and implementation approaches of modern operating systems such as android.	TPS2	70	65

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	**M**	**L**											**L**		
CO2.	**S**	**M**	**L**					**M**	**M**	**M**			**M**		**L**
CO3	**S**	**M**	**L**					**M**	**M**	**M**			**M**		**L**
CO4	**M**	**L**											**L**		
CO5	**S**	**M**	**L**					**M**	**M**	**M**		**L**	**M**		**L**
CO6	**M**	**L**										**L**	**L**		

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	Assessment 1 (Theory)								Assessment 2 (Theory)								Terminal (Theory)					
	CAT 1				Assignment 1				CAT 2				Assignment 2									
TPS Scale	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	5	6
CO1	10	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	5	-	-	-	-
CO2	5	10	20	-	-	-	50	-	-	-	-	-	-	-	-	-	-	-	20	-	-	-
CO3	-	-	-	-	-	-	-	-	10	10	20	-	-	-	70	-	-	-	20	-	-	-
CO4	-	-	-	-	-	-	-	-	10	20	-	-	-	-	-	-	10	10	-	-	-	-
CO5	5	10	20	-	-	-	50	-	-	-	10	-	-	-	30	-	-	-	20	-	-	-
CO6	-	-	-	-	-	-	-	-	10	10	-	-	-	-	-	-	5	5	-	-	-	-

***** Terminal examination should cover all Course Outcomes in the appropriate TPS Scale level.

Syllabus

Operating Systems Overview – OS Structure - Operations – OS Types – Essentials of Process – Memory – Storage Management – Kernel Data structures – Opensource operating systems – Layered approach for OS Design – System Calls – Programs- Security: The Security Problem-Program Threats-System and Network Threats

Process Management – Scheduling – operations – Inter-process Communication – Client-Server Communication – Threads: Multicore programming – Multi-threading- Libraries – Threading Issues – Process Synchronization: The critical section problem- Mutex locks – Semaphores – Monitors – Alternate approaches

Scheduling - CPU Scheduling: **Scheduling** algorithm – Multiple processor scheduling – Thread scheduling – Real-time CPU scheduling – Algorithm Evaluation – Deadlocks: Detection – Avoidance – Prevention – Recovery. **Case Study – Linux**: Components, Process Management, Scheduling.

Memory Management – Main Memory: Swapping – Continuous Memory allocation – Segmentation – Paging – Page table – Case study: Intel Architecture – Virtual Memory: Demand Paging- Copy-on-Write- Page Replacement– File systems : Structure and Implementation – Storage :Disk Scheduling – I/O: Kernel I/O Subsystem.
Case study - **Windows**: Terminal Services, File System

Virtualization - Types of Virtualization - Hypervisors – Virtualization Implementation: trap and emulate, Binary Translation, Hardware-Assisted – Virtual Machines: CPU Scheduling, Memory, I/O, Storage – Case study – Java Virtual Machine, VMware Workstation, Getting Started with CUDA

Advanced OS – Distributed Operating Systems: Needs and Design Goals – Mobile OS – Architecture Trends – **Case study** : Android OS : Modular System Components – Kernel – Architecture – Hardware abstraction layer – MAC OS – BSD

Text Book

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, “Operating System Concepts”, John Wiley & Sons Pvt. Ltd., Tenth Edition, 2018
2. Mobile OS Trends - https://people.apache.org/~xli/papers/itj2012-mobile-os-trends.pdf

Reference Books & web resources

1. William Stallings, “Operating Systems : Internals and Design Principles”, Pearson Education, 2019

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**OS Overview (5)**	
1.1	OS Structure - Operations – OS Types	1
1.2	Essentials of Process – Memory – Storage Management-Kernel Data structures	1
1.3	Opensource operating systems – Layered approach for OS Design	1
1.4	System Calls – Programs	1
1.5	Security: The Security Problem-Program Threats-System and Network Threats	1
2	**Process Management (9)**	
2.1	Scheduling	1
2.2	operations	1
2.3	Inter-process Communication	1
2.4	Client-Server Communication	1
2.5	Threads: Multicore programming – Multi-threading	1
2.6	Libraries – Threading Issues	1
2.7	Process Synchronization: The critical section problem	1
2.8	Mutex locks – Semaphores	1
2.9	Monitors – Alternate approaches	1
3	**Scheduling(6)**	
3.1	CPU Scheduling: Scheduling algorithm	1
3.2	Multiple processor scheduling – Thread scheduling	1
3.3	Real-time CPU scheduling – Algorithm Evaluation	1
3.4	Deadlocks: Detection – Avoidance – Prevention – Recovery	1
3.5	**Case Study – Linux**: Components, Process Management, Scheduling.	2
4	**Memory Management (7)**	
4.1	Main Memory: Swapping – Continuous Memory allocation	1
4.2	Segmentation – Paging – Page table	1
4.3	Case study: Intel Architecture	1
4.4	Virtual Memory – File systems : Structure and Implementation	1

Module No.	Topic	No. of Periods
4.5	Storage – Disk Scheduling – I/O	1
4.6	**Case study** - **Windows**: Terminal Services, File System	2
5	**Virtualization (4)**	
5.1	Types of Virtualization - Hypervisors – Virtualization Implementation: trap and emulate, Binary Translation	1
5.2	Hardware-Assisted – Virtual Machines: CPU Scheduling, Memory, I/O, Storage	1
5.3	Case study – Java Virtual Machine, VMware Workstation, Getting Started with CUDA	2
6	**Other Operating Systems (5)**	
6.1	Distributed Operating Systems: Needs and Design Goals	1
6.2	Mobile OS – Architecture Trends	1
6.3	**Case study** :Android OS : Modular System Components – Kernel – Architecture	2
6.4	Hardware abstraction layer – MAC OS – BSD	1
	Total	36

Course Designer(s):

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Assistant Professor, Dept of IT

22IT230	COMPUTER ORGANIZATION

Category	L	T	P	Credit
PCC	3	0	0	3

Preamble

The course on Computer organization introduces the basic structure and operations of a computer and describe the instruction execution and performance of a machine. It discusses about the performance up gradation through Pipelining, Multicore processing and discusses on Memory hierarchy and communication with I/O devices.

Prerequisite

- NIL

Course Outcomes

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

Cos	Course Outcome	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Explain the Basic Structure of Computer.	TPS2	70	75
CO2	Apply Instruction set architecture to write an Assembly level language program for simple applications.	TPS3	70	65
CO3	Explain the Basic Input/Output unit and Processing unit.	TPS2	70	75
CO4	Identify the type of hazard in a given sequence of instructions and the methods to overcome it.	TPS3	70	65
CO5	Describe storage and retrieval of information from Memory.	TPS2	70	75
CO6	Explain the basic concepts of Parallel processing.	TPS2	70	75

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO3.	**M**	**L**											**L**		
CO4.	**S**	**M**	**L**		**L**			**M**	**M**	**M**			**M**		**L**
CO5.	**M**	**L**											**L**		
CO6.	**S**	**M**	**L**										**M**		
CO7.	**M**	**L**											**L**		
CO8.	**M**	**L**											**L**		

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	Theory						Theory						Terminal		
	CAT1			CAT2			Assignment 1			Assignment 2			Theory		
TPS Scale	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
CO1	10	10	-	-	-	-	-	-	-	-	-	-	3	10	-
CO2	-	20	30	-	-	-	-	-	100	-	-	-	3	5	15
CO3	10	20	-	-	-	-	-	-	-	-	-	-	3	10	-
CO4	-	-	-	-	20	30	-	-	-	-	-	100	3	10	15
CO5	-	-	-	10	10	-	-	-	-	-	-	-	3	10	-
CO6	-	-	-	10	20	-	-	-	-	-	-	-	3	10	-

***** Terminal examination should cover all Course Outcomes in the appropriate TPS Scale level.

Syllabus

Basic Structure of Computers: Computer Types- Functional Units - Basic Operational Concepts- Number Representation and Arithmetic Operations - Character Representation – Floating point arithmetic-Performance- Historical Perspective.

Instruction Set Architecture: Memory Locations and Addresses-Memory Operations-Instructions and Instruction Sequencing- Addressing Modes-Assembly Language-Stack-Subroutine- CISC Instruction Sets

Basic Processing Unit: Instruction Execution-Hardware Components-Instruction Fetch and Execution Steps-Control Signals-Hardwired Control-CISC Style Processors

Pipelining: Pipeline Organization- Pipelining Issues-Data Dependencies-Memory Delays-Branch delays -Resource Limitation-Performance Evaluation-Superscalar Operation-Pipelining in CISC Processors

Input/Output Organization: Bus Structure-Bus Operation-Arbitration-InterfaceCircuits-Interconnection Standards- Accessing I/O Devices- Interrupts

Memory System: Semiconductor RAM Memories- Read-only Memories- Direct Memory Access-Memory Hierarchy-Cache Memories-Performance Consideration-Secondary storage

Parallel Processing: Vector (SIMD) Processing- Shared-Memory Multiprocessors- Cache Coherence- Parallel Programming for Multiprocessors.

Case study on Indian made Processors

Text Book

1. Carl Hamacher,Zvonko Vranesic,Safwat Zaky, Naraig Manjikian ,"Computer Organization and Embedded Systems" , Tata McGraw Hill ,Sixth Edition ,2012.

Reference Books & web resources

1. David A Patterson, John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", 4th Edition, Morgan Kaufmann, 2009
2. William Stallings, "Computer Architecture and Organization", PHI Pvt. Ltd., Eastern Economy Edition, Sixth Edition, 2003
3. Assembly Language, Online notes, http://linuxassembly.org/.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Basic Structure of Computers**	
1.1	Computer Types- Functional Units	1
1.2	Basic Operational Concepts	1
1.3	Number Representation and Arithmetic Operations	1
1.4	Character Representation, Floating point arithmetic	1
1.5	Performance- Historical Perspective	1
2	**Instruction Set Architecture**	
2.1	Memory Locations and Addresses	1
2.2	Memory Operations	1
2.3	Instructions and Instruction Sequencing	1
2.4	Addressing Modes	1
2.5	Assembly Language-Stack-Subroutine	1
2.6	CISC Instruction Sets	1
3	**Basic Processing Unit**	
3.1	Instruction Execution-Hardware Components	1
3.2	Instruction Fetch and Execution Steps	1
3.3	Control Signals	1
3.4	Hardwired Control	1
3.5	CISC Style Processors	1
4	**Pipelining**	
4.1	Pipeline Organization	1
4.2	Pipelining Issues-	1
4.3	Data Dependencies	1
4.4	Memory Delays-	1
4.5	Branch delays	1
4.6	Resource Limitation-Performance Evaluation	1
4.7	Superscalar Operation	1
4.8	Pipelining in CISC Processors	1

Module No.	Topic	No. of Periods
5	**Input/Output Organization**	
5.1	Bus Structure	1
5.2	Bus Operation-Arbitration	1
5.3	Interface circuits-Interconnection Standards	1
5.4	Accessing I/O Devices- Interrupts	1
6	**Memory System**	
6.1	Semiconductor RAM Memories- Read-only Memories	1
6.2	Direct Memory Access-Memory Hierarchy	1
6.3	Cache Memories	1
6.4	Performance Consideration-Secondary storage	1
7	**Parallel Processing**	
7.1	Vector (SIMD) Processing	1
7.2	Shared-Memory Multiprocessors	1
7.3	Cache Coherence	1
7.4	Parallel Programming for Multiprocessors.	1
	Total	36

Course Designer(s):

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22IT240	IT INFRASTRUCTURE MANAGEMENT

Category	L	T	P	Credit
ESC	3	0	0	3

Preamble

This course covers modern storage technologies for enterprise-grade data storage and data management. It includes networked storage models, applications in business continuity and exposure to real-world storage networking technologies.

Prerequisite

Nil

Course Outcomes

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

CO	Course Outcomes	TPS Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Explain the building blocks of Infrastructure for IT applications	TPS2	70	70
CO2	Demonstrate the networking infrastructure requirements for a given application.	TPS3	70	70
CO3	Use enterprise storage technologies such as SAN, Cloud-based storage and storage virtualization to provide storage solutions	TPS3	70	70
CO4	Adapt suitable backup and recovery strategy for a given application scenario	TPS3	70	70
CO5	Employ appropriate performance metrics to ascertain information availability	TPS3	70	70
CO6	Describe the essential steps of business continuity planning	TPS2	70	70

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO9.	**M**	**L**											**L**		
CO10	**S**	**M**	**L**					**M**	**M**	**M**			**M**		**L**
CO3	**S**	**M**	**L**					**M**	**M**	**M**			**M**		**L**
CO4	**S**	**M**	**L**					**M**	**M**	**M**			**M**		**L**
CO5	**S**	**M**	**L**					**M**	**M**	**M**			**M**		**L**
CO6	**M**	**L**					**L**					**M**	**L**		

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	Theory												Terminal					
	CAT 1			Assignment 1			CAT 2			Assignment 2			Theory					
TPS Scale	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	4	5	6
CO1	10	10	-	-	-	-	-	-	-	-	-	-	5	5	-	-	-	-
CO2	5	10	20	-	-	50	-	-	-	-	-	-	2	5	10	-	-	-
CO3	5	10	10	-	-	50	-	-	-	-	-	-	2	5	20	-	-	-
CO4	-	10	10	-	-	-	5	10	40	-		50	1	5	20	-	-	-
CO5	-	-	-	-	-	-	5	20	-	-	25	-	5	5	-	-	-	-
CO6	-	-	-	-	-	-	10	10	-	-	25	-	5	5	-	-	-	-

***** Terminal examination should cover all Course Outcomes in the appropriate TPS Scale level.

Syllabus

Storage Infrastructure: Storage Systems: Levels – Types - HDD – SSD - RAID – Infrastructure for Application deployment - Data Center – Cloud Fundamentals

Network Infrastructure: Network Devices - Switches, Routers, Hub, Bridges, Network types-LAN, WAN, Wireless Networks – Global internet – DNS

Storage for Enterprises: Direct Attached Storage - Architecture and components - Network Attached Storage – Architecture and components and connectivity -NFS – CIFS – SMB protocol – SAN: IP SAN and FC SAN: Architecture and Components– Storage Virtualization

Backup and Recovery: Backup and Recovery: Architecture – Components – Types – Granularity – Topologies - Tools

Information Availability: Information Life Cycle Management - Data Categorization – Information Availability – Business Continuity: Needs-Goals and Planning - Scalable storage systems – Service Oriented Storage – Serverless Technologies.

Text Book

1. SJaak Laan, “IT Infrastructure Architecture – Infrastructure Building Blocks and Concepts”, Third Edition, Lulu Press Inc, 2017.
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

Reference Books & web resources

1. Robert Spalding, “Storage Networks : The Complete Reference”, Tata McGraw Hill, Osborne,2003.
2. Marc Farley, “Building Storage Networks”, Tata McGraw Hill, Osborne.2001.
3. Thomas Erl, Zaigham Mahmood, Ricardo Puttini, “Cloud Computing: Concepts, Technology and Architecture”, Prentice Hall, 2013.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Storage Infrastructure**	
1.1	Storage Systems: Levels – Types - HDD – SSD	1
1.2	RAID	2
1.3	Infrastructure for Application deployment	2
1.4	Data Center Infrastructure	2
1.5	Cloud Fundamentals	2
2	**Network Infrastructure**	
2.1	Network Devices - Switches, Routers, Hub, Bridges	1
2.2	Network types-LAN, WAN, Wireless Networks	1
2.3	Global internet -DNS	1
3	**Storage for Enterprises**	
3.1	Direct Attached Storage - Architecture and components	1
3.2	Network Attached Storage – Architecture and components and connectivity -NFS – CIFS – SMB protocol	3
3.3	SAN: IP SAN and FC SAN : Architecture and Components	3
3.4	Storage Virtualization	2
4	**Backup and Recovery**	
4.1	Backup and Recovery: Architecture	2
4.2	Components – Types – Granularity	2
4.3	Topologies - Tools	2
5	**Information Availability**	
5.1	Information Life Cycle Management - Data Categorization	2
5.2	Information Availability	3
5.3	Business Continuity: Needs-Goals and Planning	2
5.4	Scalable storage systems – Service Oriented Storage – Serverless Technologies.	2
	Total hours	**36**

Course Designer(s):

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2.S. Thiruchadai Pandeeswari, Assistant Professor, Dept of IT eshwarimsp@tce.edu

22IT250	COMPUTER AIDED ENGINEERING GRAPHICS

Category	L	T	P	Credit
ESC	1	0	4	3

Terminal Exam: Practical

Preamble

Engineering Graphics is referred as language of engineers and it is essential in proposing new product designs through drawings. This course covers manual drawing of projections of points, straight lines, planes and Computer Aided Drafting of orthographic projections of solids and isometric views of combined solids and components, through 3-D modelling.

Prerequisite

Basic knowledge on geometry of objects.

Course Outcomes

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

CO Number	Course Outcomes	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Draw Geometric constructions and projections of points (in all quadrants) and projection of straight lines (in first quadrant) inclined to one reference plane. (Manual Drawing).	TPS 3	70	70
CO2	Draw the orthographic views (Front view, Top view and side view) of objects from the given isometric view. (Manual Drawing).	TPS 3	70	70
CO3	Draw the orthographic projections (Front view, Top view and side view) of plane surfaces inclined to any one reference plane. (Manual Drawing)	TPS 3	70	70
CO4	Draw the orthographic projections (Front view and Top view) of regular solids (Prisms, Pyramids, Cylinder and Cone) with axis inclined to any one reference plane using CAD software.	TPS 3	70	70
CO5	Draw the isometric views of regular solids and combined solids (Prisms, Pyramids, Cylinder, Cone, frustum of pyramid, frustum of cone) using CAD software, by 3-D modelling.	TPS 3	70	70
CO6	Draw the isometric views of irregular solids from orthographic views using CAD software, by 3-D modelling.	TPS 3	70	70

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12
CO1	S	M	S	M	M	-	-	-	M	M	-	-
CO2	S	M	S	M	M	-	-	-	M	M	-	-
CO3	S	M	S	M	M	-	-	-	M	M	-	-
CO4	S	M	S	M	M	-	-	-	M	M	-	-
CO5	S	M	S	M	M	-	-	-	M	M	-	-
CO6	S	M	S	M	M	-	-	-	M	M	-	-
Overall	3	2	3	2	2	0	0	0	2	2	0	0
	S	M	S	M	M	-	-	-	M	M	-	-

Assessment Pattern

Bloom's Category /TPS Scale	Continuous Assessment Test	Terminal Examination
Remember / 1		
Understand / 2		
Apply / 3	100	100
Analyse / 4		
Evaluate / 5		
Create / 6		

Marks Allocation for Internal Assessment:

Sl. No	Description	Marks
1	Submission of Drawing sheets (Manual Drawing & Computer Aided Drawing)	60
2	Test (Manual Drawing & Computer Aided Drawing)	40
	Total	**100***

* The total marks secured out of 100 will be converted to 50 marks.

Syllabus

Introduction - Significance of engineering graphics, Use of drawing instruments, Standards, Lettering and dimensioning, Scales. Orthographic Projection- Principles of orthographic projections, First angle projection & Third angle projection.

Geometric constructions (such as bisecting line & arc, perpendicular through a point on a line, dividing line into equal parts, parallel lines, arcs tangent to given lines, regular polygons)

Projections of points located in all quadrants.

Projections of straight lines (located in first quadrant) inclined to any one reference plane. (Manual Drawing).

Drawing orthographic views (Front view, Top view and side view) of objects from the given isometric view (Manual Drawing).

Projections (Front view, Top view and side view) of plane surfaces in first quadrant, inclined to any one reference plane by rotating object method (Manual Drawing).

Projection (Front view and Top view) of regular solids (Prisms, Pyramids, Cylinder and Cone) in first quadrant, by rotating object method when the axis is inclined to one of the reference planes using Computer Aided Drafting software.

Isometric views of regular solids and combined solids (Prisms, Pyramids, Cylinder, Cone, frustum of pyramid, frustum of cone in vertical positions only) using CAD software, by 3-D modelling.

Isometric views of irregular solids (components) from orthographic views by 3-D modelling using Computer Aided Drafting software.

Text Book

1. Bhatt N.D., Panchal V.M. and Ingle P.R., (2014) “Engineering Drawing”, Charotar Publishing House.
2. CAD Software Theory and User Manuals (Technical Drawing with AutoCAD).

Reference Books

1. Shah M.B, and Rana B.C (2009) “Engineering Drawing and Computer Graphics”, Pearson Education.
2. B.V.R.Gupta and M.Raja Roy, Engineering Drawing with AutoCAD, 3rd Edition, I.K.International Publications, 2009.
3. Natarajan K.V., “A text book of Engineering Graphics”, DhanalakshmiPublishers,Chennai, 2012.
4. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2019.
5. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2011.
6. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Publications, Bangalore, 2017.

Course Contents and Lecture Schedule

Sl.No	Topic	Lecture Hours	Practice Hours
1	**Introduction**- Significance of engineering graphics, Use of drawing instruments –Standards, Lettering and dimensioning, Scales, Orthographic Projection-Principles of orthographic projections,	1	4
2	Geometric constructions, Projection (Elevation and Plan) of points located in all quadrants, Projection (Elevation and Plan) of straight lines (in first quadrant) inclined to one reference plane (HP / VP). (Manual Drawing).	1	4
3	Drawing orthographic views (Front view, Top view and side view) of objects from the given isometric view (Manual Drawing).	1	4
4	Projection (Front view, Top view and side view) of plane surfaces in first quadrant, inclined to HP by rotating object method (Manual Drawing).	1	4
5	Projection (Front view, Top view and side view) of plane surfaces in first quadrant, inclined to VP by rotating object method (Manual Drawing).	1	4
6	Projection (Front view and Top view) of regular solids (Prisms, Pyramids, Cylinder and cone) in first quadrant, by rotating object method when the axis is inclined to HP using CAD software.	2	8
7	Projection (Front view and Top view) of regular solids (Prisms, Pyramids, Cylinder and cone) in first quadrant, by rotating object method when the axis is inclined to VP using CAD software.	2	8
8	Isometric projection – Principle, isometric scale, Isometric views and Isometric views of single simple solids and	1.5	6

	combined solids (Prisms, Pyramids, Cylinder, Cone, frustum of pyramid, frustum of cone in vertical positions only) using CAD software.		
9	Isometric views of irregular solids (components) from orthographic views by 3-D modelling using Computer Aided Drafting software.	1.5	6
	TOTAL	**12**	**48**

Question Pattern for Terminal Examination:

Question Number	Description	Type	Marks
1	Lettering and Geometric constructions	Compulsory (Manual Drawing)	8
2	Projection (Elevation and Plan) of points in all quadrants, Projections of straight lines (in first quadrant) inclined to any one reference plane.	Compulsory (Manual Drawing)	12
3	Orthographic views (Front view, Top view and side view) of objects from the given isometric view.	Either or type (Manual Drawing)	15
4	Projection (Front view, Top view and side view) of plane surfaces (in first quadrant) inclined to any one reference plane.	Either or type (Manual Drawing)	15
5	Projection (Front view and Top view) of solids (in first quadrant) inclined to any one reference plane.	Either or type (Computer Aided Drawing)	15
6	Drawing isometric view of combined solids (Prisms, Pyramids, Cylinder, Cone, frustum of pyramid, frustum of cone in vertical positions only) by 3-D modelling.	Either or type (Computer Aided Drawing)	15
7	Drawing isometric view of irregular solids (components) from orthographic views by 3-D modelling.	Either or type (Computer Aided Drawing)	20
Total			**100**

Course Designers:

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22IT260	WEB ESSENTIALS

Category	L	T	P	Credit
PCC	1	0	2	2

Terminal Exam: Practical

Preamble

The course aims to provide the web essentials for designing a simple application to the novice students. It includes web design using HTML, CSS, Scripting through Java script and PHP.

Prerequisite

None

Course Outcomes

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

COs	Course Outcomes	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Explain the web application terminologies such as web browser, web server	TPS2	70	80
CO2	Practice UI Design tools such as wireframe	TPS3	70	70
CO3	Design simple web pages using HTML elements	TPS3	70	70
CO4	Design the web pages by including different styles using CSS	TPS3	70	70
CO5	Develop simple Web Applications with client side scripting	TPS3	70	70
CO6	Develop simple Web Applications with server side scripting	TPS3	70	70

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L						L					L		L
CO2	S	M	L		L	L		L	S	S		S	M	L	M
CO3	S	M	L		L	L		L	S	S		S	M	L	M
CO4	S	M	L		L	L		L	S	S		S	M	L	M
CO5	S	M	L		L	L		L	S	S		S	M	L	M
CO6	S	M	L		L	L		L	S	S		S	M	L	M

S- Strong; M-Medium; L-Low

CO	CAT1						CAT2						RECORD & MODEL LAB						TERMINAL					
	THEORY						THEORY						THEORY & PRACTICAL						PRACTICAL					
TPS SCALE	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
CO1		10						10							10									
CO2			20												20						20			
CO3			40						10						20						20			
CO4			30						10						20						20			
CO5									50						20						20			
CO6									20						10						20			

Assessment Pattern

*****Terminal examination should cover all Course Outcomes in the appropriate TPS Scale level.

Syllabus

Web Design Essentials: Internet – WWW – Website – Two/Three tier architecture – Types of Servers – Application Server, Web Server, Database Server – Web browser – Web pages – static and dynamic – UI Design – Wireframe - HTML – Elements, Attributes, Headings, Paragraphs, Links, Images, Tables, Lists, Forms – CSS – inline, internal, external

Scripting Essentials: Client Side Scripting (Java script) – Fundamentals, Arrays, Functions- Events, Form Validations – Server Side Scripting (PHP) – Fundamentals, Functions, Arrays – Forms – Data base

Applications Case Study– Enterprise Applications in Healthcare, Finance, Transport, Education, Society, Agriculture, Governance

Text Book

1. Robin Nixon, “Learning PHP, MySQL &Javascript with jQuery, CSS, HTML5”, O’Reilly, 2018 Edition.

Reference Books& web resources

1. Steven Holzner, “PHP: The Complete Reference”, Fifth Edition, Mc Graw Hill, 2017.
2. Laura Lemay, Rafe Colburn, Jennifer Kyrnin, “Mastering HTML, CSS & JavaScript Web Publishing”, BPB Publications, 2016.

Course Contents and Lecture Schedule

Module No	Topic	No. Of Hours
1	**Web Design Essentials**	
1.1	Internet – WWW – Website – Two/Three tier architecture	1
1.2	Types of Servers – Application Server, Web Server, Database Server – Web browser – Web pages – static and dynamic	
1.3	UI Design - Wireframe	1
1.4	HTML – Elements, Attributes, Headings, Paragraphs, Links, Images	1
1.5	Tables, Lists, Forms	1
1.6	CSS – inline, internal, external	1

2	**Scripting Essentials**	
2.1	Client Side Scripting (Java script) – Fundamentals,	1
2.2	Arrays, Functions-	1
2.3	Events, Form Validations	1
2.4	Server Side Scripting (PHP) – Fundamentals	1
2.5	Functions, Arrays	1
2.6	Forms – Data base	1
3	**Application Case Study**	
3.1	– Enterprise Applications in Healthcare, Finance, Transport, Education, Society, Agriculture, Governance	1
	Total No. Of Lecture Hours	**12**

List of Experiments

Ex. No	Experiment Name	No. Of Hours
1.	Study of various web applications of different domains such as education, governance, healthcare etc	2
2.	UI Design using Wireframe	2
3.	Web page design using HTML	2
4.	Include styles for the web pages using CSS properties	2
5.	Simple Java scripts	2
6.	Java script forms and Validations using Events	2
7.	Simple PHP scripts	2
8.	PHP script forms and Validations using Events	2
9.	PHP with DB connection	4
10.	Mini-Project	4
	Total No. of Practical Hours	**24**

Course Designer(s):

1. Dr. C.Jeyamala, Associate Professor, Department of Information Technology — jeyamala@tce.edu
2. Dr. P.Karthikeyan, Associate Professor, Department of Information Technology — karthikit@tce.edu

22IT270	COMPUTER PROGRAMMING

Category	L	T	P	Credit
PCC	1	0	2	2

Terminal Exam: Practical

Preamble

The Computer Programming course aims at providing hands on experience on programming using C. The students will gain a practical insight in to structured programming concepts and improve their problem solving and programming skills.

Prerequisite

None

Course Outcomes

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

COs	Course Outcomes	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Practice C programs using basic programming constructs for simple problems	TPS3	70	80
CO2	Practice C programs using arrays for simple problems	TPS3	70	80
CO3	Apply the strings and functions for the given problem	TPS3	70	80
CO4	Practice simple programs using pointers	TPS3	70	80
CO5	Develop simple applications using structures, file processing	TPS3	70	80
CO6	Implement, test and debug the solution for a given problem using C programming language.	TPS3	70	80

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L					S					M		
CO2	S	M	L					S					M		
CO3	S	M	L					S					M		
CO4	S	M	L					S					M		
CO5	S	M	L					S					M		
CO6	S	M	L					S	S	S			M	S	

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	CAT1						CAT2						Record & Model Lab						Terminal					
	Theory						Theory						Theory & Practical						Practical					
TPS Scale	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
CO1			30												20						20			
CO2			40						10						20						20			
CO3			20						10						20						20			
CO4									20						20						10			
CO5									40						20						20			
CO6			10						20												10			

*****Terminal examination should cover all Course Outcomes in the appropriate TPS Scale level.

Syllabus

Programming constructs Structured Programming Languages – Data types – Operators – Conditional Constructs – Looping Constructs – Functions - Recursion – Scope Rules – Storage classes

Arrays 1D Array – 2D Array – Multi Dimensional Array – Arrays and Functions – Strings – String Functions

Structures and Pointers Structures – Array of Structures – Pointers –– Pointers and Arrays – Pointers and Functions - Pointers and Structures – Dynamic Memory Allocation – Unions – Enum – Bit fields

File Processing Files – Preprocessor – Command Line Arguments

Text Book

1. Byron S Gottfried, “Programming with C”, 4th edition, Schaum’s Outlines, 2018.

Reference Books& web resources

1. Yashwant Kanetkar, “Let us C”, 18th Edition, BPB Publications, 2021.
2. Kernighan, B.W and Ritchie,D.M, The C Programming language, Second Edition, Pearson Education, 2015.

Course Contents and Lecture Schedule

Module No	Topic	No. Of Hours
1	**Programming Constructs**	
1.1	Structured Programming Languages	1
1.2	Data types	
1.3	Operators	
1.4	Conditional Constructs	1
1.5	Looping Constructs	
1.6	Functions	1
1.7	Recursion	
1.8	Scope Rules and Storage classes	1
2	**Arrays**	
2.1	1D Array	1
2.2	2D Array	
2.3	Multi Dimensional Array	1
2.4	Arrays and Functions	
2.5	Strings	1
2.6	String Functions	
3	**Structures and Pointers**	
3.1	Structures	1
3.2	Array of Structures	
3.3	Pointers	1
3.4	Pointers and Arrays	
3.5	Pointers and Functions	1
3.6	Pointers and Structures	
3.7	Dynamic Memory Allocation	1
3.8	Unions, Enum, Bit fields	
4	**Files Processing**	

4.1	Files Processing	1
4.2	Preprocessor	
4.3	Command Line Arguments	
	Total No. Of Lecture Hours	**12**

List of Experiments

Ex. No	Experiment Name	No. Of Hours
11	Simple programs with operators, expressions and conditional statements	2
12	Simple programs using loops, nested loops, break and continue statements	2
13	Applications using functions	2
14	Applications using one dimensional array	2
15	Applications using two dimensional array	2
16	Applications using string library functions	2
17	Applications using Structures, and Array of Structures	2
18	Applications using Dynamic memory allocation	4
19	Applications using File operations	4
20	Practice union, enum and macros	2
	Total No. of Practical Hours	**24**

List of Problems/Applications but not limited to:

- Sequential search and Binary Search algorithms
- Matrix Problems
- Factorial, Fibonacci, GCD, etc using iterative and recursive approach
- CPU Scheduling algorithms like FCFS
- Linux file system organization using appropriate header files and methods
- Implementation of Linux File System commands like cat, ls, grep, cp, mv, rm, etc

Course Designer(s):

1. Dr. P.Karthikeyan, Associate Professor, Department of Information Technology — karthikit@tce.edu
2. Dr. A.M.Abirami, Associate Professor, Department of Information Technology — abiramiam@tce.edu

B. TECH INFORMATION TECHNOLOGY DEGREE PROGRAMME

SCHEDULING OF COURSES

&

CURRICULUM AND DETAILED SYLLABI

FOR

THIRD SEMESTER

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2022-23 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
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Passed in Board of Studies on 2.12.2022 Approved in 64th Academic Council Meeting on 11.1.2023

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

COURSES OF STUDY
(For the candidates admitted from 2022-23 onwards)

THIRD SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			credits
			L	T	P	
THEORY						
22IT310	Discrete Mathematics	BSC	3	1	-	4
22IT320	Object Oriented Programming	PCC	3	-	-	3
22IT330	Software Engineering	PCC	3	-	-	3
22IT340	Data Structures	PCC	3	-	-	3
22IT350	IT Operations and Management	ESC	2	-	-	2
PRACTICAL						
22IT360	System Administration Lab	ESC	-	-	2	1
22IT370	Object Oriented Programming Lab	PCC	-	-	2	1
22IT380	Data Structures Lab	PCC	-	-	2	1
22ES390	Design Thinking	ESC	-	-	6	3
Total			**14**	**1**	**12**	**21**

BS : Basic Science
HSS : Humanities and Social Science
ES : Engineering Science

L : Lecture
T : Tutorial
P : Practical

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

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

SCHEME OF EXAMINATIONS
(For the candidates admitted from 2022-23 onwards)

THIRD 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	22IT310	Discrete Mathematics	3	40	60	100	27	50
2	22IT320	Object Oriented Programming	3	40	60	100	27	50
3	22IT330	Software Engineering	3	40	60	100	27	50
4	22IT340	Data Structures	3	40	60	100	27	50
5	22IT350	IT Operations and Management	3	40	60	100	27	50
PRACTICAL								
6	22IT360	System Administration Lab	3	60	40	100	18	50
7	22IT370	Object Oriented Programming Lab	3	60	40	100	18	50
8	22IT380	Data Structures Lab	3	60	40	100	18	50
9	22ES390	Design Thinking	3	100			100	50

* CA evaluation pattern will differ from course to course and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.

22IT310	DISCRETE MATHEMATICS

Category	L	T	P	Credit
BSC	3	1	0	4

Preamble

The Ideas of Discrete Mathematics are the fundamental to the science and technology specific to the computer age. This course provides an introduction to some fundamental concepts in Discrete Mathematics. The topics covered include: set theory, functions, relations, and lattice theory, mathematical logic, proof techniques, recurrence relations, counting methods, graphs and predicate calculus. These topics have wide range of applications in algorithm design, automata theory, compiler theory, artificial intelligence, software engineering etc.

Prerequisite

NIL

Course Outcomes

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

CO	COURSE OUTCOMES	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Apply the concepts of relations and functions to solve the given problem.	TPS3	70	65
CO2	Construct the recurrence relation for a given engineering problem and solve the recurrence relation using generating functions and also solve combinatorial problems using counting techniques.	TPS3	70	65
CO3	Understand the concepts of graph connectivity, matching and coloring.	TPS2	75	70
CO4	Construct Hasse diagram for the given POSET and also verify the constructed Hasse diagram for modular, distributive, bounded and complemented lattice.	TPS3	70	65
CO5	Apply the concepts of logical operators, truth table and tautalogy to prove logical expressions are equivalent and to compute normal forms.	TPS3	70	65
CO6	Apply logic rules of inference to check the validity of the propositional calculus and predicate calculus statements and to prove theorems	TPS3	70	65

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	S	S	L	L		L							S	L	
CO2.	S	M	L	L		L							M	L	
CO3.	S	S	L	L		L							S	L	
CO4	S	S	L	L		L							S	L	
CO5	S	M	L	L		L							M	L	
CO6	S	S	L	L		L							S	L	

Assessment Pattern

CO	Assessment 1						Assessment 2						Terminal		
	CAT 1			Assignment 1			CAT 2			Assignment 2					
TPS	1 10	2 30	3 60	1 -	2 -	3 100	1 10	2 30	3 60	1 -	2 -	3 100	1 -	2 30	3 70
CO1	3	-	23	-	-	40	-	-	-	-	-	-	-	3	10
CO2	7	10	23	-	-	40	-	-	-	-	-	-	-	3	17
CO3	-	20	-	-	-	-	-	-	-	-	-	-	-	9	-
CO4	-	-	14	-	-	20	3	-	13	-	-	20	-	6	10
CO5	-	-	-	-	-	-	4	20	20			40	-	6	16
CO6	-	-	-	-	-	-	3	10	27			40	-	3	17
TOTAL	10	30	60	-	-	100	10	30	60	-	-	100	-	30	70

***ASSIGNMENT II - CASE STUDY**

Syllabus

Relations and Functions: Relations, Binary Relations, Equivalence Relations, Composition of relations - Functions, Bijections, composition of functions -– Mathematical Induction – The Basics of counting, The Pigeonhole principle, Permutations and combinations - Recurrence relations - Generating functions.

Graphs and Lattice Theory: Graphs, Planar graphs, Connectivity, Matching, Colouring - Partially ordered set, POSET as Lattice, Properties of Lattice, Sub lattice, Special Lattices: Modular, Distributive, Complemented, Bounded.

Propositional Calculus: Introduction – Statements and Notations, Basic &Higher Connectives**:** –Truth Tables using connectives – Tautological Implications & Equivalence of Formulas – Functionally Complete set of connectives - Normal Forms**:** Disjunctive-Conjunctive-Principal Disjunctive-Principal Conjunctive.

Theory of inference and Predicate Calculus: Checking the validity using the truth table, Rules of Inference: P, T, CP, AP rules –Consistency of premises. Predicates - Function, Variables and Quantifiers, Predicate formulas –Free and Bound Variables (One Place Predicate).

Text Book

1. Kenneth H. Rosen., “Discrete Mathematics and Its Applications”, 8th Edition, McGraw hill publications, 2019.
2. T.P. Tremblay and R. Manohar, "Discrete Mathematical Structures with application to Computer Science”, Tata McGraw Hill, 2002.

Reference Books& web resources

1. Dr.M.K.Venkataraman., Dr.N.Sridharan and N.Chandrasekaran, "Discrete Mathematics", National Publishing Company, Chennai, 2004.
2. EitanFarchi, Ben-Chaim, "Mathematical Logic and its Application to Computer Science Lecture Notes",March 3, 2010

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Relational Structures on Sets**	
1.1	Definition of Relation – Matrix & Graph representation of a relation - Binary Relation – Properties of Binary Relation.	2
1.2	Equivalence relation - Composition of Relations	1
	Tutorial	1
1.3	Functions –Bijective Function-Inverse functions	2
1.4	Mathematical Induction	1
	Tutorial	1
1.5	The Basics of counting	1
1.6	The Pigeonhole principle	1
1.7	Permutations	1
	Tutorial	1
1.8	Combinations	1
1.9	Recurrence relation and Generating Functions	2
	Tutorial	1
2	**Graphs and Lattice Theory**	
2.1	Graphs, Graph models and Connectivity	2
2.2	Matching of a graph and graph coloring	2
	Tutorial	1
2.3	POSET, Hasse Diagram, Lattices	2
2.4	Properties of Lattices, Sublattice	1
	Tutorial	1
2.5	Modular Lattice, Distributive lattice and Complemented lattice	1
2.6	Bounded and Boolean lattices, De'Morgan's Law in Lattice theory	1
	Tutorial	1
3	**Propositional Calculus**	

Module No.	Topic	No. of Periods
3.1	Introduction – Statements and Notations	1
3.2	Negation – Conjunction – Disjunction – Truth table	1
3.3	Conditional – Biconditional – Tautological Statements	1
	Tutorial	1
3.4	Logically equivalent and Equivalence of Formulas	1
3.5	Duality Law – Tautological Implications-	1
3.6	Functionally Complete set of Connectives, Nand, Nor	1
	Tutorial	1
3.7	Disjunctive – Conjunctive – Principle Disjunctive – Principle Conjunctive	2
	Tutorial	1
4	**Inference Theory and Predicate Calculus**	
4.1	Checking the validity using the truth table, Rules of inference: Direct method	1
4.2	Consistency of premises and Rules of inference: Indirect Method	1
4.3	Rules of inference: CP & AP rules	1
	Tutorial	1
4.4	Predicates-Functions, Variables and quantifier	1
4.5	Quantifier: essential quantifier, universal quantifier	1
4.6	Predicate formulas – Free and Bound Variables	2
	Tutorial	1
	Total	48

Course Designer(s):

1. Dr. P. Victor pvmat@tce.edu
2. Ms. H. Sri Vinodhini srivinodhini@tce.edu
3. Dr. P. Krishnapriya pkamat@tce.edu

22IT320	OBJECT ORIENTED PROGRAMMING

Category	L	T	P	Credit
PCC	3	0	0	3

Preamble

This course aims to give practice on object-oriented programming constructs such as encapsulation, inheritance, and polymorphism using Java. It also covers various packages such as I/O, utility, and event handling to develop applications for real-world problems.

Prerequisite

Nil

Course Outcomes

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

CO	Course Outcome	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Apply basic programming constructs like Control structures, looping, arrays, type casting for the given problems	TPS3	70	70
CO2	Apply encapsulation, inheritance and polymorphism for the given problems	TPS3	70	70
CO3	Implement interface, exceptions for solving the given problems	TPS3	70	70
CO4	Implement threading for solving the given problems	TPS3	70	70
CO5	Apply packages for handling files, string, collections and logging for the given problem.	TPS3	70	70
CO6	Develop object-oriented applications for the given scenario that uses event handling.	TPS3	70	70

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L		S							M	M	M	L
CO2	S	M	L		S							M	M	M	L
CO3	S	M	L		S							M	M	M	L
CO4	S	M	L		S							M	M	M	L
CO5	S	M	L		S							M	M	M	L
CO6	S	M	L		S							M	M	M	L

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	CAT1			Assignment -I			CAT2			Assignment - II			Terminal					
TPS Scale	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	4	5	6
CO1	10		20			20								10				
CO2	5	10	20			40							5		15			
CO3	5	10	20			40							5		15			
CO4							10	5	20			30	5	10				
CO5							5	10	20			40	5		15			
CO6							5	5	20			30			15			

*****Terminal examination should cover all Course Outcomes in the appropriate TPS Scale level.

Syllabus

Basic Programming Constructs: object-oriented paradigm, class, methods, data types, arrays, Scanner, control structures - condition, loops, type casting

Object Oriented Programming Constructs: Encapsulation, Constructors - overloading, static, this, Inheritance, compile-time polymorphism – method overloading, method overriding, runtime polymorphism – dynamic method dispatch, super, abstract, final, interface, Exception Handling – built-in exceptions and user-defined exceptions, Threading – Create Thread, Multi threads, Priority, Synchronization, Inter thread communication

Packages: User-defined packages, String Handling - Methods, I/O – File Reading and Writing, StringTokenizer, Collections - Arraylist, linked list, HashSet, Linked Hashset, Tree Set, Logging - create logs, log files

Event Handling: Event classes, EventListener Interfaces - Action Listener, Focus Listener, Item Listener, Key Listener, Mouse Listener, Text Listener, AWT components - Frame, Label, Button, TextField, CheckBox, CheckBoxGroup, Choice, List, Layout – grid, card.

Text Book

1. Herbert Schildt, “Java: The Complete Reference”, McGraw-Hill, Eleventh Edition, 2017

Reference Books& web resources

1. Paul Deitel and Harvey Deitel, “Java How to Program (Early Objects)”, Pearson, Eleventh Edition, 2017.
2. E.Balagurusamy, “Programming with Java” , McGraw-Hill, Fifth Edition, 2014.
3. Kathy Sierra, “Head First Java”, Shroff publications, Second edition, 2005.
4. Cay S. Horstmann and Gary Cornell, “Core Java, Volume I - Fundamentals”, Prentice Hall, Ninth Edition, 2013.
5. Cay S. Horstmann and Gary Cornell, “Core Java, Volume II – Advanced Features : 2”, Prentice Hall, Eleventh Edition, 2018.
6. https://onlinecourses.nptel.ac.in/noc19_cs07/

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lecture Hours
1	**Basic Programming Constructs**	
1.1	Object-oriented paradigm, class, methods	1
1.2	Data types, arrays, Scanner	1
1.3	control structures - condition, loops, type casting,	2
2	**Object Oriented Programming Constructs**	
2.1	Encapsulation	1
2.2	Constructors - Overloading	1
2.3	Static, this	1
2.4	Inheritance	2
2.5	Compile time polymorphism – method overloading	1
2.6	Method overriding	1
2.7	Runtime polymorphism – dynamic method dispatch	1
2.8	Super, abstract, final	1
2.9	Interface	1
2.10	Exception Handling – Built in exceptions	1
2.11	User defined exceptions	1
2.12	Threading – Create thread	2
2.13	Multi threads, Priority	1
2.14	Synchronization	1
2.15	Inter thread communication	1
3	**Packages**	
3.1	User defined packages	1
3.2	String Handling - Methods	1
3.3	I/O – File Reading and Writing, StringTokenizer	1
3.4	Collections	1
3.5	Arraylist, linked list	1
3.6	Hashset, Linked Hashset, Tree Set	1
3.7	Logging –create logs	2
3.8	Log files	1
4	**Event Handling**	
4.1	Event classes, EventListener Interfaces - Action Listener, Focus Listener, Item Listener	2
4.2	Key Listener, Mouse Listener, Text Listener	1
4.3	AWT components - Frame, Label, Button, TextField, CheckBox, CheckBoxGroup, Choice, List	2
4.4	Layout – grid, card	1
	Total Lecture Hours	**36**

Course Designer(s):

1. Dr.S.Sridevi, Associate Professor - IT sridevi@tce.edu
2. Dr.P.Karthikeyan, Associate Professor - IT rthikit@tce.edu

22IT330	SOFTWARE ENGINEERING

Category	L	T	P	Credit
PCC	3	0	0	3

Preamble

This course highlights the process, models and tools involved in building quality software in a productive manner. It also enables the students to acquire analytical, critical, technical writing, team building and managerial skills for real world scenarios by using agile practices.

Prerequisite

NIL

Course Outcomes

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

CO	Course Outcome	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Compare traditional and agile software process models	TPS2	70	70
CO2	Identify user stories, Story map, functional and non-functional requirements for any given problem	TPS3	70	60
CO3	Prepare design documents with standards for the given requirements	TPS3	70	60
CO4	Develop test cases using appropriate testing techniques for an application	TPS3	70	60
CO5	Explain the scope of the software maintenance problem and demonstrate the use of version controlling and tracking mechanisms.	TPS2	70	70
CO6	Demonstrate DEVOPS life cycle processes and introduce state of art tools used in large scale software systems.	TPS2	70	70

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1.	M	L						M				S	L		L
CO2.	S	M	L		M	M			S	S		S	M	M	M
CO3	S	M	L		M	M			S	S		S	M	L	M
CO4	S	M	L		M				S	S		S	M	L	M
CO5	M	L							S	S		S	L		M
CO6	M	L			L				S	S		S	L		M

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	Theory						Theory						Terminal		
	CAT 1			Assignment 1			CAT 2			Assignment 2			Theory		
TPS Scale	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
CO1	15	15	-	-	-	-	-	-	-	-	-	-	5	5	-
CO2	10	15	15	-	-	50	-	-	-	-	-	-	1	5	20
CO3	5	10	15	-	-	50			20	-	-		2	5	20
CO4	-	-	-	-	-	-	5	10	20	-	-	50	2	5	20
CO5	-	-	-	-	-	-	10	15	-	-	25	-	5	5	-
CO6	-	-	-	-	-	-	5	15	-	-	25	-	5	5	-

*****Terminal examination should cover all Course Outcomes in the appropriate TPS Scale level.

Syllabus

Software Process Models: Generic Process Models Vs Agile Process model. Agile Software Development methodologies -Extreme Programming (XP), Adaptive Software Development (ASD) - Dynamic Systems Development Method (DSDM) – Scrum – Crystal – Feature Driven Development (FDD) - Roles and responsibilities of software project manager.

Requirements Analysis: Requirement Gathering – Eliciting user stories- story map - Functional Requirements - Non-functional Requirements. Use Cases – SRS Documentation- Requirements Management Tools.

Design: Design process - Concepts - Guidelines – Design Approach - Structured approach – Object-oriented approach. Architectural Styles and Pattern-Based Design- Data Design - Design Notations – Data Flow Diagram – Context Diagram - UML Diagrams – Class Diagram – Sequence Diagram –Activity Diagram-State Machine Diagram- User Interface Design - Design Documentation. Exploration of Design tools.

Software Development: Coding standards and Practices, code inspection, reviews and walkthroughs

Testing: Testing Process-STLC – Testing Strategies – Black box and white box testing - White box testing - Basis path testing- Control structure testing – Program Dependence Graph. Black box testing –Equivalence Partitioning – Boundary Value Analysis – Cause effect graph Testing levels – Unit testing – Integration testing - System testing -Modular testing – Regression testing –User acceptance testing – Traceability Matrices -Verification & Validation Report-. Automated Testing tools

Devops: Goals & principles- Stakeholders – DevOps Architecture Features–Lifecycle phases- DevOps Workflow and Practices- -DevOps Automation Tools

Software Maintenance and Configuration Management: Characteristics, controlling factors, maintenance tasks-Configuration Management: Tasks- version control- tracking-VC tools-GIT-Software release - reverse engineering and re-engineering. Software Quality Models: SEI-CMM

Text Book

1. Software Engineering: A Practitioner's Approach By Roger S. Pressman and Bruce Maxim McGraw-Hill Higher International; ISBN-10: 1259872971; ISBN-13: 978-1259872976, 9 th Edition (09/19)
2. Orit Hazzan, Yael Dubinsky, “Agile software engineering ǁ”, Springer,2014

3. Michael Duffy, “DevOps Automation Cookbook”, Kindle editions, 2015

Reference Books& web resources

1. Rajib Mall, “Fundamentals of Software Engineering”, PHI, 4th edition, 2014.
2. PankajJalote, An integrated approach to Software Engineering, Springer/Narosa.
3. Ian Sommerville, Software Engineering, Addison-Wesley 10th edition, 2015.
4. https://cloudacademy.com/blog/introduction-to-devops/

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Software Process Models**	
1.1	Generic Process Models	1
1.2	Agile Process model	1
1.3	Agile Software Development methodologies	
1.3.1	Extreme Programming (XP)- Adaptive Software Development (ASD)	1
1.3.2	Dynamic Systems Development Method (DSDM)- Scrum	1
1.3.3	Crystal- Feature Driven Development (FDD)	1
1.3.4	Generic Process Models Vs Agile Process model	1
1.4	Roles and responsibilities of software project manager	1
2	**Requirements Analysis**	
2.1	Requirement Gathering	1
2.2	Eliciting user stories- story map	1
2.3	Functional Requirements	1
2.4	Non-functional Requirements	
2.5	Use Cases	
2.6	SRS Documentation	1
2.7	Requirements Management Tools.	1
3	**Design**	
3.1	Design process-concepts – guidelines	1
3.2	Design Approach - Structured approach – Object-oriented approach.	
3.3	Software Architecture - Data design –Architectural styles and pattern -based design	1
3.4	Design Notations	1
3.5	Data Flow Diagram – Context Diagram	1
3.6	UML Diagrams – Class Diagram - Sequential Diagram –Activity Diagram-State Machine Diagram User Interface Design	3
3.7	Design Documentation- Exploration of Design tools.	1
4	**Development and Testing**	
4.1	Coding standards and Practices	1

4.2	Code inspection	
4.3	Reviews and walkthroughs	1
5	**Testing techniques**	
5.1	Testing Process-STLC – Testing Strategies	1
5.2	White box testing	2
5.2.1	Basis path testing	
5.2.2	Control structure testing	
5.2.3	Program Dependence Graph	
5.3	Black box testing	2
5.3.1	Equivalence Partitioning	
5.3.2	Boundary Value Analysis	
5.3.3	Cause effect graph	
5.4	Testing levels – Unit testing – Integration testing - System testing -Modular testing – Regression testing –User acceptance testing	1
5.5	Traceability Matrices -Verification & Validation Report	1
5.6	Automated Testing tools	1
6	**Devops**	
6.1	Goals & principles- Stakeholders- DevOps Architecture Features–Lifecycle phases- DevOps Workflow and Practices	2
6.2	DevOps Automation Tools	1
7	**Software Maintenance and Configuration Management**	
7.1	Software Maintenance-Characteristics, controlling factors, maintenance tasks	1
7.2	Configuration Management: Tasks- version control- tracking-VC tools-GIT	1
7.3	Software release - reverse engineering and re-engineering.	1
7.4	Software Quality Models: SEI-CMM	1
	Total Hours	36

Course Designer(s):

S.Karthiga, Asst.Professor,Dept of IT skait@tce.edu
S.Pudumalar, Asst.Professor,Dept. of IT spmit@tce.edu

22IT340	DATA STRUCTURES

Category	L	T	P	Credit
PCC	3	0	0	3

Preamble

The course introduces the fundamental data structures and their operations. The course discusses the use of linear and non-linear data structures with real time applications. It strives to strengthen the programming ability of students to solve problems and write efficient algorithms using suitable data structures.

Prerequisite

None

Course Outcomes

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

COs	Course Outcomes	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Use suitable linear data structures and their operations for solving a given problem	TPS3	70	70
CO2	Use suitable non-linear data structures like trees and their operations for solving a given problem	TPS3	70	70
CO3	Use suitable non-linear data structures like hash table, graph and their operations for solving a given problem	TPS3	70	70
CO4	Compute space and time complexity of a given problem	TPS3	70	70
CO5	Interpret computational efficiency of searching and sorting algorithms	TPS3	70	70
CO6	Formulate solutions by identifying suitable ADTs for solving problems using suitable programming languages	TPS3	70	70

Mapping with Programme Outcomes

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	S	M	L					M				M	S		M
CO2	S	M	L					M				M	S		M
CO3	S	M	L					M				M	S		M
CO4	S	M	L					M				M	S		M
CO5	S	M	L					M				M	S		M
CO6	S	M	L		M			M	M	M	L	M	S	L	M

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	Theory						Theory						Terminal					
	Test 1			Assignment 1			Test 2			Assignment 2								
TPS Scale	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	4	5	6
CO1	10	15	25			30							6	10	10			
CO2							5	10	20			30	6	5	10			
CO3							5	10	20			20	4	5	10			
CO4	5		5										2		8			
CO5		10	10			10							2	10				
CO6			20			50			30			50			12			

Assignments include solving coding challenges, quiz, problem solving using Programming languages.

Syllabus

Data Abstraction: Data Representation - Types of Data Structures - Abstract Data Type

Linear ADTs: List - Stack - Queue - Circular Queue - Linked List - Singly Linked List, Doubly Linked List, Circular Linked List - Applications - Expression evaluation, Scheduling Algorithms, Polynomial Evaluation, Josephus Problem

Non-linear ADTs: Tree Terminology - Binary tree - Tree traversals - Expression Tree – Binary Search Tree - AVL Tree - B-tree - Binary Heap – Red Black Tree – Tries - Applications – Dictionary, kth smallest element, Hash Table – Hashing Techniques, Rehashing – Graphs – Graph Terminology – Graph Representation – Graph traversals – Connected Components - Applications

Algorithm Analysis: Asymptotic Measures – Space Complexity – Time Complexity

Searching and Sorting: Searching Techniques - Sequential Search, Binary Search, Search trees – Sorting Techniques – Bubble Sort, Insertion Sort, Selection Sort, Shell Sort, Quick Sort, Merge Sort, Heap Sort

Text Book

1. M. A. Weiss, “Data Structures and Algorithm Analysis in C”, Second Edition, Pearson Education, 2012.
2. Richard Gilberg, Behrouz A. Forouzan, “Data Structures: A Pseudo code Approach with C”, Second edition, India Edition 2007.

Reference Books& web resources

1. M. A. Weiss, “Data Structures and Algorithm Analysis in Java”, Second Edition, Pearson Education, 2014
2. Aho, J.E. Hopcroft and J.D. Ullman, “Data Structures and Algorithms”, Pearson Education, 1983.
3. Basant Agarwal, Bejamin Baka, “Hands-On Data Structures and Algorithms with Python: Write complex and powerful code using the latest features of Python 3.7, 2nd Edition, 2018
4. SWAYAM / NPTEL’s Course for Data Structures – http://nptel.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/data_str_algo/frameset.htm
5. Web Reference for Data Structures – https://www.geeksforgeeks.org/data-structures
6. Web Reference for Data Structures – https://www.hackerrank.com/domains/data-structures
7. Web Reference for Data Structures – www.leetcode.com/

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Data Abstraction**	
1.1	Data Representation	1
1.2	Types of Data Structures	
1.3	Abstract Data Type (ADT)	

Module No.	Topic	No. of Periods
2	**Linear ADTs**	
2.1	List	2
2.2	Applications – Array Problems, Matrix Problems, Strings problems	1
2.3	Stack ADT	2
2.4	Queue ADT	1
2.5	Circular Queue ADT	1
2.6	Linked List – Singly, Double, Circular Lists	3
2.7	Applications – Expression evaluation, Polynomial Evaluation, Josephus Problem	3
3	**Non-linear ADTs:**	
3.1	Trees	
3.1.1	Trees Terminology	1
3.1.2	Binary Tree traversals	1
3.1.3	Expression Tree	1
3.1.4	Binary Search Tree	2
3.1.5	AVL Tree	2
3.1.6	B-tree	2
3.1.7	Binary Heap	2
3.1.8	Applications – Dictionary, kth smallest element	1
3.2	Hash Table	
3.2.1	Hashing Techniques	2
3.2.2	Rehashing	
3.3	Graph	
3.3.1	Graph Terminology	1
3.3.2	Graph Representation	
3.3.3	Graph traversals	
3.3.4	Connected Components	2
3.3.5	Applications	
4	**Algorithm Analysis:**	
4.1	Asymptotic Measures	1
4.2	Space Complexity	
4.3	Time Complexity	
5	**Searching and Sorting**	
5.1	Searching Techniques	
5.1.1	Sequential Search	1
5.1.2	Binary Search	
5.1.3	Search trees	
5.2	Sorting Techniques	

Module No.	Topic	No. of Periods
5.2.1	Bubble Sort	1
5.2.2	Insertion Sort	
5.2.3	Selection Sort	
5.2.4	Shell Sort	1
5.2.5	Quick Sort	
5.2.6	Merge Sort	1
5.2.7	Heap Sort	
	Total Lecture Hours	36

Course Designer(s):

1. A M Abirami abiramiam@tce.edu
2. P.Manojkumar pmkit@tce.edu

22IT350	IT OPERATIONS AND MANAGEMENT

Category	L	T	P	Credit
ESC	2	0	0	2

Preamble

This course offers a strong foundation on system administration that involves Linux and Windows server administration, Configuration and Monitoring of various server roles. This course also provides exposure to shell commands and implementation of system admin tasks using bash scripting.

Prerequisite

NIL

Course Outcomes

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

CO	Course Outcomes	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Explain the essential roles of the system administrator in administrating IT Infrastructure	TPS2	70	80
CO2	Use appropriate shell commands to manage users, files and devices in the Linux system	TPS3	70	80
CO3	Make use of bash scripting to implement system administration tasks.	TPS3	70	80
CO4	Configure and monitor various server roles such as DNS server, Web server and Mail server on windows server.	TPS3	70	80
CO5	Implement group policy settings and manage resources using Active Directory in Windows Server.	TPS3	70	80
CO6	Outline emerging system administration functions such as Devops, MLOps and serverless infrastructure.	TPS2	70	80

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L					M						L		L
CO2	S	M	L		S			M	M	M		M	M	M	L
CO3	S	M	L		S			M	M	M		M	M	M	L
CO4	S	M	L		S			M	M	M		M	M	M	L
CO5	S	M	L		S			M	M	M		M	M	M	L
CO6	M	L					M						L		L

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	Theory						Theory						Terminal		
	CAT1			Assignment 1			CAT2			Assignment 2					
TPS Scale	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
CO1	10	10	-	-	-	-	-	-	-	-	-	-	5	-	-
CO2	10	20	20	-	-	20	-	-	-	-	-	-	5	5	10
CO3	-	-	30	-	-	80	-	-	-	-	-	-	-	-	20
CO4	-	-	-	-	-	-	10	5	20	-	-	60	5	5	20
CO5	-	-	-	-	-	-	5	5	30	-	-	20	-	5	10
CO6	-	-	-	-	-	-	5	20	-	-	20	-	5	5	-

***** Terminal examination should cover all Course Outcomes in the appropriate TPS Scale level.

Syllabus

System Administration basics – Essential Duties and Roles of a system administrator – Datacenter – Overview – Datacenter Infrastructure Management

Linux Administration – Boot Process – System daemons: init and systemd – GRUB Configurations and Commands – Rootly powers – Access Control – File privileges – User Management – Process control – File System – Types, mounting, fsck, repair, User and group quotas - Network File system – Logs – Cron jobs - Linux Troubleshooting

Scripting for Administration – Bash scripting: Redirections and Pipelines - Arithmetic operations – functions – Command Line arguments – Control Flow – Loops.

Windows Administration – Server Roles and Features - User accounts – Group Policy - Active directory- Network policies- Remote access- Managing File services

Server Configuration and Monitoring – Web Server – Mail Server – DNS server –– Configuration and Management on Linux and Windows.

Evolving arenas for System Admins – Devops – pipelining CI and CD, MLOps, Serverless Infrastructure.

Text Book

1. Evi Nemeth, Garth Snyder, Trent R. Hein, Ben whaley, Dan Mackin, Unix and Linux System Administration Handbook, Pearson Education, Fifth Edition, 2018.
2. Windows Server Management - https://learn.microsoft.com/en-us/windows-server/administration/manage-windows-server

Reference Books & web resources

1. Linux commands and Bash Scripting - https://linuxhint.com/
2. Windows Server Administration - https://en.wikiversity.org/wiki/Windows_Server_Administration

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**System Administration basics**	
1.1	Essential Duties and Roles of a system administrator	1
1.2	Datacenter – Overview	1
1.3	DCIM	2
2	**Linux Administration**	
2.1	Boot Process	1
2.2	System daemons: init and systemd	
2.3	GRUB Configurations and Commands	1
2.4	Rootly powers	
2.5	Access Control	1
2.6	File privileges, Log Management	
2.7	User Management	2

Module No.	Topic	No. of Periods
2.8	Process control	
2.9	File System: types, mounting, fsck, repair	
2.10	User and group quotes, Cron Jons	1
2.11	Network File system	
2.12	Linux Troubleshooting	
3	**Scripting for Administration**	
3.1	Bash scripting: Redirections and Pipelines	2
3.2	Arithmetic operations	
3.3	functions – Command Line arguments	
3.4	Control Flow – Loops	1
4.	**Windows Administration**	
4.1	Server Roles and Features	1
4.2	User accounts	1
4.3	Group Policy	1
4.4	Active directory	
4.5	Network policies	1
4.6	Remote access- Managing File services	2
5	**Server Configuration and Monitoring**	
5.1	Web Server	1
5.2	Mail Server	
5.3	DNS server	1
5.4	Configuration and Management on Linux and Windows.	2
5.5	Managing File services	
6	**Evolving arenas for System Admins**	
6.1	Devops	2
6.2	Pipelining CI and CD	
6.3	MLOps, Serverless Infrastructure.	
	Total	24

Course Designer(s):

1. S. Thiruchadai Pandeeswari, Assistant Professor, IT, eshwarimsp@tce.edu
2. Dr K. Indira, Assistant Professor, IT kiit@tce.edu

22IT360	System Administration Lab

Category	L	T	P	Credit
ES	0	0	2	1

Preamble

This laboratory course aims to provide foundational skills in System administration which include user management, file management, server roles configuration and management on Linux and Windows server operating systems.

Prerequisite

None

Course Outcomes

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

COs	Course Outcomes	TCE Proficiency Scale	Expected Proficiency (%)	Expected Attainment Level (%)
CO1	Use shell commands for basic utilities and file manipulation on Linux server	TPS3	70	80
CO2	Change file privileges and ownership using appropriate shell commands on Linux server	TPS3	70	80
CO3	Perform process management, user management and access control using suitable commands on Linux server	TPS3	70	80
CO4	Construct bash scripts for implementing user-process-file management and other system administration tasks	TPS3	70	80
CO5	Install, configure and monitor Web-DNS-File-Mail servers on both Linux and Windows server OS	TPS3	70	80
CO6	Configure Active Directory Domain Services on Windows server OS and apply group policy settings	TPS3	70	80

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L		M			M	M	M		M	M	M	M
CO2	S	M	L		M			M	M	M		M	M	M	M
CO3	S	M	L		M			M	M	M		M	M	M	M
CO4	S	M	L		M			M	M	M		M	M	M	M
CO5	S	M	L		M			M	M	M		M	M	M	M
CO6	S	M	L		M			M	M	M		M	M	M	M

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	Observation-Record			Test			Terminal		
TPS Scale	1	2	3	1	2	3	1	2	3
CO1	5	5	-	-	-	10	-	-	10
CO2	10	10	-	-	-	20	-	-	20
CO3	10	10	-	-	-	20	-	-	20
CO4	10	10	-	-	-	20	-	-	20
CO5	10	10	-	-	-	20	-	-	20
CO6	5	5	-	-	-	10	-	-	10

Course Contents

Ex. No.	Topic	No. of Sessions	COs Mapping
	Linux Administration		
1	Installation of Linux Server OS	1	CO1
2	Basic utilities and File Manipulation		CO1
3	Managing File Ownership and File Privileges – Mounting Filesystems	1	CO2
4	User Management		CO3
5	Process Management and Troubleshooting	1	CO3
6	Implementation of bash scripts for user-file-process management tasks	1	CO4
7	Installation of Web Server and hosting a static webpage	1	CO5
8	Installation and Configuration of DNS Server	1	CO5
9	Implementation of File server and Mail server	1	CO5
10	Study on Directory services on Linux Server	1	CO3
	Windows Administration		
11	a) Installation of IIS Server and hosting a static webpage b) Installation of SMTP Server	1	CO3
12	Configuring DNS server role	1	CO4
13	Implementation of Active Directory and Group Policy Settings	1	CO5
14	Configuration of File Server Resource Manager	1	CO6
15	Study on NPS server role and Network Administration		CO5
	Total Lecture Hours	**12**	

Course Designer(s):

1.S. Thiruchadai Pandeeswari, Assistant Professor IT, eshwarimsp@tce.edu
2.Dr K. Indira, Assistant Professor, IT kiit@tce.edu

22IT370	OBJECT ORIENTED PROGRAMMING LAB

Category	L	T	P	Credit
PCC	0	0	2	1

Preamble

The course is designed to develop programming skills for writing applications using object-oriented programming constructs. It strengthens the logical reasoning skills of students to solve problems and develop efficient applications in Java.

Prerequisite

None

Course Outcomes

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

COs	Course Outcomes	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Develop simple applications using object-oriented programming constructs	TPS3	80	70
CO2	Practice file operations with string and handle exceptions for the given problems	TPS3	80	70
CO3	Develop packages with classes and interfaces for the given scenario	TPS3	80	70
CO4	Apply multithreading and generate logs for the given problems	TPS3	80	70
CO5	Practice the event handling techniques with the given UI based applications	TPS3	80	70
CO6	Develop a simple application with database connectivity	TPS3	80	70

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L		M			S	L	L		S	M	M	M
CO2	S	M	L		M			S	L	L		S	M	M	M
CO3	S	M	L		M			S	L	L		S	M	M	M
CO4	S	M	L		M			S	L	L		S	M	M	M
CO5	S	M	L		M			S	L	L		S	M	M	M
CO6	S	M	L		M			S	L	L		S	M	M	M

S- Strong; M-Medium; L-Low

Assessment Pattern

Cognitive Levels	Model Examination	Terminal Examination
Remember		
Understand	20	20
Apply	80	80
Analyse		
Evaluate		
Create		

.

Course Contents

Ex. No.	Topic	No. of Sessions	COs
1	Basic Programming using loops and control statements	1	CO1
2	Demonstrate Encapsulation	1	CO1
3	Practice Inheritance	1	CO1
4	Practice Polymorphism	1	CO1
5	Practice Packages & Interfaces	1	CO3
6	Demonstrate built-in Exceptions and User defined Exceptions	1	CO2
7	Practice Threading	1	CO4
8	Practice I/O with string handling	1	CO2
9	Practice Collections with string methods	1	CO2
10	Practice Logging	1	CO4
11	Practice Event Handling	1	CO5
12	Develop simple application with database connectivity	1	CO6
	Total Sessions	**12**	

Course Designer(s):

1. Dr.S.Sridevi, Associate Professor, Department of IT sridevi@tce.edu
2. Dr.P.Karthikeyan, Associate Professor, Department of IT karthikit@tce.edu

22IT380	DATA STRUCTURES LAB

Category	L	T	P	Credit
PCC	0	0	2	1

Preamble

The course is designed to develop programming skills for writing applications using linear and non-linear data structures. It strengthens the logical reasoning skills of students to solve problems and write efficient algorithms using suitable data structures.

Prerequisite

None

Course Outcomes

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

COs	Course Outcomes	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Use suitable array-based linear data structures for a given problem	TPS3	70	80
CO2	Use suitable linked list data structures and their operations for a given problem	TPS3	70	80
CO3	Use suitable tree data structures and their operations for a given problem	TPS3	70	80
CO4	Use suitable hashing techniques for a given problem	TPS3	70	80
CO5	Use suitable graph data structure and its operations for a given problem	TPS3	70	80
CO6	Experiment with different searching and sorting algorithms using time complexity measures	TPS3	70	80

Mapping with Programme Outcomes

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	S	M	L		L			S	L	L		S	S	L	M
CO2	S	M	L		L			S	L	L		S	S	L	M
CO3	S	M	L		L			S	L	L		S	S	L	M
CO4	S	M	L		L			S	L	L		S	S	L	M
CO5	S	M	L		L			S	L	L		S	S	L	M
CO6	S	M	L		L			S	L	L		S	S	L	M

S- Strong; M-Medium; L-Low

Assessment Pattern

Cognitive Levels	Model Examination	Terminal Examination
Remember	0	0
Understand	20	20
Apply	80	80
Analyse	0	0
Evaluate	0	0
Create	0	0

.

Course Contents and Lecture Schedule

Ex. No.	Topic	No. of Sessions	COs Mapping
1	Implementation of List ADT using array and structures for simple applications	1	CO1
2	Implementation of Matrix ADT using array and pointers for simple applications	1	CO1
3	Implementation of Stack ADT for simple applications	1	CO1
4	Implementation of Queue and Circular Queue ADT for simple applications	1	CO1
5	Implementation of Linked List ADT for simple applications	1	CO2
6	Implementation of Doubly Linked List ADT for simple applications	1	CO2
7	Implementation of Circular Linked List ADT for simple applications	1	CO2
8	Implementation of Binary Search Tree ADT for simple applications	1	CO3
9	Implementation of Binary Heap ADT for simple applications	1	CO3
10	Implementation of Hashing techniques for simple applications	1	CO4
11	Implementation of Graph ADT for simple applications	1	CO5
12	Performance analysis of searching and sorting algorithms	1	CO6
	Total Lecture Hours	**12**	

List of problems/applications but not limited to:

- Matrix problems like Sparse Array
- Expression evaluation using Stack ADT
- CPU scheduling / Disk scheduling algorithm (like FCFS) using Queue ADT
- Polynomial evaluation using Linked List ADT
- Josephus problem using Circular Linked List ADT
- Finding Middle number, Palindrome checking using Doubly Linked List ADT
- Expression tree, Dictionary using Binary Search Tree
- kth smallest element using Binary Heap ADT
- Searching, Indexing, Encoding/Decoding problems using Hashing techniques
- Graph traversals, Connected components using Graph ADT
- Time complexity analysis of Sorting Algorithms for 1k-5k numbers

Course Designer(s):

1. A M Abirami abiramiam@tce.edu
2. P.Manojkumar pmkit@tce.edu

B. TECH INFORMATION TECHNOLOGY DEGREE PROGRAMME

SCHEDULING OF COURSES

&

CURRICULUM AND DETAILED SYLLABI

FOR

FOURTH SEMESTER

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2022-23 ONWARDS

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

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Passed in Board of Studies on 2.12.2022 Passed in 64th Academic Council Meeting on 11.1.2023

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

COURSES OF STUDY
(For the candidates admitted from 2022-23 onwards)

FOURTH SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			credits
			L	T	P	
THEORY						
22IT410	Probability and Statistics	BSC	3	1	-	4
22IT420	Algorithm Design Principles	PCC	3	-	-	3
22IT430	Computer Networks	PCC	3	-	-	3
22IT440	Database Management Systems	PCC	3	-	-	3
22IT490	Project Management	HSMC	3	-	-	3
THEORY CUM PRACTICAL						
22IT450	Programming for Internet of Things	ESC	2	-	2	3
PRACTICAL						
22IT470	Computer Networks Laboratory	PCC	-	-	2	1
22IT480	Database Management Systems Lab	PCC	-	-	2	1
AUDIT COURSE						
Total			**17**	**1**	**6**	**21**

BS : Basic Science
HSS : Humanities and Social Science
ES : Engineering Science

L : Lecture
T : Tutorial
P : Practical

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

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

SCHEME OF EXAMINATIONS
(For the candidates admitted from 2022-23 onwards)

FOURTH SEMESTER

S.No.	Course Code	Name of the Course	Duration of Terminal Exam. in Hrs.	Marks			Minimum Marks for Pass	
				CA *	TE **	Max. Marks	Terminal Exam	Total
THEORY								
1	22IT410	Probability and Statistics	3	40	60	100	27	50
2	22IT420	Algorithm Design Principles	3	40	60	100	27	50
3	22IT430	Computer Networks	3	40	60	100	27	50
4	22IT440	Database Management Systems	3	40	60	100	27	50
5	22IT490	Project Management	3	40	60	100	27	50
THEORY CUM PRACTICAL								
6	22IT450	Programming for Internet of Things	3	50	50	100	25	50
PRACTICAL								
7	22IT470	Computer Networks Laboratory	3	60	40	100	18	50
8	22IT480	Database Management Systems Lab	3	60	40	100	18	50

* CA evaluation pattern will differ from course to course and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.

22IT410	PROBABILITY AND STATISTICS

Category	L	T	P	Credit
BSC	3	1	0	4

Preamble

The main objective of this course is to provide students with the foundations of probabilistic and statistical analysis mostly used in varied applications in engineering and science computer networks. Statistical methods are important tools which provide the engineers with both descriptive and analytical methods for dealing with the variability in observed data. This course introduces students to cognitive learning in statistics and develops skills on analyzing the data by using different tests and designing the experiments with several factors.

Prerequisite

Basics of Probability and Statistics.

Course Outcomes

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

COs		TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Identify mathematical expectation, probability mass/density functions, entropy	TPS2	75	70
CO2	Compute the conditional probability using Baye's theorem or compute the probability for the defined distributions	TPS3	70	65
CO3	Apply the concept of correlation and regressions to solve engineering problems	TPS3	70	65
CO4	Apply the concepts of large/small sample tests into real life problems.	TPS3	70	65
CO5	Use the appropriate non parametric hypothesis testing procedures based on inferences to solve the problem under study.	TPS3	70	65
CO6	Design and conduct of engineering experiments involving a single factor, two factors and three factors.	TPS3	70	65

Mapping with Programme Outcomes

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	**M**	**L**									**M**	**L**		**M**
CO2	**S**	**M**	**L**								**M**	**M**		**M**
CO3	**S**	**M**	**L**								**M**	**M**		**M**
CO4	**S**	**M**	**L**								**M**	**M**		**M**
CO5	**S**	**M**	**L**								**M**	**M**		**M**
CO6	**S**	**M**	**L**								**M**	**M**		**M**

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	Assessment 1						Assessment 2						Terminal		
	CAT 1			Assignment 1			CAT 2			Assignment 2					
TPS	1 10	2 30	3 60	1 -	2 -	3 100	1 10	2 30	3 60	1 -	2 -	3 100	1 -	2 30	3 70
CO1	10	20	-	-	-	-	-	-	-	-	-	-	-	15	-
CO2	-	10	28	-	-	50	-	-	-	-	-	-	-	3	16
CO3	-	-	32	-	-	50	-	-	-	-	-	-	-	3	13
CO4	-	-	-	-	-	-	10	20	20	-	-	50	-	9	16
CO5	-	-	-	-	-	-	-	-	20	-	-	20	-	-	10
CO6	-	-	-	-	-	-	-	10	20	-	-	30	-	-	15
TOTAL	10	30	60	-	-	100	10	30	60	-	-	100	-	30	70

TUTORIALS: PROGRAM USING R-PROGRAMMING/PYTHON

ASSIGNMENT II – CASE STUDY

Syllabus

PROBABILITY DISTRIBUTIONS: Conditional probability -Bayes‟ theorem- Random variables - Probability distribution for Discrete random variable, The cumulative distribution function - Expected Value, Expected value of a function, Rules of Expectation, The variance of X, Rule of variance. The Binomial Distribution, The Poisson Distribution, Continuous random variables and Probability Distributions- Probability Density Functions – Probability distribution for continuous variable - Cumulative distribution function and Expected Values - The Normal Distribution, Jointly Distributed Random Variables – Two discrete Random Variables – Independent random variables, Continuous distributions - Expected Values, Covariance, Correlation. Entropy - Entropy as Uncertainty - Systems and States - The Boltzmann-Planck Entropy - The Boltzmann-Gibbs-Shannon Entropy

STATISTIS: Linear correlation - Bivariate Correlation -Rank correlation- Linear Regression - Multiple and partial correlations

TEST OF HYPOTHESIS: Hypotheses and Test Procedures, Test about Population Mean, Test Concerning Population proportion, P – Values – P-values for z-test, P-values for t-test. z-test and confidence interval for difference between two population means, The two sample t-test and confidence interval, Inference concerning a difference between two population proportion – A large sample test procedure, Inference concerning two population variance – F distribution – P values for F distribution – Confidence Interval, Goodness of fit: Chi-square distributions.

NON-PARAMETRIC STATISTICS: Introduction- Signed rank test - Wilcoxon rank sum test - Kruskal Wallis test - Runs test

The Analysis of Variance: Single-Factor ANOVA - Two-Factor ANOVA - Three-Factor ANOVA.

Text Book

1. Jay L. Devore, “Probability and Statistics for Engineering and the Sciences” (English) 9th Edition, Cengage Learning India Pvt Ltd, New Delhi, 2012.
2. John D Ramshaw, “The Statistical foundations of Entrophy”, Worlds Scientific Publishing Co. Pte. Ltd
3. Ronald E. Walpole, Sharon L. Myers, Keying Ye, “Probability & Statistics for Engineers and Scientists”, 9th Edition, Pearson Education, New Delhi, 2012.

4. S. C. Gupta & V. K. Kapoor, “Fundamentals of Mathematical Statistics”, Sultan Chand and Sons, New Delhi.

Reference Books & web resources

Mendenhall William, “Introduction to Probability and Statistics”, 14th Edition, Duxbury Press, New Delhi, 2012.

Richard A. Johnson, Irwin Miller, John Freund, “Miller & Freund's Probability and Statistics for Engineers”, 8th Edition, Pearson, 2015

Course Contents and Lecture Schedule

Module No.	Topic	No. Of Periods
1	**PROBABILITY DISTRIBUTIONS:**	
1.1	Conditional probability -Bayes" theorem	1
1.2	Random variables - Probability distribution for Discrete random variable, The cumulative distribution function	1
	Tutorial	1
1.3	Expected Value, Expected value of a function, Rules of Expectation, The variance of X, Rule of variance.	1
1.4	The Binomial Distribution	1
1.5	The Poisson Distribution	1
	Tutorial	1
1.6	Continuous random variables and Probability Distributions- Probability Density Functions – Probability distribution for continuous variable	1
1.7	Cumulative distribution function and Expected Values	1
1.8	The Normal Distribution	1
	Tutorial	1
1.9	Jointly Distributed Random Variables – Two discrete Random Variables – Independent random variables, Continuous distributions	1
1.10	Expected Values, Covariance, Correlation	1
1.11	Entropy - Entropy as Uncertainty - Systems and States - The Boltzmann-Planck Entropy - The Boltzmann-Gibbs-Shannon Entropy	2
	Tutorial	1
2	**STATISTICS**	
2.1	Linear correlation	2
2.2	Bivariate Correlation	1
	Tutorial	1

Module No.	Topic	No. Of Periods
2.3	Rank correlation	1
2.4	Linear Regression	1
2.5	Multiple and partial correlations	1
	Tutorial	1
3	**TEST OF HYPOTHESIS**	
3.1	Hypotheses and Test Procedures	1
3.2	Test about Population Mean, The one sample t-test	1
3.3	Test Concerning Population proportion	1
	Tutorial	1
3.4	P – Values – P-values for z-test, P-values for t-test.	1
3.5	z-test and confidence interval for difference between two population means	1
3.6	The two sample t-test and confidence interval	1
	Tutorial	1
3.7	Inference concerning a difference between two population proportion – A large sample test procedure	1
3.8	Inference concerning two population variance – F distribution – P values for F distribution – Confidence Interval	1
3.9	Goodness of fit: Chi-square distributions.	1
	Tutorial	1
4	**NON-PARAMETRIC STATISTICS:**	
4.1	Introduction- Signed rank test	1
4.2	Wilcoxon rank sum test	1
4.3	Kruskal Wallis test	1
4.4	Runs test	1
	Tutorial	1
5	**THE ANALYSIS OF VARIANCE**	
5.1	Single-Factor ANOVA	1
5.2	Two-Factor ANOVA	2
	Tutorial	1
5.3	Three-Factor ANOVA.	2

Module No.	Topic	No. Of Periods
	Tutorial	1
	Total	48

Course Designer(s):

1. Ms. H Sri Vinodhini, Assistant Professor of Mathematics, srivinodhini@tce.edu
2. Dr. P. Victor, Assistant Professor of Mathematics, pvmat@tce.edu
3. Dr. P. Krishnapriya, Assistant Professor of Mathematics, pkamat@tce.edu

22IT420	ALGORITHM DESIGN PRINCIPLES

Category	L	T	P	Credit
PCC	3	0	0	3

Preamble

This course aims at explaining how to identify, formulate and solve real world engineering problems that require usage of algorithms with emphasis on design and analysis based on asymptotic notations. Upon completion of this course, they will be able to constructing efficient algorithms for solving engineering problems by using various algorithm design paradigms and data structures.

Prerequisite

Data structures

Course Outcomes

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

CO Number	Course Outcome Statement	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Analyze the best case, worst case and average case running time of algorithms using Asymptotic notation.	TPS4	A	60
CO2	Identify the appropriateness of brute force approach for the problems like sorting, searching etc.	TPS3	A	70
CO3	Develop algorithms to solve computational problems using design paradigms like divide and conquer, greedy and dynamic programming.	TPS3	A	70
CO4	Construct algorithms using design paradigms like Backtracking and branch and bound for a given problem.	TPS3	A	70
CO5	Make use of the complexity classes like NP-Complete, NP-hard and develop polynomial reductions for the real world problems	TPS3	A	70
CO6	Examine the appropriate design scenario and algorithmic design paradigms based on the application requirements.	TPS4	A	60

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	M	L									L		
CO2	S	S	M	L									S		
CO3	S	S	S	M	L	L						M	S	L	
CO4	S	S	S	M	L	L						M	S	L	
CO5	S	S	S	S	L	M						M	S		

CO6	S	S	S	S	S	M		L	M	M	L	M	S	S	M

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	Theory								Theory								Terminal			
	CAT1				Assignment 1				CAT2				Assignment 2							
TPS Scale	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
CO1	5	10	5	10				50	5		10					30	2	5		10
CO2	5	5	5						-	-	-	-					2	5	6	
CO3	5	5	35				30		-	-	-	-					2	5	19	
CO4	-	-	-	-					10	10	35						2	5	12	
CO5	-	-	-	-					5	5	10						2		13	
CO6				10				20				10				70				10

*****Terminal examination should cover all Course Outcomes in the appropriate TPS Scale level.

Syllabus

Algorithms: Fundamentals of Algorithmic Problem Solving – Analysis of Algorithm Efficiency – Running time analysis - Asymptotic Notations: O (Big-Oh), Θ (theta), Ω (Omega) Notations - Worst case and average case complexity - Mathematical analysis for Recursive and Non-recursive algorithms.

Brute force Approach: Sorting: Selection sort, Bubble sort, Insertion sort – Searching: Sequential search - Depth First and Breadth First Search

Divide-and-conquer: Divide and conquer methodology – Solving Recurrence relation using recurrence trees, repeated substitution, master theorem – Sorting: Quick sort, Merge sort– Binary search – Multiplication of Large Integers – Strassen's Matrix Multiplication.

Greedy technique: Greedy choice - minimum spanning trees - Prim's algorithm - Kruskal's Algorithm - Dijkstra's Algorithm- fractional knapsack and Huffman coding

Dynamic programming: Computing a Binomial Coefficient –Warshall's and Floyd's algorithm – Integral knapsack (contrasted with the fractional variant) - longest increasing subsequence - matrix chain multiplication- Memory functions.

Backtracking: n-Queens problem – Hamiltonian Circuit Problem – Subset Sum Problem - Case study: Solving Sudoku, Cross word Puzzle, m-coloring problem.

Branch and bound: Assignment problem – Knapsack Problem – Travelling Salesman Problem.

Limitations of algorithm power: Classes P, NP, NP-complete - NP-completeness: reduction amongst problems: Knapsack problem, Traveling salesman Problem, Satisfiability Problem.

Text Book

1. Anany Levitin, “Introduction to the Design and Analysis of Algorithms”, Pearson Education, Third Edition, 2012.

Reference Books& web resources

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, “Introduction to Algorithms”, PHI Learning Private Limited, Third Edition, 2012.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, “Data Structures and Algorithms”, Pearson Education, Reprint 2006.
3. S.Sridhar, “Design and Analysis of Algorithms”, Oxford University Press, 2014.
4. Design And Analysis of Algorithms - http://nptel.ac.in/courses/106101060/
5. Design And Analysis of Algorithms - https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-design-and-analysis-of-algorithms-spring-2015/

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours
1	**Algorithms (5)**	
1.1	Fundamentals of Algorithmic Problem Solving	1
1.2	Analysis of Algorithm Efficiency – Running time analysis	2
1.3	Asymptotic Notations - O(Big-Oh), Θ (theta), Ω (Omega) Notations, Worst case and average case complexity	1
1.4	Mathematical analysis for Recursive and Non-recursive algorithms	1
2	**Brute Force Approach (4)**	
2.1	Sorting : Selection sort, Bubble sort, Insertion sort	2
2.2	Searching: Sequential search	
2.3	Breadth First Search	1
2.4	Depth First Search	1
3	**Divide-and-conquer (6)**	
3.1	Solving Recurrence relation using recurrence trees, repeated substitution	1
3.2	Master theorem	1
3.3	Sorting: Quick sort, Merge sort	1
3.4	Binary search	1
3.5	Multiplication of Large Integers	2
3.6	Strassen’s Matrix Multiplication.	
4	**Greedy technique(4)**	
4.1	Greedy choice	2
4.2	Minimum spanning trees - Prim’s algorithm, Kruskal's Algorithm	
4.3	Dijkstra's Algorithm	1
4.4	Fractional knapsack and Huffman coding	1

5	**Dynamic programming (6)**	
5.1	Computing a Binomial Coefficient	1
5.2	Warshall's and Floyd algorithm	1
5.3	Integral knapsack (contrasted with the fractional variant)	1
5.4	Longest increasing subsequence	1
5.5	Matrix chain multiplication, Memory functions	1
	Case study on Greedy and Dynamic programming techniques	1
6	**Backtracking (4)**	
6.1	n-Queens problem	1
6.2	Hamiltonian Circuit Problem	1
6.3	Subset Sum Problem	1
6.4	Case study: Solving Sudoku, Cross word Puzzle, m-colouring problem	1
7	**Branch and bound (3)**	
7.1	Assignment problem	1
7.2	Knapsack Problem	1
7.3	Travelling Salesman Problem	1
8	**Limitations of algorithm power (4)**	
8.1	Classes P, NP, NP-complete	1
8.2	NP-completeness: reduction amongst problems: Knapsack problem, Traveling salesman Problem	2
8.3	Satisfiability Problem	1
	Total	36

Course Designers:

1. Dr.S.Padmavathi, Professor, IT Department spmcse@tce.edu
2. Mrs.P.Vijaya Praba Assistant Professor, IT Department pvpit@tce.edu

22IT430	COMPUTER NETWORKS

Category	L	T	P	Credit
PCC	3	0	0	3

Preamble

The domain of Internet has grown in a rapid pace from traditional circuit switched and packet switched small scale networks to modern high-speed mobile and wireless Internet. The broad objectives of the course on computer networks are to explore (i) the architecture and principles of computer networks, (ii) the protocols and their functionalities, (iii) the requirements for the future Internet and its impact on the computer network architecture.

Prerequisite

Nil

Course Outcomes

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

S.No	Course Outcomes	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Explain the general principles of data communication and describe how computer networks are organized with the concept of layered approach.	TPS2	A	80
CO2	Simulate Flow control, Error control and Access control techniques at the Data link layer	TPS3	B	70
CO3	Design logical sub-address blocks with a given address block and implement various routing protocols at the Network Layer	TPS3	B	70
CO4	Interpret the various fields of TCP and UDP datagrams and implement protocols for reliable/unreliable, connection oriented/ connectionless services at Transport layer	TPS3	B	70
CO5	Demonstrate the usage of various congestion control mechanisms to improve quality of service of the given network.	TPS3	B	70
CO6	Explain the working principle of various application layer protocols such as HTTP, FTP, DNS, SMTP, Telnet, Rlogin, SNMP etc.,	TPS2	A	80

Mapping with Programme Outcomes

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1.	M	L										L	M		
CO2.	S	M	L			L	L					L	S	L	L
CO3	S	M	L			L	L					L	S	L	L
CO4	S	M	L			L	L					L	S	L	L
CO5	S	M	L			L	L					L	S	L	L
CO6	M	L										L	M		

Assessment Pattern

CO	CAT1			CAT2			Assignment -1			Assignment -2			Terminal		
TPS Scale	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
CO1	10	10												5	
CO2	5	10	25						50				5	5	15
CO3	5	10	25						50				5	5	15
CO4				10	10	25						40	5	5	10
CO5				5	10	25						40	5	5	10
CO6				5	10						20			5	

***** Terminal examination should cover all Course Outcomes in the appropriate TPS Scale level.

Syllabus

Basics of Computer Networking: Layered Network Protocol Architectures –ISO/OSI, TCP/IP. Personal, Local, Metropolitan and Wide Area Networks, Components -NIC, Switches, Bridges, Hub and Routers, Topologies

Physical Layer: Digital and Analog Signals, Encoding and Decoding, Analog and Digital data Transmission techniques, Multiplexing, Spread spectrum.

Data Link Layer: Framing, Error control - Bit-parity, CRC, Checksum and Hamming Codes; Flow Control - Stop-and-Wait, Go-back-N, Selective Repeat. Performance analysis of ARQ protocols, Access Control -ALOHA, CSMA, CSMA-CD, CSMA-CA, Reservation, Polling Example protocols such as HDLC and PPP, ARP and RARP

Network Layer: Internet Protocol (IP) suite, IPv4 and IPv6 addressing and headers; Routing protocols- distance-vector and link-state approaches, Interior and Exterior Gateway Protocol concepts; Routing Algorithms - Dijkstra's algorithm and distributed Bellman-Ford algorithm; Example protocols: OSPF, RIP, BGP.

Transport Layer: Reliable end-to-end transmission protocols; UDP header; Details of TCP header and operation including options headers and congestion control; TCP variants such as Reno, Tahoe, Vegas, Compound and CUBIC.

Application Layer: Socket Interface and Socket programming; Example protocols such as DNS, SMTP, FTP, and HTTP.

Text Book

1. Behrouz A.Foruzan, “Data Communication and Networking”, McGraw Hill Education, Fifth Edition, 2017

Reference Books & web resources

1. Larry L.Peterson and Bruce S. Davie, “Computer Networks – A systems Approach” Fifth Edition, Elsevier, 2019
2. James F. Kurose, Keith W. Ross , “Computer Networking: A Top-Down Approach “, Sixth Edition, Pearson, 2012.
3. NPTEL Course on Computer Networks by IIT-Kharagpur - http://nptel.ac.in/video.php?subjectId=106105081

4. Cisco network fundamentals - http://ptgmedia.pearsoncmg.com/images/9781587132087/samplepages/1587132087.pdf

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Basics of Computer Networking:**	
1.1	Layered Network Protocol Architectures –ISO/OSI, TCP/IP.	3
1.2 1.3	Personal, Local, Metropolitan and Wide Area Networks, Components -NIC, Switches, Bridges, Hub and Routers, Topologies	1
2	**Physical Layer:**	
2.1	Digital and Analog Signals, Encoding and Decoding	2
2.2	Analog and Digital data Transmission techniques	2
2.3	Multiplexing, Spread spectrum.	2
3	**Data Link Layer**	
3.1 3.2	Framing Error Detection – Bit Parity, CRC, Checksum	2
3.3	Error Correction – Hamming Code	1
3.4	Flow Control - Stop-and-Wait, Go-back-N, Selective Repeat.	3
3.5	Access Control - ALOHA, CSMA, CSMA-CD, CSMA-CA, Reservation, Polling	3
3.6	Example protocols such as HDLC and PPP, ARP and RARP	1
4	**Network Layer**	
4.1	Internet Protocol (IP) suite	1
4.2	IPv4 and IPv6 addressing and headers;	2
4.3	Routing protocols- distance-vector and link-state approaches,	1
4.4	Interior and Exterior Gateway Protocol concepts; Routing Algorithms - Dijkstra's algorithm and distributed Bellman-Ford algorithm;	2
4.5	Example protocols: OSPF, RIP, BGP.	1
5	**Transport Layer**	
5.1	Reliable end-to-end transmission protocols; UDP header;	1
5.2	Details of TCP header and operation including options headers	1
5.3	Congestion Control	2
6	**Application Layer**	
6.1	Socket Interface and Socket programming	3
6.2	Example protocols such as DNS, SMTP, FTP, HTTP Telnet,	2

Module No.	Topic	No. of Periods
	Rlogin, SNMP	
	Total	36

Course Designer(s):

1. S.Muthuramalingam, Professor, Department of Information Technology , smrit@tce.edu
2. C.Jeyamala, Associate Professor, Department of Information Technology, jeyamala@tce.edu

22IT440	DATABASE MANAGEMENT SYSTEMS

Category	L	T	P	Credit
PCC	3	0	0	3

Preamble

This course facilitates the student to understand the various functionalities of Database Management Systems such as the creation, maintenance, and manipulation of Databases for real-world applications. The course also emphasizes the need for the design of database systems with normalization and provides in-depth coverage of various principles of database systems.

Prerequisite

Nil

Course Outcomes

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

COs	Course Outcomes	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Explain Database system concepts, architecture, and its environment.	TPS2	70	90
CO2	Implement SQL queries for the given ER Model/scenario.	TPS3	70	80
CO3	Construct PL/SQL program to perform various Query operations for a given database.	TPS3	70	80
CO4	Apply normalization techniques for the database design.	TPS3	70	80
CO5	Apply concurrency control, transaction processing, Recovery techniques, and file indexing for the given scenario	TPS3	70	80
CO6	Build a NoSQL model for real-world application.	TPS3	70	80

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO12	PSO1	PSO2	PSO3
CO1	M	L											L		
CO2	S	M	L		S			M	M	M		L	M	M	M
CO3	S	M	L		S			M	M	M		L	M	M	M
CO4	S	M	L									L	M		L
CO5	S	M	L									L	M		L
CO6	S	M	L		S			M	M	M		S	M	M	M

S- Strong; M-Medium; L-Low

Assessment Pattern

CO		CAT1			Assignment -I			CAT2			Assignment - II			Terminal					
TPS Scale		**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**4**	**5**	**6**
CO1		10	10											5	10				
CO2		5	5	30			50							5		15			
CO3		5	5	30			50							5		15			
CO4								5		15			30		10				
CO5								5	15	30			40	5		15			
CO6								5	10	15			30			15			

***** Terminal examination should cover all Course Outcomes in the appropriate TPS Scale level.

Syllabus

Databases and Databases Users: Characteristics of the Database Approach- Database Users-Actors on the scene, workers behind the scene.

Database Systems Concepts and Architecture-Data models, Schemas and Instances, -Three Schema Architecture and Data Independence-Database Languages and Interfaces-Database System environment, Centralized and Client/Server Architectures for DBMSs-Classification of Database Management Systems

Data Modeling: Relational Algebra, Relational Data Model -Entity Relationship (ER) Model, Entity Types, Entity Sets, Attributes, Types of Keys, Relationship Types, Structural Constraints- -Enhanced ER Model - Introduction

Database query language: Basic SQL: Data types –Types of Constraints, Views, Complex Queries – Joins, string, date, and correlated subquery- PL/SQL –Cursor, Trigger, Procedure, Function, Exception and Package

Database Design Theory and Normalization: Functional Dependencies-Normal forms based on Primary keys-2NF-3NF-Boyce Codd Normal Form-Multivalued dependencies and Fourth Normal Form-Join dependencies and Fifth Normal Form.

File Organization: Indexing - B+tree

Transaction Processing - ACID Properties – Schedules – Serializability – Transaction support in SQL

Concurrency control -Need for Concurrency – Concurrency control –Two-Phase Locking-Timestamp – Multiversion – Validation and Snapshot isolation– Multiple Granularity locking

Recovery – Recovery based on deferred and immediate update – Shadow paging

NoSQL Database – CAP Theorem – Document-Based systems – MongoDB - Key value Stores –-Column-Based Systems – Graph Databases.

Text Book

1. Ramez Elmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, Seventh Edition, Pearson Education, 2017
2. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, “Database System Concepts”, Seventh Edition, McGraw Hill, 2020

Reference Books & web resources

1. C.J.Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Databases and Databases Users:** -	
1.1	Characteristics of the Database Approach	1
1.2	Database Users-Actors on the scene, workers behind the scene	
2	**Database Systems Concepts and Architecture**	
2.1	Data models, Schemas and Instances	1
2.2	Three Schema Architecture and Data Independence	
2.3	Database Languages and Interfaces-Database System environment	1
2.4	Centralized and Client/Server Architectures for DBMSs	
2.5	Classification of Database Management Systems	1
3	**Data Modeling**	
3.1	Relational Algebra	1
3.2	Relational Data Model	1
3.3	Entity Relationship (ER) Model, Entity Types, Entity Sets, Attributes	
3.4	Types of Keys, Relationship Types	1
3.5	Structural Constraints- -Enhanced ER Model - Introduction	1
4	**Database query language**:	
4.1	Basic SQL: Data types –Types of Constraints	1
4.2	Views	1
4.3	Complex Queries - Joins, string, date, and correlated subquery	2
4.4	PL/SQL - Cursor, Trigger	2

Module No.	Topic	No. of Periods
4.5	Procedure, Function	1
4.6	Exception and Package	1
5	**Database Design Theory and Normalization**:	
5.1	Functional Dependencies-Normal forms based on Primary keys	1
5.2	2NF-3NF- Boyce Codd Normal Form	1
5.3	Multivalued dependencies and Fourth Normal Form	1
5.4	Join dependencies and Fifth Normal Form	1
6	**File Organization**	
6.1	Indexing : B+tree	1
7	**Transaction Processing**	
7.1	ACID Properties – Schedules	1
7.2	Serializability	2
7.3	Transaction support in SQL	1
8.	**Concurrency control**	
8.1	Need for Concurrency – Concurrency control	1
8.2	Two-Phase Locking- Timestamp	1
8.3	Multiversion – Validation and Snapshot isolation	1
8.4	Multiple Granularity locking	1
9.	**Recovery**	
9.1	Recovery based on the deferred and immediate update	1
9.2	Shadow paging	1
10	**NOSQL Database**	
10.1	CAP Theorem – Document-Based systems – MongoDB	2
10.2	Key value Stores	1
10.3	Column-Based Systems – Graph Databases	2
	Total	36

Course Designer(s):

1. Dr.S.Sridevi, Associate Professor, Department of IT sridevi@tce.edu
2. Dr.K.V.Uma, Assistant Professor, Department of IT kvuit@tce.edu

22IT450	PROGRAMMING FOR INTERNET OF THINGS

Category	L	T	P	Credit
ESC	2	0	2	3

Preamble

This course focuses on understanding different architectures used for connecting devices to the internet across multiple networks and protocols in the Internet of Things environment. It also aims at giving the students a platform to sense, connect and actuate things through powerful interfaces and programs. The course familiarizes the students with methodologies and tools in IoT, and how it is integrated into Cloud Deployment platform for Business applications.

Prerequisite

NIL

Course Outcomes

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

CO	Course Outcome	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Explain the different types of Architecture Models and Communication Protocols in IoT	TPS2	80	70
CO2	Practice Programming language –in Arduino and Raspberry Pi to build a real-time automation application	TPS3	70	70
CO3	Use different types of Sensors and Actuators to build an automation application.	TPS3	70	70
CO4	Make use of different communication technologies like MQTT, REST and JSON to interface with web and mobile application.	TPS3	70	70
CO5	Experiment with Cloud Deployment platforms from hyperscalers to sense, monitor and visualize the data through Web Server.	TPS3	70	70
CO6	Examine different domain-based application practices to solve Business needs with IoT applications.	TPS3	70	70

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L					M						L		L
CO2	S	M	L		S			M	M	M		M	M	M	L
CO3	S	M	L		S			M	M	M		M	M	M	L
CO4	S	M	L		S			M	M	M		M	M	M	L
CO5	S	M	L		S			M	M	M		M	M	M	L
CO6	S	M	L		S			M	M	M		M	M	M	L

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	Theory							Terminal		
	CAT			Model Test			OCR	(Theory)		
TPS Scale	1	2	3	1	2	3		1	2	3
CO1	10	-		-	-	-	-	-	-	10
CO2	20	10	-	-	-	20	20	-	-	10
CO3	20	10	-	-	-	20	20	-	-	20
CO4	-	20	-	-	-	20	20	-	-	20
CO5	-	10	-	-	-	20	20	-	-	20
CO6	-	-	-	-	-	20	20	-	-	20

***** Terminal examination should cover all Course Outcomes in the appropriate TPS Scale level.

Syllabus

Internet of Things: Origin and Architecture: Evolution - Internet of Things - reference architecture-Network Architecture-Device Architecture-Publish-Subscribe architecture-Industry4.0-RAMI.

IoT Communication Protocols: Wired Communication Protocols-Wireless Communication Protocols-Application Protocols - Transport layer protocols – TCP vs UDP, IP- IPv4 vs IPv6, MQTT vs AMQP, NETCONF vs RESTCONF.

Programming for IoT: Microcontrollers: C++ - Arduino, Microprocessors: Python - Raspberry Pi

Sensors and Actuators: Types of Sensors: Domain-Based Sensor, Gesture Tracking Sensors, Wearables, Drones, GPS, Types of Actuators: Drives & Motion Control/Pneumatics.

Communication Devices: Bluetooth, GSM (Twilio), Web/Mobile Application-Comparison of Development Boards, Lora.

Integration with Cloud: Wi-Fi – Node MCU-Web Server - Data Acquisition-Send/Receive Data-Remote Data Monitoring-Visualization.

IoT Platforms and Use case: Microsoft Azure, AWS, GCP, IBM Watson, Node-Red.
Use Case: Fleet Services-Financial Services-Dairy Farming- Fitness Trackers-IoT Connected Cars-Retail-Tourism-Logistics-Biometrics.

Text Book

1. Internet Of Things, Shriram K Vasudevan, Abhishek S Nagarajan, RMD Sundaram, 2020
2. The Internet of Things: Enabling Technologies, Platforms, and Use Cases, Pethuru Raj, Anupama C. Raman, Auerbach Publications; 1st edition, 2017

Reference Books & web resources

1. Internet Of Things - A Hands-On Approach, Arsheep Bahga, Vijay Madisetti, 2015
2. http://www.instructables.com/

3. https://aws.amazon.com/iot/
4. https://azure.microsoft.com/en-in/services/iot-hub/
5. https://www.ibm.com/cloud/internet-of-things

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Internet of Things**	
1.1	Origin and Architecture: Evolution	1
1.2	Internet of Things reference architecture	
1.3	Network Architecture	1
1.4	Device Architecture-Publish-Subscribe architecture	
1.5	Industry4.0-RAMI	1
1.6	**IoT Communication Protocols**	
1.7	Wired Communication Protocols	1
1.8	Wireless Communication Protocols	
1.9	Application Protocols	1
1.10	Transport layer protocols	
1.11	TCP vs UDP, IP- IPv4 vs IPv6	1
1.12	MQTT vs AMQP, NETCONF vs RESTCONF	1
2	**Programming for IoT**	
2.1	Microcontrollers: C++ - Arduino	1
2.2	Microprocessors: Python - Raspberry Pi	1
3	**Sensors and Actuators**	
3.1	Types of Sensors: Domain Based Sensor	1
3.2	Gesture Tracking Sensors	1
3.3	Wearables, Drones, GPS	1
3.4	Types of Actuators	1
4	**Communication Devices**	
4.1	Bluetooth, GSM (Twilio)	2
4.2	Web/Mobile Application	
4.3	Comparison of Development Boards	1
4.4	LoRA	3
5	**Integration with Cloud**	
5.1	Wi-Fi	1
5.2	NodeMCU-Web server	1
5.3	Data acquisition-Send/Receive Data	1
5.4	Remote Data Monitoring-Visualization	
6	**IoT Platforms and Use Case**	
6.1	Microsoft Azure, AWS,GCP,BM Watson , Node-Red	1
6.2	Use Case: Fleet Services-Financial Services	
6.3	Dairy Farming- Fitness Trackers-IoT Connected Cars	1
6.4	Retail-Tourism-Logistics-Biometrics	
	Total	24

List of Experiments:

The List of experiments can be applied to any domain inclusive of Industry 4.0,Health, Agriculture, Finance, Tourism, Connected Cars.

S.No	Topic	No. of Periods
1.	Implement Automation Projects using Tinker Cad.	1
2.	Installation of Arduino Ide and Environment Setup – Introduction to basic Actuators – LEDS, Buzzers	2
3.	Home Automation Sensors - Gas Sensor, Servo motor, PIR Sensor	2
4.	Medical Sensors – Pulse sensor, Temperature sensor	2
5.	Measurement Sensors - Ultrasonic Sensor, vibration sensor, flex sensor, Force sensor, IR Sensor,	2
6.	Agriculture-based sensor - Moisture sensor, Water level sensor, DHT sensor, turbidity sensor	2
7.	Communication Devices – Bluetooth, GSM, GPS	2
8.	Smart Lighting implementation using LoRa	3
8.	WiFi Module – Node MCU- integrate with sensors and actuators	2
9.	Installation of OS in Raspberry pi and programming in pi	1
10.	Interfacing sensor with Raspberry Pi, PI Camera	2
11.	Communication devices with Raspberry Pi – RFID	1
12.	Data collection using sensors and Retrieving Data From Cloud(Wi-Fi)	1
13.	Use any Online IoT Platform along with Node-Red	1
		24

Course Designer(s):

1. Dr.K. Indira, kiit@tce.edu
2. Ms.C.V. Nisha Angeline, cvnait@tce.edu

22IT490	PROJECT MANAGEMENT

Category	L	T	P	Credit
HSMC	3	0	0	3

Preamble

This course provides a comprehensive overview of the principles, processes, and practices of software project management. This course leverages essential knowledge, techniques and skills required to successfully manage projects of any type and size.

Prerequisite

NIL

Course Outcomes

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

CO	COURSE OUTCOMES	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Explain the key components of a project plan	TPS2	70	80
CO2	Apply appropriate project planning and tracking tools	TPS3	70	70
CO3	Show the importance of a cost benefit analysis to the successful implementation of a project plan	TPS3	70	70
CO4	Interpret how to identify the lessons learned in a project closeout and review session	TPS2	70	80
CO5	Develop a project plan for the applications on Internet of Things, Society and Environment	TPS3	70	70
CO6	Apply suitable software project management technique for the given software project scenario	TPS3	70	70

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L									S		L		L
CO2	S	M	L		S						S		M		L
CO3	S	M	L								S			L	L
CO4	M	L									S	L			L
CO5	S	M	L		S	M	M	S	S	S	S	L	M	L	L
CO6	S	M	L						S	S	S		M		S

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	Theory						Theory						Terminal		
	CAT 1			Assignment 1			CAT 2			Assignment 2			Theory		
TPS Scale	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
CO1	10	10	-	-	-		-	-	-	-	-	-	5	5	
CO2	5	20	10	-	-	50	-	-	-	-	-	-	5	5	
CO3	5	20	20	-	-	50	-	-	-	-	-	-	5	5	20
CO4	-	-	-	-	-	-	10	10	-	-	-	-		5	
CO5	-	-	-	-	-	-	5	20	10	-	-	50	5	5	10
CO6	-	-	-	-	-	-	5	20	20	-	-	50		5	20

*****Terminal examination should cover all Course Outcomes in the appropriate TPS Scale level.

Syllabus

Project- Project Life cycle- Process Group-Project Management Software.

Project Initiation Phase – Scoring Matrix – Project Charter – Role of charter – Creation of charter – Role of stakeholder – Identification of stakeholders– Stakeholders register and management strategy – Ranking the Stakeholder

Project Planning Phase - Requirement Process Collection – Project Scope – Work break down structure– Define activities –Milestones Estimate activity resources – Activity durations – Plan risk management – Identify and rank risks –Risk response plan – Risk contingency plan – Plan quality management –Quality roles and responsibilities – Define project quality – Measure project quality – Quality control – Quality management plan – Human resource plan – Communication management plan

Project cost estimation - Analogous estimation – Parametric – Three-point method – WBS method – Project Management Tools & Strategies – PERT, CPM and GANNT

Project Execution Phase – Project staffing assignment – Project Manager Team assessment – Team feedback – Task distribution – Create issue logs

Project Monitoring, Controlling and Closing Phase – Cost and Schedule variance Analysis –Work Performance Results – Change control – Quality Control – Risk register update – Lesson Learned

Software Project Management – Software Metrics-Metrics Analysis Report-Version Change Control- Risk management - Quality management and assurance–Software Maintenance-Cost estimation –COCOMO model –Function Point Analysis- SDLC Auditing– Case study - Software management tools and techniques

Text Book

2. Warburton. R &Kanabar. V, The Art and Science of Project Management, RW Press, RI, Second Edition, 2016.
3. Project Management Institute. 2021. A Guide to the Project Management Body of Knowledge (PMBOK Guide). 7th ed. Newton Square, PA: Project Management Institute.
4. Bob Hughes, Mike Cotterell, Software Project Management, Tata McGraw Hill, Third Edition, 2011.

5. Kanabar. V and Warburton, R, Fundamentals Project Management, Kaplan Press, New York, 2008.
6. Walker Royce, Software Project Management A Unified Framework, Pearson Education, 2004.
7. Pierre Bourque, Richard E. Fairley, and IEEE Computer Society. 2014. Guide to the Software Engineering Body of Knowledge (SWEBOK(R)): Version 3.0 (3rd. ed.). IEEE Computer Society Press, Washington, DC, USA.

Course Contents and Lecture Schedule

Module No	Topic	No. of Lecture Hours
1	**Introduction-Project**- Project Life cycle- Process Group	**1**
1.1	Project Management Software.	**1**
2	**Project Initiation Phase**	
2.1	Scoring Matrix	1
2.2	Project Charter – Role of charter – Creation of charter	1
2.3	Role of stakeholder – Identification of stakeholders	1
2.4	Stakeholders register and management strategy – Ranking the Stakeholder	1
3	**Project Planning Phase**	
3.1	Requirement Process Collection – Project Scope – Work breakdown structure	1
3.2	Define activities –Milestones - Estimate activity resources – Activity durations	1
3.3	Plan risk management – Identify and rank risks –Risk response plan – Risk contingency plan	2
3.4	Plan quality management –Quality roles and responsibilities – Define project quality – Measure project quality – Quality control – Quality management plan	2
3.5	Human resource plan – Communication management plan	1
4	**Project cost estimation**	
4.1	Analogous estimation – Parametric	1
4.2	Three point method – WBS method	1
4.3	Project Management Tools & Strategies – PERT, CPM and GANNT	3
5	**Project Execution Phase**	
5.1	Project staffing assignment – Project Manager Team assessment	1
5.2	Team feedback – Task distribution – Create issue logs	2
6	**Project Monitoring, Controlling and Closing Phase**	
6.1	Cost and Schedule variance Analysis	1
6.2	Work Performance Results – Change control	1
6.3	Quality Control – Risk register update	1
6.4	Lesson Learned	1
7	**Software Project Management**	
7.1	Software Metrics- Metrics Analysis Report - Version Change Control	2
7.2	Risk management	2
7.3	Quality management and assurance	1
7.3.1	Software Maintenance	1

7.4	Cost estimation – COCOMO model-	2
7.4.1	Function Point Analysis	
7.5	SDLC Auditing	2
	Total	**36**

Course Designer(s):

1.Dr.P.Karthikeyan,Asso.Professor,IT karthikit@tce.edu
2.S.Pudumalar,Asst.Professor,IT spmit@tce.edu

22IT470	COMPUTER NETWORKS LABORATORY

Category	L	T	P	Credit
PC	0	0	2	1

Preamble

The laboratory course on Computer Networks helps the students to gain practical understanding of networking concepts by simulating various protocols in GNS3 and LAN Trainer Kit. The course also enable the students to develop simple networking applications using Java based Socket programming. This course also includes hands-on exercises on packet capture and analysis.

Prerequisite

Nil

Course Outcomes

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

S.No	Course Outcomes	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Develop client server applications using Remote Method Invocation (RMI)	TPS3	B	70
CO2	Develop client server applications using Socket Programming	TPS3	B	70
CO3	Analyse the performance of different topologies of Local Area Networks under varying load conditions and node failure	TPS3	B	70
CO4	Perform packet capture and interpret the various fields in different layers of TCP/IP stack	TPS3	B	70
CO5	Implement protocols for error correction/detection and flow control.	TPS3	B	70
CO6	Perform configuration of DHCP, DNS, routing tables and firewalls	TPS3	B	70

Mapping with Programme Outcomes

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L		M			M		M		M	S	M	M
CO2	S	M	L		M			M		M		M	S	M	M
CO3	S	M	L		M			M		M		M	S	M	M
CO4	S	M	L		M			M		M		M	S	M	M
CO5	S	M	L		M			M		M		M	S	M	M
CO6	S	M	L		M			M		M		M	S	M	M

S- Strong; M-Medium; L-Low

S.No	List of Experiments	COs	No of Hours
Socket Programming			
1.	Develop a remote service request-response application using RMI	CO1	2
2.	Implement a simple file transfer protocol (FTP) using connection- oriented and connectionless sockets	CO2	2
3.	Develop a simple single client-server chatting application using (i) Connection-oriented and (ii) Connectionless sockets (Use Stream Mode Socket API and Datagram Socket API respectively)	CO2	2
4.	Extend the single client – single server chatting application developed using connection-oriented sockets to a multiple client – single server chatting application using threads	CO2	2
5.	Develop a multicast chatting tool that will be used to communicate among a multicast group	CO2	2
6.	Develop a concurrent server that spawns several threads, one for each client requesting a specific service	CO2	2
7.	Implement sliding window and stop and wait techniques to establish flow control between a sender and receiver	CO5	2
Configuration and Simulation Exercises			
8.	Basic Networking commands	CO3	1
9.	Simulate Distance vector routing with and without Node failure scenarios	CO5	1
10.	Simulate Link State routing with and without Node failure scenarios	CO5	1
11.	Simulate a LAN based on Ethernet with a minimum of ten nodes and examine the performance under different load scenarios	CO3	2
12.	Simulate Address Resolution and reverse address resolution	CO5	1
13.	Configuration of DHCP and DNS servers	CO6	2
Packet Capture and Analysis			
14.	Study of frame format of IP, TCP and UDP datagrams and Traffic analysis	CO4	2

- Socket Programming exercises may be carried out using networking capabilities of Java platform.
- Simulation Experiments may be carried out using GNS3 or Riverbed Modeler Academic edition/ LAN Trainer Kit
- Packet Analysis experiments may be carried out using Wireshark, Fiddler or Network Miner

Learning Resources

1. Harold, Elliotte Rusty. *Java network programming*. " O'Reilly Media, Inc.", 2004.
2. Kurose, James F. *Computer networking: A top-down approach featuring the internet, 3/E*. Pearson Education India, 2005.

3. Sanders, Chris. *Practical packet analysis: Using Wireshark to solve real-world network problems*. No Starch Press, 2017.

Course Designer(s):

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2. C.Jeyamala, Associate Professor, Department of Information Technology, jeyamala@tce.edu

22IT480	DATABASE MANAGEMENT SYSTEMS LAB

Category	L	T	P	Credit
PCC	0	0	2	1

Preamble

This course aims to provide a strong foundation in database design concepts and to provide adequate exposure to SQL and PL/SQL programming with the help of the Oracle RDBMS environment. It also deals with connecting the database to a programming language and thereby creating web applications for real-world scenarios.

Prerequisite

None

Course Outcomes

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

COs	Course Outcomes	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Design a database with integrity constraints and appropriate normal forms for real-world applications.	TPS3	80	90
CO2	Implement Data Manipulation Languages for a given application	TPS3	80	90
CO3	Apply complex SQL queries for a given application	TPS3	80	90
CO4	Apply various composite data types to execute PL/SQL block	TPS3	80	90
CO5	Implement Procedures, Functions, Triggers, Cursors, exceptions and Packages for the given application.	TPS3	80	90
CO6	Implement No SQL data model for a given application	TPS3	80	90

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L		M			M	M	M		M	M	M	M
CO2	S	M	L		M			M	M	M		M	M	M	M
CO3	S	M	L		M			S	M	M		S	M	M	M
CO4	S	M	L		M			S	M	M		M	M	M	M
CO5	S	M	L		M			S	M	M		S	M	M	M
CO6	S	M	L		S			S	M	M		S	M	M	M

S- Strong; M-Medium; L-Low

Assessment Pattern

Cognitive Levels	Model Examination	Terminal Examination
Remember		
Understand	20	20
Apply	80	80
Analyse		
Evaluate		
Create		

LIST OF EXPERIMENTS

S.No	List of Experiments	Cos	No.of Hours
1.	Identification of Mini Project and UI design	CO1	2
2.	Creation and Modification of relations	CO1	2
3.	Integrity constraint enforcement and simple SQL queries	CO1	2
4.	Creation and updation of views	CO2	2
5.	Complex SQL Queries -Date, String, Joins, Subquery	CO3	2
6.	Query tuning and Normalization	CO1	2
7.	PL/SQL block creation and usage of various composite data types	CO4	2
8.	Cursor management, Creation of Triggers and Exceptions in SQL	CO5	2
9.	Procedures, functions, and packages in PL/SQL	CO5	2
10.	Installation of MongoDb and creation of Collections	CO6	2
11.	Simple and Join Queries in MongoDb	CO6	
12.	Perform MongoDb Query and Projection operation	CO6	2
13.	Demonstrate Mini-Project as Web application	CO5	2
	Total		24

Course Designer(s):

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2. K.V.Uma, Assistant Professor, Department of IT kvuit@tce.edu

B. TECH INFORMATION TECHNOLOGY DEGREE PROGRAMME

SCHEDULING OF COURSES

&

CURRICULUM AND DETAILED SYLLABI

FOR

FIFTH SEMESTER

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2022-23 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING

(A Government Aided Autonomous Institution affiliated to Anna University)

MADURAI – 625 015, TAMILNADU

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Passed in Board of Studies Meeting on 27.4.2023 Approved in 65th Academic Council meeting on 27.05.2023

CREDIT DISTRIBUTION FOR STUDENTS ADMITTED IN THE YEAR 2022 ONWARDS

S.No	Category	Credits
A	Foundation Courses (FC)	54-62
	Humanities and Social Sciences including Management Courses (HSMC)	9-11
	Basic Science Courses (BSC)	24- 27
	Engineering Science Courses (ESC)	21 -27
B	Professional Core Courses (PCC)	55
C	Professional Elective Courses (PEC)	24 - 39
	Programme Specific Elective (PSE)	15 - 24
	Programme Elective for Expanded Scope (PEES)	9-15
D	Open Elective Courses (OEC)	6-12
	Interdisciplinary Elective (IE)	3-6
	Basic Science Elective (BSE)	3-6
E	Project work	12
F	Internship and Mandatory Audit Courses as per Regulatory authorities	Non-Credit (Not included for CGPA)
	Minimum Credits to be earned for the award of the Degree	160 (from A to E) and the successful completion of Mandatory Courses

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

COURSES OF STUDY
(For the candidates admitted from 2022-23 onwards)

FIFTH SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			credits
			L	T	P	
THEORY						
22IT510	Information security	PCC	3	-	-	3
22IT520	Machine Learning	PCC	3	-	-	3
22IT530	Cloud Computing	PCC	3	-	-	3
22ITPX0	Programme Elective	PEC	3	-	-	3
22XXBX0	Interdisciplinary Elective	IE	3	-	-	3
THEORY CUM PRACTICAL						
22IT550	Web Technologies	PCC	1	-	4	3
PRACTICAL						
22IT570	Information security Lab	PCC	-	-	2	1
22IT580	Cloud Computing Lab	PCC	-	-	2	1
PROJECT						
22IT590	Project I	PW	-	-	6	3
Total			**16**	**-**	**14**	**23**

BS : Basic Science
HSS : Humanities and Social Science
ESC : Engineering Science

L : Lecture
T : Tutorial
P : Practical

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

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

SCHEME OF EXAMINATIONS
(For the candidates admitted from 2022-23 onwards)

FIFTH 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	22IT510	Information security	3	40	60	100	27	50
2	22IT520	Machine Learning	3	40	60	100	27	50
3	22IT530	Cloud Computing	3	40	60	100	27	50
4	22ITPX0	Programme Elective	3	40	60	100	27	50
5	22XXBX0	Interdisciplinary Elective	3	40	60	100	27	50
THEORY CUM PRACTICAL								
6	22IT550	Web Technologies	3	50	50	100	22.5	50
PRACTICAL								
6	22IT570	Information security Lab	3	60	40	100	18	50
7	22IT580	Cloud Computing Lab	3	60	40	100	18	50
PROJECT								
9	22IT590	Project I	3	40	60	100	27	50

* CA evaluation pattern will differ from course to course and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.

22IT510 INFORMATION SECURITY

Category	L	T	P	Credit
PCC	3	0	0	3

Preamble

This course on Information Security focuses on the models, tools, and techniques for enforcement of security with emphasis on the use of cryptography. Upon completion of the course, the learners will be able to develop basic understanding of security, cryptography, system attacks and defences against them.

Prerequisite

Nil

Course Outcomes

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

COs	Course Outcomes	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Perform Encryption/ Decryption of text using symmetric and asymmetric crypto algorithms to provide confidentiality.	TPS3	80	65
CO2	Compute hash and digital signature for the given message to provide integrity and non-repudiation service.	TPS3	80	65
CO3	Examine the strength of any cryptographic algorithm by cryptanalysis.	TPS3	70	60
CO4	Explain different types of authentication and key agreement protocols.	TPS2	90	75
CO5	Use security protocols such as SSL, IP Sec etc., at different layers of TCP/IP stack to develop security solutions	TPS3	80	65
CO6	Identify security attacks and vulnerabilities in any information system and provide preventive measures and solutions in adherence with security standards	TPS4	70	60

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	S	M	L		L								M		
CO2	S	M	L		L								M		
CO3	S	S	M	L	L								S		
CO4	M	L											M		
CO5	S	M	L										M		
CO6	S	S	M	L	M			S	M	M		S	S	M	M

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	CAT1				Assignment 1				CAT2				Assignment 2				Terminal			
	100				100				100				100				100			
TPS Scale	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
CO1	8	8	34				50											10	30	
CO2			16				25											5	10	
CO3	9	9		16				25				18								10
CO4									16									10		
CO5									16	16	16				50			5	10	
CO6												18				50				10

***** Terminal examination should cover all Course Outcomes in the appropriate TPS Scale level.

Syllabus

Basics of Information Security – Perspectives and Impact, Threats and vulnerabilities, Attacks, Security Services -CIA Triad and Security Models, Internet Law and Cyber Crimes, Security Standards

Cryptography - Mathematics for Cryptography – Number Theory - Modulo Arithmetic - Euclidean and extended Euclidean Theorem - Chinese Remainder Theorem - Euler and Fermat theorem, Galois Fields, Primality Testing Methods

Symmetric Key Cryptosystems –Hill Cipher, Advanced Encryption Standard, Public Key Cryptography - RSA , Elliptic Curve Cryptosystems , Integrity – Message Authentication Code and Hash , Application of Hash in Blockchain Technologies, Digital Signatures.

Authentication and Key Exchange – One way Authentication- Mutual Authentication- Dictionary Attacks- Kerberos- Biometrics- Multifactor Authentication. Key management – Digital certificates- Public Key Infrastructure.

Security Protocols Security at Application Layer – PGP, Electronic Payments – SET Security at Transport Layer –SSL and TLS, Security at Network layer –IP Sec

Network Defense Tools - Firewalls, Intrusion Prevention and Detection Systems.

Secure Software Development -Software Vulnerabilities – OWASP Web Application Security Concerns -Phishing, Buffer Overflows, Format String Attacks, Cross Site Scripting, SQL injection, DoS, DDoS, Session Hijacking and Pharming Attacks.

Non cryptographic Protocol Vulnerabilities –Viruses, Worms and Malwares -Case Studies

Text Book

1. Behrouz. A. Foruzan and Debdeep Mukhopadhyay, “Cryptography and Network Security”, Tata McGraw Hill , Third Edition, 2016.

Reference Books & web resources

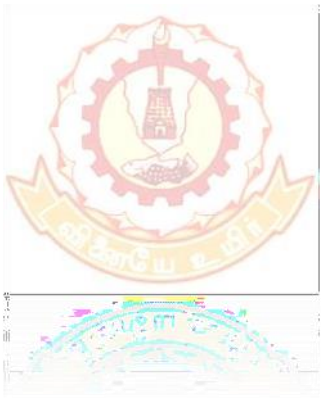
1. William Stallings, “Cryptography and Network Security: Principles and Practice”, Prentice Hall,Seventh Edition, 2017.
2. Bernard L Menezes, and Ravinder Kumar “Cryptography, Network Security and Cyber Laws”, Cengage Learning India Pvt Limited, 2018.
3. Charlie Kaufman and Radia Perlman, Mike Speciner, “Network Security, Private Communication in Public World”, Prentice Hall India, Second Edition, 2002.
4. William Stallings, "Network Security Essentials: Applications and Standards", Prentice Hall, Sixth Edition, 2016.
5. Man Young Rhee, "Internet Security Cryptographic Principles, Algorithms and Protocols", Wiley, First Edition, 2003.
6. Douglas R. Stinson, “Cryptography Theory and Practice”, Third Edition, Chapman & Hall/CRC, 2006.
7. https://onlinecourses.nptel.ac.in/noc22_cs90/preview

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Basics of Information Security**	
1.1	Perspectives and Impact, Threats and vulnerabilities, Attacks, Security Services -CIA Triad and Security Models, Internet Law and Cyber Crimes, Security Standards	2
2	**Cryptography**	
2.1 2.2 2.3	**Mathematics for Cryptography – Number Theory** Modulo Arithmetic Euclidean and extended Euclidean Theorem, Chinese Remainder Theorem	2
2.4	Galois Fields	2
2.5 2.6	Euler and Fermat theorem Primality Testing Methods	1
2.7	**Symmetric Key Cryptosystems** –Hill Cipher	2
2.8	Advanced Encryption Standard	3
2.9	**Public Key Cryptography** - RSA	2
2.10	Elliptic Curve Cryptosystems	2
2.11	Integrity – Message Authentication Code and Hash	2
2.12	Application of Hash in Blockchain Technologies,	1
2.13	Digital Signatures	1
3	**Authentication and Key Exchange**	
3.1 3.2 3.3	One way Authentication Mutual Authentication Passwords and Dictionary Attacks	1
3.4	Biometrics- Multifactor Authentication	1
3.5 3.6	**Key management** Digital certificates Public Key Infrastructure	2
4	**Security Protocols**	
4.1	Security at Application Layer – PGP, Electronic Payments- SET	2
4.2	Security at Transport Layer –SSL and TLS,	1
4.3	SET Security at Network layer –IP Sec	1
5	**Network Defense Tools**	
5.1	Firewalls	1
5.2	Intrusion Prevention and Detection Systems	1
6	**Secure Software Development** OWASP Web Application Security Concerns	
6.1 6.2 6.3	Phishing Buffer Overflows Format String Attacks	1
6.4	Cross Site Scripting	1
6.5 6.6	SQL injection, DoS and DDoS	1
6.7 6.8	Session Hijacking Pharming Attacks	1
7	**Non cryptographic Protocol Vulnerabilities**	
7.1 7.2 7.3	Viruses Worms Malwares Case Studies	2
	Total	36

Course Designer(s):

1. Jeyamala.C, Associate Professor, jeyamala@tce.edu, Information Technology
2. Parkavi.R, Assistant Professor, rpit@tce.edu, Information Technology



22IT520 **MACHINE LEARNING**

Category	L	T	P	Credit
PCC	3	0	0	3

Preamble

The course on machine learning provides an emphasis on data dimensionality reduction techniques, supervised, unsupervised and reinforcement learning models. It also facilitates the student by interpreting the real world problems by examining with appropriate machine learning tools.

Prerequisite

Nil

Course Outcomes

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

CO	Course Outcomes	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Describe theory underlying machine learning concepts and techniques.	TPS2	70	70
CO2	Apply suitable dimensionality reduction techniques to select the features from the given dataset.	TPS3	70	65
CO3	Construct algorithms to learn linear and non-linear classification and Regression models.	TPS3	70	65
CO4	Implement data clustering algorithms such as Hierarchical Clustering, Gaussian Mixture Models, Expected Maximization and Hidden Markov Model to cluster the given dataset and hence identity the outliers.	TPS3	70	65
CO5	Apply reinforcement learning techniques for real life problems especially medical data set.	TPS3	70	65
CO6	Analyze the performance of various classifiers, regression models, clustering and reinforcement algorithms in terms of time and space complexity.	TPS4	70	60

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L											L		
CO2	S	M	L		M							M	M	L	L
CO3	S	M	L		M							M	M	L	L
CO4	S	M	L		M							M	M	L	L
CO5	S	M	L		M							M	M	L	L
CO6	S	S	M	L	S	M		M	M	M		S	S	S	M

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	Assessment 1 (Theory)								Assessment 2 (Theory)								Terminal (Theory)					
	CAT 1				Assignment 1				CAT 2				Assignment 2									
TPS Scale	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	5	6
CO1	2	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	10	-	-	-	-
CO2	6	10	30	-	-	-	50	-	-	-	-	-	-	-	-	-	2	10	15	-	-	-
CO3	2	-	30	-	-	-	50	-	-	-	-	-	-	-	-	-	2	-	15	-	-	-
CO4	-	-	-	-	-	-	-	-	4	10	30	-	-	-	30	-	2	-	15	-	-	-
CO5	-	-	-	-	-	-	-	-	4	10	30	-	-	-	30	-	2	-	15	-	-	-
CO6	-	-	-	-	-	-	-	-	2	-	10	-	-	-	-	40	-	-	10	-	-	-

*****Terminal examination should cover all Course Outcomes in the appropriate TPS Scale level.

Syllabus

Machine Learning:

Introduction Basic Concepts - Probability, Linear Algebra, Convex Optimization Introduction to Machine Learning -Components of learning – Inductive Learning Hypotheses-Learning models – geometric models, probabilistic models, logic models,Statistical Decision Theory, Bayesian Learning (ML, MAP, Bayes estimates, Conjugate priors)**.**

Dimensionality Reduction:

Feature selection ,Regression – Types - Linear Regression -Polynomial Regression - Ridge and LASSO (Least Absolute Shrinkage and Selection Operator) Regression - Error Rate Estimation, Principal Component Analysis (PCA)-Linear Discriminant Analysis (LDA)-Independent Component Analysis (ICA) -Partial Least Squares (PLS).

Supervised Learning :

Decision Trees, Bayesian Learning- Bayes Optimal Classifier, Naive Bayes,Nearest Neighbour Models - Belief Network – SVM,Neural Networks - Basics, Early Models, Perceptron Learning, Backpropagation.

Evaluation measures:

Hypothesis testing, Ensemble Methods, Bagging Adaboost Gradient Boosting, Diagnosis and Regularization of Bias Vs Variance - Learning Curve.

Unsupervised Learning:

Clustering algorithms (K-means, hierarchical, spectral),Divisive and Agglomerative – Gaussian Mixture Models – Expectation Maximization (EM) algorithm – Hidden Markov Model (HMM),Anomaly Detection – Outlier Types, Techniques of Anomaly Detection.

Reinforcement Learning:

RL Model, Types of RL, Optional videos (RL framework, TD learning, Solution Methods, Applications)**,**Q Learning – SARSA (State-Action-Reward-State-Action) Algorithms- Case study, Machine Learning Framework and Libraries-Matplotlib-NLTK–Pandas– Scikit learn

Text Book

1. Tom M Mitchell, “Machine Learning”, McGraw-Hill, Indian Edition, 2017

Reference Books& web resources

1. Manaranjan Pradhan, U Dinesh Kumar, “Machine Learning using Python”, Wiley, First Edition, 2019..
2. Y. S. Abu-Mostafa, M. Magdon-Ismail, and H.-T. Lin, “Learning from Data”, AML Book Publishers, First Edition, 2012.
3. P. Flach, “Machine Learning: The art and science of algorithms that make sense of data”, Cambridge University Press, First Edition, 2012.
4. K. P. Murphy, “Machine Learning: A probabilistic perspective”, MIT Press, First Edition, 2012
5. M. Mohri, A. Rostamizadeh, and A. Talwalkar, “Foundations of Machine Learning”, MIT Press, First Edition, 2012.

6. C. M. Bishop, “Pattern Recognition and Machine Learning”, Springer, First Edition, 2007.
7. https://nptel.ac.in/courses/106105152/ - Introduction to Machine Learning by Prof.Sudeshna Sarkar, IIT Kharagpur
8. https://www.coursera.org/learn/machine-learning - Machine Learning by Prof. Andrew Ng, Standford University

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Machine Learning**	
1.1	Introduction Basic Concepts - Probability	1
1.2	Linear Algebra	
1.3	Convex Optimization	
1.4	Introduction to Machine Learning– Components of learning	1
1.5	Inductive Learning Hypotheses	
1.6	Learning models – geometric models probabilistic models, logic models	1
1.7	Statistical Decision Theory	1
1.8	Bayesian Learning (ML, MAP, Bayes estimates, Conjugate priors)	2
2	**Dimensionality Reduction**	
2.1	Feature selection	1
2.2	Regression- Types-Linear Regression-Polynomial Regression	1
2.3	Ridge and LASSO (Least Absolute Shrinkage and Selection Operator) Regression - Error Rate Estimation	1
2.4	Principal Component Analysis (PCA)	1
2.5	Linear Discriminant Analysis (LDA)	1
2.6	Independent Component Analysis (ICA)	1
2.7	Partial Least Squares (PLS)	1
3	**Supervised Learning**	
3.1	Decision Trees	1
3.2	Bayesian Learning	1
3.3	Bayes Optimal Classifier	
3.4	Naive Bayes,Nearest Neighbour Models	1
3.5	Belief Network	1
3.6	SVM	1

Module No.	Topic	No. of Periods
3.7	Neural Networks - Basics, Early Models	1
3.8	Perceptron Learning	1
3.9	Backpropagation	1
4	**Evaluation measures**	
4.1	Hypothesis testing	1
4.2	Ensemble Methods	1
4.3	Bagging Adaboost Gradient Boosting	1
4.4	Diagnosis and Regularization of Bias Vs Variance	1
4.5	Learning Curve	
5	**Unsupervised Learning**	
5.1	Clustering algorithms (K-means, hierarchical, spectral),Divisive and Agglomerative	1
5.2	Gaussian Mixture Models	1
5.3	Expectation Maximization (EM) algorithm	1
5.4	Hidden Markov Model (HMM)	1
5.5	Anomaly Detection– Outlier Types	1
5.6	Techniques of Anomaly Detection	
6	**Reinforcement Learning**	
6.1	RL Model	1
6.2	Types of RL	
6.3	Optional videos (RL framework, TD learning, Solution Methods, Applications)	1
6.4	Q Learning	1
6.5	SARSA(State-Action-Reward-State-Action) Algorithms-Case study	1
6.6	Machine Learning Framework and Libraries- Matplotlib- NLTK – Pandas – Scikit-learn	2
	Total	36

Course Designer(s):

1. Dr.C.Deisy, Professor, IT cdcse@tce.edu
2. Ms.P.VijayaPraba, Assistant Professor, IT pvpit@tce.edu

22IT530 CLOUD COMPUTING

Category	L	T	P	Credit
PCC	3	0	0	3

Preamble

The objective of the course is to provide fundamental knowledge in distributed and service computing that extends the comprehensive view of cloud computing architecture, service models, deployment methods, resource scheduling, migration methodologies and cloud programming framework to meet the on-demand service.

Prerequisite

- **Nil**

Course Outcomes

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

CO	Course Outcomes	TPS Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Explain the key technologies, strengths, limitations, and applications of cloud computing.	TPS2	70	75
CO2	Apply the suitable virtualization concept for the given scenario.	TPS3	70	65
CO3	Categorize the cloud service types, architecture, contract negotiations needed for cloud service delivery and cloud software development.	TPS3	70	60
CO4	Identify the necessity, appropriate cloud architecture/model for deploying an application in a cloud environment based on the given requirements.	TPS3	70	65
CO5	Adapt the Resource Scheduling and Migration Methodologies based on VM Allocation.	TPS3	70	65
CO6	Examine the emerging technologies to incorporate in cloud computing platforms with appropriate programming models.	TPS4	70	75

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**M**	**L**										**L**	**L**		
CO2	**S**	**M**	**L**		**L**			**L**	**L**	**L**		**M**	**M**	**L**	**L**
CO3	**S**	**M**	**L**		**M**			**M**	**M**	**M**	**L**	**M**	**M**	**L**	**M**
CO4	**S**	**M**	**L**		**M**	**L**		**M**	**M**	**M**	**L**	**M**	**M**	**M**	**L**
CO5	**S**	**M**	**L**		**M**			**L**	**L**	**L**		**M**	**M**	**L**	**L**
CO6	**S**	**S**	**M**	**L**	**M**			**S**	**M**	**M**		**S**	**S**	**M**	**M**

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	CAT1				Assignment 1				CAT2				Assignment 2				Terminal			
	100				100				100				100				100			
TPS Scale	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
CO1	5	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	5		-
CO2	5	15	20	-	-	-	50	-	-	-	-	-	-	-	-	-	2	5	12	-
CO3	5	15	20	-	-	-	50	-	-	-	-	-	-	-	-	-	2	5	12	-
CO4	-	-	-	-	-	-	-	-	5	10	20	-	-	-	20	-	2	5	12	-
CO5	-	-	-	-	-	-	-	-	5	10	20	-	-	-	30	-	2	5	12	-
CO6	-	-	-	-	-	-	-	-	5	10	15	-	-	-	-	50	-	5	12	-

***** Terminal examination should cover all Course Outcomes in the appropriate TPS Scale level.

Syllabus

Basics of Cloud: Historical developments in computing- Definition of Cloud Computing-Essential Characteristics-Data center Design and Interconnection Network-Cloud Deployment Models-Benefits and Challenges-

Virtualization: Definition- Benefits of Virtualization-Types of Virtualization -Virtual Machine monitor-Virtual machine properties-Interpretation and binary translation-Types of VM: System VM, Process VM, HLL VM, Hypervisors: Xen, KVM , VMWare, Virtual Box, Hyper-V.

Cloud Architecture: Cloud Reference Model-SPI Framework-Market Oriented Cloud Architecture-SLA-Billing and Accounting- Economics of Scaling.

Service Models: SaaS – Multi-tenant OpenSaaS - PaaS – Leveraging PaaS for productivity-IaaS – Improving performance, System and storage redundancy, Cloud based NAS devices, Advantages, Server types- IDaaS – AAA model-Single Sign-on, OpenID- Database as a Service-Monitoring as a Service-Communication as services-XaaS. Case study: Open stack.

Programming models: Fundamental aspects of parallel and distributed programming models: MPI, OpenMP, Cloud programming models: Hadoop, Map reduce, Spark .

Resource Allocation and Migrating: Resource Allocation and Task Scheduling Algorithms**-** Seven Steps Migration Methodology-Cloud Migration Strategies-Application Migration to Cloud-Database Migration to Cloud-Data Migration to Cloud.

Emerging Technologies: Mobile Cloud Computing - IoT Applications- Fog and Edge computing- Serverless Computing-Green Cloud Computing.

Text Book

1. Mehul Mahrishi Kamal Kant Hiran, Ruchi Doshi, Dr. Fagbola Temitayo, “Cloud Computing”, BPB Publications, First Edition,2019
2. Shailendra Singh, “Cloud Computing”, Oxford University Press, First edition, 2018.
3. RajkumarBuyya, Vecchiola, Selvi, “Mastering Cloud Computing”, McGraw Hill Education, First edition,2017.
4. Dac-Nhuong Le, Raghvendra Kumar, Gia Nhu Nguyen, Jyotir Moy Chatterjee , “Cloud Computing and Virtualization”, Wiley,2018.

Reference Books & web resources

1. RajkumarBuyya, Christian Vecchiola, S.ThamaraiSelvi, “Mastering cloud computing” , Morgan Kaufman, 2013.
2. Dr. Kris Jamsa, —Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business Models, Mobile, Security and More‖, Jones and Bartlett learning, First edition, 2013.
3. ArshdeepBahga, Vijay Madisetti, —Cloud Computing: A Hands-On Approach‖, CreateSpace Independent Publishing Platform, 1st edition, 2013.
4. https://onlinecourses.nptel.ac.in/noc21_cs14/

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Basics of Cloud**	
1.1	Historical developments in computing	1
1.2	Definition of Cloud Computing	1
1.3	Essential Characteristics	
1.4	Data center Design and Interconnection Network	1
1.5	Cloud Deployment Models	1
1.6	Benefits and Challenges	
2	**Virtualization**	
2.1	Definition	1
2.2	Benefits of Virtualization	
2.3	Types of Virtualization	1
2.4	Virtual Machine monitor	2
2.5	Virtual machine properties	
2.6	Interpretation and Binary translation	2
2.7	Types of VM: System VM, Process VM, HLL VM	
2.8	Hypervisors: Xen, KVM , VMWare, Virtual Box, Hyper-V.	1
3	**Cloud Architecture**	
3.1	Cloud Reference Model	1
3.2	SPI Framework	
3.3	Market Oriented Cloud Architecture	1
3.4	SLA-Billing and Accounting	1
3.5	Economics of Scaling.	
4	**Service Models**	

Module No.	Topic	No. of Periods
4.1	SaaS – Multi-tenant, OpenSaaS	1
4.2	PaaS – leveraging PaaS for productivity-IaaS – Improving performance	1
4.3	System and storage redundancy, Cloud based NAS devices	1
4.4	IDaaS – AAA model-Single Sign-on, OpenID	1
4.5	Database as a Service	1
4.6	Monitoring as a Service	1
4.7	Communication as services	
4.8	XaaS	1
4.9	Case study: Open stack.	
5	**Resource Allocation and Migrating**	
5.1	Resource Allocation and Task Scheduling Algorithms	1
5.2	Seven Steps Migration Methodology	1
5.3	Cloud Migration Strategies	1
5.4	Application Migration to Cloud	1
5.5	Database Migration to Cloud-.	1
5.6	Data Migration to Cloud	1
6	**Programming models:**	
6.1	Fundamental aspects of parallel and distributed programming models: MPI, OpenMP	2
6.2	Cloud programming models: Hadoop, Map reduce, Spark.	2
7	**Emerging Technologies**	
7.1	Mobile Cloud Computing	2
7.2	IoT Applications	
7.3	Fog and Edge computing	2
7.4	Serverless Computing	
7.5	Green Cloud Computing	1
	Total Lectures	**36**

Course Designer(s):

1. Dr.S.Padmavathi, Professor, Dept. . of IT spmcse@tce.edu
2. Dr.K.Indira, Assistant Professor, Dept of IT kiit@tce.edu

22IT550	WEB TECHNOLOGIES

Category	L	T	P	Credit
PCC	1	0	4	3

Terminal Exam Type: Practical

Preamble

This course covers the design and implementation of web-based applications including related software, database and interfaces. The students will learn about mark-up languages, scripting languages, interactive graphics and databases with current trends. It also covers various web services and testing technologies.

Prerequisite

- NIL

Course Outcomes

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

COs	Course Outcomes	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Demonstrate essential software tools for webapplication development	TPS2	70	70
CO2	Use latest front-end technologies to build web applications that incorporate the latest user interface design trends and features	TPS3	70	70
CO3	Develop simple server-side applications using Node JS with DB	TPS3	70	70
CO4	Build applications using XML and JSON tostore data in a sharable manner.	TPS3	70	70
CO5	Utilize diverse software testing methodologies	TPS3	70	70
CO6	Analyse and interpret the appropriate web services for the application requirements/industry scenarios	TPS4	70	70

Mapping with Programme Outcomes

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	M	L			L			L	L	L		L	L	L	L
CO2	S	M	L		S			S	S	S		S	M	S	S
CO3	S	M	L		S			S	S	S		S	M	S	S
CO4	S	M	L		S			S	S	S		S	M	S	S
CO5	M	L			L			L	L	L		L	L	L	L
CO6	S	M	L		S			S	S	S		S	M	S	S

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	CAT 1 Theory						CAT 2 Theory						Model Lab & Record						Terminal Practical					
TPS Scale	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
CO1	10	30	10												10						10			
CO2	10		20												20						20			
CO3			20												20						20			
CO4							10	10	20						20						20			
CO5								10	10						20						20			
CO6							10		10	20					10						10			

***Terminal examination should cover all Course Outcomes in the appropriate TPS Scale level.

Syllabus

Web essentials: IDE/ Editors, Deployment, Console, NPM, Architecture Patterns, UI design, UI Prototype tools using Figma.

Front end: HTML5, CSS3, Angular JS – data binding, controllers, scopes, dependency injection, filters, directives, services, factory, modules, components, animations. Debugging in front end- React JS Basics

Back end: Node JS – Express – console, events, modules - file system, HTTP, net, OS, path, DNS, DB - MySQL, MongoDB

XML: XML Basics, Structure, Elements, attributes, Namespaces, Working with DTD, Schema, Grouping elements, writing and Parsing XML Document, DOM, XML Formatters, CSS – XSLT, XPATH, XQUERY, JSON – element, value, object, members, array, string, data types, parsing.

Application Testing & **Web services**: Testing Tools – Selenium- JMeter - **Web services** - SOAP, WSDL, RDF, RSS, REST – types, resources, methods

Text Books

1. Aristeidis Bampakos,"Angular Projects: Build modern web apps byexploring Angular 12 with 10 different projects and cutting-edge technologies, 2nd Edition", 2020.
2. iCode Academy,"Angular JS for Beginners", August 2017.
3. Mastering HTML, CSS & Javascript Web Publishing by Laura Lernay, Rafe Colburn, Jennifer Kyrnir, BPB Publications, 2016
4. Godbole, "Web Technologies", July 2017.

Learning Resources

1. https://www.freecodecamp.org/
2. https://www.w3schools.com/
3. https://www.codecademy.com/

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Web essentials**	
1.1	IDE/ Editors, Deployment, Console	1
1.2	NPM	
1.3	MVC, MVVM	1
1.4	UI design, UI Prototype tools –using Figma	
2	**Frontend**	
2.1	HTML5, CSS3	1
2.2	AngularJS– databinding	
2.3	Controllers and scopes	
2.4	Dependency injection	
2.5	Filters, directives	1
2.6	Services, factory	
2.7	Modules, components	
2.8	Animations, Debugging in front end.	
3	**Backend**	
3.1	NodeJS–console	1
3.2	Events	
3.3	Modules-file system	
3.4	Express	
3.5	HTTP, net	1
3.6	OS,path, DNS	
3.7	DB–MySQL	
3.8	MongoDB	
4	**Data transportation**	
4.1	XML Basics, Structure, Elements, attributes	1
4.2	Namespaces, Working with DTD	
4.3	Schema, Grouping elements	
4.4	DOM	
4.5	XML Formatters, CSS–XSLT	1
4.6	XPATH, XQUERY	
4.7	JSON	
5	**Web Application Testing**	
5.1	Testing Tools – Selenium- JMeter	2
6	**Web services**	
6.1	SOAP, WSDL	1
6.2	RDF, RSS	
6.3	RESTful–types, Resources, methods	1
	Total Hours	**12**

List of Experiments:

Ex.No	Experiment Name	No. of Hours	Cos
1.	Prepare the UI Prototype using Figma	2	CO1
2.	Design a web application front-end using HTML, CSS, JS	2	CO2
3.	Design the front-end part of the application using Angular Js and React JS	4	CO2
4.	Experiment with code debugging	2	CO2
5.	Design Backend part of the Application Using DJango Framework	4	CO2
6.	Develop the Back-end part of the application using SQL and MongoDB	4	CO3
7.	Practice with ExpressJS	3	CO3
8.	Practice with XML Formatters	4	CO4
9.	Practice with XML DTD	3	CO4
10.	Perform various testing such as functional,usability, interface using testing tools such as selenium	4	CO5
11.	Practice with CI/CD (Continuous Integration and Continuous Deployment)	4	CO5
12.	Improvement in the web application code after testing and customer feedback	4	CO5
13.	Practice with Web Services	4	CO6
14.	Implement the web service using your chosen programming language and web framework and interact with a database or other backend systems to retrieve or store data.	2	CO6
15.	Write a report summarizing your findings and providing a recommendation for which web service to use. Include details on the pros and cons of each service, any limitations you encountered, and any other relevant information.	2	CO6
	Total Hours	**48**	

Course Designer(s):

1. Dr.S.Karthiga, Assistant Professor, Department of Information Technology — skait@tce.edu
2. Dr.M.Akila Rani, Assistant Professor, Department of Information Technology — marit@tce.edu

22IT570	INFORMATION SECURITY LAB

Category	L	T	P	Credit
PCC	0	0	2	1

Preamble

The laboratory course on Information security aims to provide hands on experience in using various crypto libraries for securing computer applications. Practical exposure on usage of various network security tools for analyzing security vulnerabilities and protection is provided.

Prerequisite

None

Course Outcomes

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

COs	Course Outcomes	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Utilize symmetric and public key cryptography to offer confidentiality in simple application development	TPS3	80	70
CO2	Perform message and entity authentication using hashing and digital signatures	TPS3	80	70
CO3	Use standard crypto libraries for crypt analysis	TPS4	80	70
CO4	Configure and manage network defense tools like Firewalls and Intrusion Detection Systems	TPS3	80	70
CO5	Identify software vulnerabilities such as SQL injection and provide solutions for prevention and detection	TPS4	80	70
CO6	Analyze the network attacks and identify the malwares in the network	TPS4	80	70

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L		M			M	L			M	M	M	L
CO2	S	M	L		M			M	L			M	M	M	L
CO3	S	S	M	L	M			M	L			M	S	M	L
CO4	S	M	L		M			M	L			M	M	M	L
CO5	S	S	M	L	M			M	L	L		M	S	M	L
CO6	S	S	M	L	M			M	L	L		M	S	M	L

S- Strong; M-Medium; L-Low

Assessment Pattern

Cognitive Levels	Model Examination	Terminal Examination
Remember		
Understand		
Apply	60	60
Analyse	40	40
Evaluate		
Create		

.

Course Contents

Ex. No.	Topic	No. of Sessions	COs
1	Implementation and Crypt analysis of Hill Cipher	1	CO1/CO3
2	Develop a secure client server communication using symmetric key algorithms (Use Standard crypto Libraries)	1	CO1/CO3
3	Implement RSA cryptosystem with key management	1	CO1/CO3
4	Verify integrity of client server communication using Hashing techniques	1	CO2
5	Perform Man in the middle attack in Diffie Hellman Key Exchange protocol	1	CO1
6	Perform password extraction, cracking and recovery from target system	1	CO4
7	Simulation of SQL Injection attack - Testing Web applications for SQL injection vulnerabilities, Scanning web servers, analyzing logs, Securing web application	1	CO5
8	Configuration of Firewalls in system environment / using OPNET or Cisco Packet Tracer or GNS3	1	CO4
9	Simulation of Virtual Private Network using OPNET or Cisco Packet Tracer or GNS3	1	CO4
10	Study of Transport Layer Security Protocol using Wireshark	1	CO4
11	Configure Intrusion Detection System tool for monitoring events in a host to detect malicious activities	1	CO4
12	Creation, Detection and Prevention of Buffer overflow attack, Cross site scripting	1	CO6
	Total Sessions	**12**	

Course Designer(s):

1. Dr.C.Jeyamala, Associate Professor, Department of IT jeyamala@tce.edu
2. Mrs.R.Parkavi, Assistant Professor, Department of IT rpit@tce.edu

22IT580 CLOUD COMPUTING LAB

Category L T P Credit

PCC 0 0 2 1

Preamble

This laboratory course will make the students to experience the key techniques and concepts of web service creation, consuming service, cloud computing service, data processing platform and simulation computing platform. The students will be competent with the design, programming, and application of cloud computing systems through hands-on experience**.**

Prerequisite

NIL

Course Outcomes

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

COs	Course Outcomes	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Build RESTful web service and consume Service in client application.	TPS3	90	80
CO2	Develop and Implement applications using different cloud services.	TPS3	90	80
CO3	Apply parallel programming model to perform data intensive application.	TPS3	90	70
CO4	Build data intensive application in Hadoop Platform.	TPS3	90	80
CO5	Simulate a cloud environment to implement new schedulers by analyzing the parameters affecting performance.	TPS4	90	70
CO6	Develop and Implement applications using Dockers Containers	TPS3	90	80

Mapping with Programme Outcomes

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	S	M	L		M	L		S	L	L		S	M	M	L
CO2	S	M	L		M	L		S	L	L		S	M	M	L
CO3	S	M	L		L			S	L	L		S	M	L	L
CO4	S	M	L		M			S	L	L		S	S	L	M
CO5	S	S	M	L	M			S	L	L		L	S	L	L
CO6	S	M	L		M	L		S	M	M	M	S	S	M	M

S- Strong; M-Medium; L-Low

Assessment Pattern

Cognitive Levels	Model Examination	Terminal Examination
Remember	0	0
Understand	0	0
Apply	80	80
Analyze	20	20
Evaluate	0	0
Create	0	0

Course Contents and Lecture Schedule

Ex. No.	Topic	No. of Sessions	COs Mapping
1.	Study of Different Computing Paradigms with performance measures.	1	CO1
2.	Building RESTful web service and consume the service in the client application	1	CO1
3.	Building web application and hosts the necessary databases, services and authentication using different hosting platforms.	1	CO2
4.	Implementation of Database as a service for an application with CRUD operations.	1	CO2
5.	Implementation of an application using Single Sign On as identity management.	1	CO2
6.	Implementation of Storage as a service for an application using Dropbox.	1	CO2
7.	Implementation of Parallel Programming with MPI to perform Task Management.	1	CO3
8.	Implementation of Hadoop Single and Multi-Node cluster for an application data processing.	1	CO4
9.	Implementation of Apache Spark Deployment on top of HDFS for an application.	1	CO4
10.	Analyzing various Resource Scheduling Management using iFogSim.	1	CO5
11.	Simulation of Large Scale application based Data center and Users allocation in Cloud Analyst under various deployment configurations.	1	CO5
12.	Deployment of Restful Application in Docker/Kubernetes platform.	1	CO6
	Total	**12**	

Course Designer(s):

1. Dr.S.Padmavathi, Professor, Dept of IT spmcse@tce.edu
2. Dr.K.Indira, Assistant Professor, Dept of IT kiit@tce.edu

B. TECH INFORMATION TECHNOLOGY DEGREE PROGRAMME

SCHEDULING OF COURSES

&

CURRICULUM AND DETAILED SYLLABI

FOR

SIXTH SEMESTER

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2022-23 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

Passed in Board of Studies Meeting on 27.4.2023

Approved in 65th Academic Council meeting on 27.05.2023

CREDIT DISTRIBUTION FOR STUDENTS ADMITTED IN THE YEAR 2022 ONWARDS

S.No	Category	Credits
A	Foundation Courses (FC)	54-62
	Humanities and Social Sciences including Management Courses (HSMC)	9-11
	Basic Science Courses (BSC)	24- 27
	Engineering Science Courses (ESC)	21 -27
B	Professional Core Courses (PCC)	55
C	Professional Elective Courses (PEC)	24 - 39
	Programme Specific Elective (PSE)	15 - 24
	Programme Elective for Expanded Scope (PEES)	9-15
D	Open Elective Courses (OEC)	6-12
	Interdisciplinary Elective (IE)	3-6
	Basic Science Elective (BSE)	3-6
E	Project work	12
F	Internship and Mandatory Audit Courses as per Regulatory authorities	Non-Credit (Not included for CGPA)
	Minimum Credits to be earned for the award of the Degree	160 (from A to E) and the successful completion of Mandatory Courses

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

COURSES OF STUDY
(For the candidates admitted from 2022-23 onwards)

SIXTH SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			credits
			L	T	P	
THEORY						
22IT610	Accounting and Finance	HSMC	3	-	-	3
22IT620	Artificial Intelligence	PCC	3	-	-	3
22ITPX0	Programme Elective	PEC	3	-	-	3
22XXBX0	Basic Science Elective	BSE	3	-	-	3
THEORY CUM PRACTICAL						
22IT650	Mobile Application Development	PCC	3	-	-	3
22EG660	Professional Communication	HSMC	-	1	2	2
PRACTICAL						
22IT680	Data Science Lab	PCC	-	-	2	1
PROJECT						
22IT690	Project -II	PW	-	-	6	3
Total			**15**	**1**	**10**	**21**

BS : Basic Science
HSS : Humanities and Social Science
ESC : Engineering Science

L : Lecture
T : Tutorial
P : Practical

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

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

SCHEME OF EXAMINATIONS
(For the candidates admitted from 2022-23 onwards)

SIXTH 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	22IT610	Accounting and Finance	3	40	60	100	27	50
2	22IT620	Artificial Intelligence	3	40	60	100	27	50
3	22ITPX0	Programme Elective	3	40	60	100	27	50
4	22XXBX0	Basic Science Elective	3	40	60	100	27	50
THEORY CUM PRACTICAL								
5	22IT650	Mobile Application Development	3	50	50	100	22.5	50
6	22EG660	Professional Communication	3	50	50	100	22.5	50
PRACTICAL								
7	22IT680	Data Science Lab	3	60	40	100	18	50
PROJECT								
9	22IT690	Project -II	3	40	60	100	27	50

* CA evaluation pattern will differ from course to course and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.

		Category	L	T	P	Credit
22IT620	**ARTIFICIAL INTELLIGENCE**	**PCC**	**3**	**0**	**0**	**3**

Preamble

This course deals with the development of intelligent information systems that can be used to solve well-defined problems with the knowledge of Search techniques, Deep Learning, Natural language processing and Computer Vision systems.

Prerequisite

- NIL

Course Outcomes

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

CO Number	Course Outcome Statement	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Explain the key characteristics of intelligent agents	TPS2	80	90
CO2	Find the optimal move for a given game using adversarial search	TPS3	80	80
CO3	Solve Constraint Satisfaction Problems such as Map Coloring , Job-Shop Scheduling etc Using backtracking search.	TPS3	80	80
CO4	Develop a conversational agent that uses natural language understanding and generation.	TPS3	80	70
CO5	Perform Image classification and Detection of objects with the knowledge of Computer Vision	TPS3	70	70
CO6	Examine various Search techniques , Deep learning, Computer Vision techniques for solving engineering problems in the fields of science, medicine, finance etc.	TPS4	70	70

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L											L		
CO2	S	M	L		M	L		L		L	L	M	M	M	L
CO3	S	M	L					M	L	L	L	L	M		L
CO4	S	M	L		M	L		M	M	M	L	M	M	M	L
CO5	S	M	L		M	L		M	M	M	L	M	M	M	L
CO6	S	S	M	L	M	L	L	M	M	M	L	S	M	M	M

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	Theory								Theory								Terminal					
	CAT1				Assignment 1				CAT2				Assignment 2									
TPS Scale	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	5	6
CO1	2	10															2	5				
CO2	2	12	30				50										2	5	10			
CO3	2	12	30				50										2	5	10			
CO4									2	12	20				25		2	5	10			
CO5									2	12	20				25		2	5	10			
CO6									2	10	20				20	30		5	20			

*****Terminal examination should cover all Course Outcomes in the appropriate TPS Scale level.

Syllabus

Introduction to AI and Intelligent Agents : The Foundations of Artificial Intelligence-The History of Artificial Intelligence- Risks and Benefits of AI , Intelligent agents: Agents and Environments- The Structure of Agents, Ethics in AI

Solving Problems by Searching: Problem-Solving Agents- Search Algorithms-Uninformed Search Strategies – Informed (Heuristic) Search Strategies – Heuristic Functions- Search in Complex Environments : Local Search and Optimization Problems- Hill-climbing search-Simulated annealing – Local beam search

Adversarial Search and Games: Game Theory- Optimal Decisions in Games –Heuristic Alpha–Beta Tree Search –Monte Carlo Tree Search- Stochastic Games –Limitations of Game Search Algorithms

Constraint Satisfaction Problem: Defining Constraint Satisfaction Problems-Sudoku, tic-tac-toe, map coloring, cryptarithmetic puzzle, Constraint Propagation: Inference in CSPs-Backtracking Search for CSPs.

Deep Learning: Simple Feedforward Networks- Computation Graphs for Deep Learning-Convolutional Neural Networks – Generalization- Recurrent Neural Networks- GANs-Transfer Learning

Natural Language Processing: Language Models – Grammar – Parsing – Augmented Grammars –Sentiment analysis -Deep Learning for NLP: Word Embeddings –Recurrent Neural Networks for NLP, Transformer models, speech recognition, chatbots, Voice assistants.

Computer Vision: Image processing-Feature Extraction-Classifying Images – Object Detection and Recognition: face recognition, pose estimation

Text Book

1. “Artificial Intelligence: A Modern Approach” by S. Russell and P. Norvig , Pearson, Fourth Edition, 2020

Reference Books& web resources

1. Michael Negnevitsky , “ARTIFICIAL INTELLIGENCE: A Guide to Intelligent Systems”, Addison-Wesley, Third Edition, 2011.
2. Freeman and Skapura, “Neural Networks: Algorithms, Applications and Programming Techniques”, Pearson Education Asia, 2001.
3. Deepak Khemani, “Artificial Intelligence”, Tata McGraw Hill Education, 2013.

4. James H Martin and Daniel Jurafsky, " Speech and Language Processing : An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition" , 2014.
5. Josh Patterson and Adam Gibson, "Deep Learning: A Practitioner's Approach" , OReilly, 2017.
6. Mohamed Elgendy , "Deep Learning for Vision Systems", Manning,2020
7. https://nptel.ac.in/courses/106105077
8. https://www.edx.org/course/artificial-intelligence-ai

Course Contents and Lecture Schedule

Module No.	Topic	No. Of Hours
1.	**Introduction to AI and Intelligent Agents**	
1.1	The Foundations of Artificial Intelligence- The History of Artificial Intelligence- Risks and Benefits of AI	1
1.2	Intelligent Agents – Agents and Environments	1
1.3	The Structure of Agent	1
1.4	Ethics in AI	1
2.	**Solving Problems by Searching**	
2.1	Problem-Solving Agents- Search Algorithms Uninformed Search Strategies - Informed (Heuristic) Search Strategies - Heuristic Functions	3
2.2	Search in Complex Environments : Local Search and Optimization Problems	1
2.3	Hill-climbing search- Simulated annealing -Local beam search	1
3.	**Adversarial Search and Games**	
3.1	Game Theory- Optimal Decisions in Games	1
3.2	Heuristic-Alpha-Beta Tree Search -Monte Carlo Tree Search	2
3.3	Stochastic Games -Limitations of Game Search Algorithms	2
4	**Constraint Satisfaction Problem**	
4.1	Defining Constraint Satisfaction Problems- Constraint Propagation	3
4.2	Inference in CSPs- Backtracking Search for CSPs	1
5	**Deep Learning**	
5.1	Simple Feedforward Networks- Computation Graphs for Deep Learning	1
5.2	Convolutional Neural Networks – Generalization- Recurrent Neural Networks	2
5.3	GANs-Transfer Learning	2
6	**Natural Language Processing**	
6.1	Language Models - Grammar - Parsing	1
6.2	Augmented Grammars – Sentiment Analysis	2
6.3	Deep Learning for NLP: Word Embeddings -Recurrent Neural Networks for NLP	3
6.4	Transformer Models: Speech Recognition, chatbots, voice assistants	2
7	**Computer Vision**	
7.1	Image Processing- Features Extraction	1
7.2	Classifying Images	2
7.3	Object Detection and Recognition	2
	Total periods	**36**

Course Designers:

1. Dr.C.Deisy, Professor, IT Department cdcse@tce.edu
2. Dr.S.Padmavathi Professor, IT Department spmcse@tce.edu

22IT650	MOBILE APPLICATION DEVELOPMENT

Category	L	T	P	Credit
PCC	1	0	4	3

Terminal Exam Type: Practical

Preamble

This course on Mobile Application Development will enable the student to gain knowledge and skills in developing mobile applications using Android. The student will learn about the fundamentals of mobile application development, including user interface design, database integration, web services, and mobile application testing. By the end of the course, the student will have the necessary skills and knowledge to develop mobile applications from scratch.

Prerequisite

- NIL

Course Outcomes

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

COs	Course Outcomes	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Incorporate UI components and delve into the fundamentals of UI design and development	TPS3	70	70
CO2	Make use of different types of services used in mobile application development	TPS3	70	70
CO3	Use various storage options available for Android applications, and explore the different multimedia components.	TPS3	70	70
CO4	Make use of linkify text to create clickable links in mobile applications integrating social media into applications.	TPS3	70	70
CO5	Experiment with the various hardware components and sensors.	TPS3	70	70
CO6	Examine the usage of XML, JSON parsing, Web services, Kotlin, React Native, Material Design and RSS Feed Reader in an application development	TPS4	70	70

Mapping with Programme Outcomes

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	S	M	L		M			L	L	L		L	M	L	L
CO2	S	M	L		M			L	L	L		L	M	L	L
CO3	S	M	L		M			L	L	L		L	M	L	L
CO4	S	M	L		M			L	L	L		L	M	L	L
CO5	S	M	L		M			L	L	L		L	M	L	L
CO6	S	S	M	L	M			L	L	L		L	M	L	L

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	CAT 1 Theory						CAT 2 Theory						Model Lab & Record						Terminal Practical					
TPS Scale	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
CO1	10	10	10												10						10			
CO2	10	10	20												20						20			
CO3			30												20						20			
CO4							10	10	20						20						20			
CO5								20	20						20						20			
CO6										20					10						10			

***Terminal examination should cover all Course Outcomes in the appropriate TPS Scale level.

Syllabus

Introduction - History of Mobile Applications – Fundamentals of Multiplatform Mobile Application Development - Architecture - API's - ADE - Gradle

UI Design and Development – User Responsive Layouts - Views – Activity – Widgets & Notifications, Menus & Dialogues

Services - Types of services - Location based Services - Sending SMS – Broad cast receivers – Geo Coding & Maps - Telephony

Android Storage - Shared Pref – SQLite – Content provider - Firebase

Multimedia - Video – Audio– Graphics - Animation - Google Admob : Banner & Interstitial Ads

Linkify &Integrating with social Media– MatchFilter & TransformFilter - Integrating Google Sign in - Twitter - LinkedIn

Hardware Support - Camera & Microphone – Bluetooth – Wi-Fi - Sensor

Advanced Features – Google Play console - Performance Optimizations for Mobile apps - Xml Parsing, JSON Parsing,RSSFeedReader,Kotlin, React Native, Material Design, Game Development (Case Study)

Text Book

1. Barry Burd, "Android Application Development All-in-One For Dummies", August 4, 2020.
2. RetoMeier, "Professional Android Application Development 4", Wrox, 2012.
3. Dawn Griffiths, David Griffiths, "Head First Android Development", Shroff/O'Reilly 2nd Edition, 2017.

Reference Books & web resources

1. Android Development documentation https://developer.android.com/docs
2. Android Arsenalhttps://android-arsenal.com
3. Udacity https://www.udacity.com/courses/android .

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Introduction**	
1.1	History of Mobile Applications	1
1.2	Multiplatform Mobile Application Development	
1.3	Architecture	
1.4	API's, ADE & Gradle	
2	**UI Design and Development**	
2.1	Layout & Views	1
2.2	Activity, Widgets	
2.3	Notifications, Menus & Dialogues	1
3	**Services**	
3.1	Types of services, Location based Services	1
3.2	Sending SMS, Broad cast receivers	
3.3	Geo Coding & Maps, Telephony	1
4	**Android Storage**	
4.1	Shared Pref	1
4.2	SQLite	
4.3	Content provider	1
4.4	Firebase	
5	**Multimedia**	
5.1	Video & Audio	1
5.2	Graphics, Animation	
5.3	Google Admob : Banner & Interstitial Ads	
6	**Linkify & Integrating with social Media**	
6.1	MatchFilter & TransformFilter	1
6.2	Integrating Google Sign in - Twitter - LinkedIn	
7	**Hardware Support**	
7.1	Camera & Microphone	1
7.2	Bluetooth – Wi-Fi – Sensor	
8	**Advanced Features**	
8.1	Performance Optimizations for Mobile apps	1
8.2	Xml Parsing, JSON Parsing	
8.3	RSS Feed Reader	
8.4	Kotlin, React Native	1
8.5	Material Design, Game Development	
	Total Hours	**12**

List of Experiments:

Ex.No	Experiment Name	No. of Hours	COs
1.	Android Studio Installation and setting up of an Environment	2	CO1
2.	Practice with different layouts, views and explore the available Widgets in android	4	CO1
3.	Demonstrate and customize different types of menus.	4	CO1
4.	Practice with Intents in an Android application	4	CO1

5.	Demonstrate how to create dialogue boxes using the Dialog Fragment class and practice with different types notifications using the Notification Compat Builder class	4	CO1
6.	Experiment with Different Services in Android	5	CO2
7.	Practice with different Storage options in Android	6	CO3
8.	Practice with Android Multimedia and Google Admob	5	CO3
9.	Linkify and Integrating with Social Media Applications	5	CO4
10.	Explore the different Hardware support options for Android Applications - Camera/Bluetooth/WiFi/Sensor	5	CO5
11.	Experiment with the Advanced features in Android	4	CO6
	Total Hours	**48**	

Course Designer(s):

1. Dr.S.Karthiga, Assistant Professor, Department of Information Technology — skait@tce.edu
2. Ms.C.V.Nisha Angeline, Assistant Professor, Department of Information Technology — cvnait@tce.edu

		Category	L	T	P	Credit
22IT680	**DATA SCIENCE LAB**	**PCC**	**3**	**0**	**0**	**3**

Preamble

This course will give insights of various tools and techniques from the disciplines of applied statistics, mathematics and computer science and to make better and informed decisions for various purposes by analysing a large amount of data.

Prerequisite

- Nil

Course Outcomes

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

Cos	Course Outcomes	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Perform descriptive analytics, Data Visualization on the benchmark data sets	TPS3	70	80
CO2	Perform data analysis and Visualization using suitable libraries.	TPS4	70	70
CO3	Build a Classifier, Regression and Clustering model for the application chosen and do performance analysis.	TPS4	70	70
CO4	Perform Time Series Analysis and Image Classification on real time dataset.	TPS3	70	70
CO5	Develop any of the IR model for NLP applications.	TPS3	70	70
CO6	Develop mini project by integrating Web/Mobile platform for Data Science Application.	TPS4	70	70

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L		S			S	S	M		L	M	M	L
CO2	S	S	M	L	S			S	S	M		L	M	M	L
CO3	S	S	M	L	S			S	S	M		L	M	M	L
CO4	S	M	L		S			S	S	M		L	M	M	L
CO5	S	M	L		S			S	S	M		L	M	M	L
CO6	S	S	M	L	S			S	S	M		L	M	M	L

S- Strong; M-Medium; L-Low

Assessment Pattern

Cognitive Levels	Model Examination	Terminal Examination
Remember		
Understand		
Apply	60	60
Analyse	40	40
Evaluate		
Create		

Course Contents

Exp No.	Topic	No. of Sessions	COs
1.	Identification of Application and perform Descriptive Statistics	1	CO1
2.	Data Pre-processing and Data visualization	1	CO1
3.	Correlation and covariance measure analysis	1	CO2
4.	Build a Classification model	1	CO3
5.	Build a Linear and Logistic Regression model and do the performance analysis	2	Co3
6.	Build a Clustering model and calculate the Error measures and Bias.	1	CO3
7.	Time Series Analysis on real time dataset	1	CO4
8.	Image Pre-processing and classification	2	CO4
9.	IR Modelling and Text analysis	2	CO5
10.	Mini project using AI/ML/DL Algorithms (Create Web/Mobile Application)		CO6
	Total Sessions	12	

List of problems/applications but not limited to:

1. Healthcare
2. Agriculture
3. Logistics
4. Energy Conservation
5. Business and Finance
6. Book reviews

Course Designer(s):

1. Dr C.Deisy, Professor, Department of IT cdcse@tce.edu
2. Dr. K.V.Uma, Assistant Professor ,Department of IT kvuit@tce.edu

B. TECH INFORMATION TECHNOLOGY DEGREE PROGRAMME

SCHEDULING OF COURSES

&

CURRICULUM AND DETAILED SYLLABI

FOR

SEVENTH SEMESTER

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2022-23 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

Passed in Board of Studies Meeting on 27.4.2023 65th Academic Council meeting on 27.05.2023

CREDIT DISTRIBUTION FOR STUDENTS ADMITTED IN THE YEAR 2022 ONWARDS

S.No	Category	Credits
A	Foundation Courses (FC)	54-62
	Humanities and Social Sciences including Management Courses (HSMC)	9-11
	Basic Science Courses (BSC)	24- 27
	Engineering Science Courses (ESC)	21 -27
B	Professional Core Courses (PCC)	55
C	Professional Elective Courses (PEC)	24 - 39
	Programme Specific Elective (PSE)	15 - 24
	Programme Elective for Expanded Scope (PEES)	9-15
D	Open Elective Courses (OEC)	6-12
	Interdisciplinary Elective (IE)	3-6
	Basic Science Elective (BSE)	3-6
E	Project work	12
F	Internship and Mandatory Audit Courses as per Regulatory authorities	Non-Credit (Not included for CGPA)
	Minimum Credits to be earned for the award of the Degree	160 (from A to E) and the successful completion of Mandatory Courses

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

COURSES OF STUDY
(For the candidates admitted from 2022-23 onwards)

SEVENTH SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			credits
			L	T	P	
THEORY						
22IT710	Cognitive Science	ESC	2	-	-	2
22ITPX0	Programme Elective	PEC	3	-	-	3
22ITPX0	Programme Elective	PEC	3	-	-	3
22ITPX0	Programme Elective	PEC	3	-	-	3
22ITPX0	Programme Elective	PEC	3	-	-	3
22ITPX0	Programme Elective	PEC	3	-	-	3
PRACTICAL						
22IT770	Virtualization Technologies Lab	PCC	-	-	2	1
22IT780	Multimedia Lab	PCC	-	-	2	1
PROJECT						
22IT790	Project -III	PW	-	-	6	3
Total			**17**	**-**	**10**	**22**

BS : Basic Science
HSS : Humanities and Social Science
ESC : Engineering Science

L : Lecture
T : Tutorial
P : Practical

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

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

SCHEME OF EXAMINATIONS
(For the candidates admitted from 2022-23 onwards)

SEVENTH 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	22IT710	Cognitive Science	3	40	60	100	27	50
2	22ITPX0	Programme Elective	3	40	60	100	27	50
3	22ITPX0	Programme Elective	3	40	60	100	27	50
4	22ITPX0	Programme Elective	3	40	60	100	27	50
5	22ITPX0	Programme Elective	3	40	60	100	27	50
6	22ITPX0	Programme Elective	3	40	60	100	27	50
PRACTICAL								
7	22IT770	Virtualization Technologies Lab	3	60	40	100	18	50
8	22IT780	Multimedia Lab	3	60	40	100	18	50
PROJECT								
9	22IT790	Project -III	3	40	60	100	27	50

* CA evaluation pattern will differ from course to course and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.

22IT710 **COGNITIVE SCIENCE**

Category	L	T	P	Credit
ESC	2	0	0	2

Preamble

To understand contemporary theories, methods, and empirical findings about human cognition. To develop an ability to think scientifically about high-level cognitive processes.

Prerequisite

Nil

Course Outcomes

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

CO	Course Outcomes	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Understand the philosophy about mind	TPS2	70	80
CO2	Illustrate the adaptive nature of cognition	TPS3	70	70
CO3	Compute contrast detection in cognitive neuroscience	TPS3	70	70
CO4	Apply the cognitive approach to identify the autism child early detection	TPS3	70	70
CO5	Apply cognitive behaviour for any two different games	TPS3	70	70
CO6	Analyse the classical philosophical issues of mind and cognitive impaired people along with case studies	TPS4	70	60

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	L				S			S	S	M	L	L	L		
CO2	L							M	S	M					
CO3	L										M	M		M	M
CO4	S	M	L		S	L	L	M	M	M	M	M	M		M
CO5	S	S			S			M	M	M	M	M	S		
CO6	S	M	L		M	L	L	M	M	M	M	S	M	M	M

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	Assessment 1								Assessment 2								Terminal					
	CAT 1				Assignment1				CAT 2				Assignment2				(Theory)					
TPS Scale	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	5	6
CO1	4	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	10	-	-	-	-
CO2	4	10	30	-	-	-	50	-	-	-	-	-	-	-	-	-	2	10	15	-	-	-
CO3	2	10	30	-	-	-	50	-	-	-	-	-	-	-	-	-	2	-	15	-	-	-
CO4	-	-	-	-	-	-	-	-	4	15	30	-	-	-	30	-	2	-	15	-	-	-
CO5	-	-	-	-	-	-	-	-	4	15	15	-	-	-	30	-	2	-	15	-	-	-
CO6	-	-	-	-	-	-	-	-	2	-	15	-	-	-	-	40	-	-	10	-	-	-

***** Terminal examination should cover all Course Outcomes in the appropriate TPS Scale level.

Syllabus

Introduction and Philosophy: Foundation of Cognitive Science – Introduction to Mind – three classical philosophy about mind –philosophy of science - mind in cognitive Science – exploring the mental content – logic and science of mind

Psychology: The place of psychology within cognitive science – history of psychology – science of information processing

Neurosciences: Cognitive neuroscience – origin of cognitive neuroscience – sensation, association, perception and meaning – stages of perceptual representation –consciousness-emotions – a promise of future

Computational Intelligence: Machines and cognition – architectures of cognition – common Model for Cognition ,knowledge based systems.

Logical Decision Making: Basics – representation and reasoning under uncertainty – decision making under uncertainty – learning

Case Study: Game design –Military Agent Modelling – Diagnostic Criteria in early detection of physical and mental health issues – Real time applications of Cognitive Modelling.

Text Book

1. Ella Hunter, Cognitive Science and Technology,Willford Press, 2016
2. Wilson, Robert A., & Keil, Frank C. (eds.), The MIT Encyclopedia of the Cognitive Sciences (MITECS), MIT Press, 2001

Reference Books & web resources

1. Bowerman, Melissa and Stephen C. Levinson, Language Acquisition and Conceptual Development, Cambridge University Press 2001.
2. Sternberg, Robert J., Cognitive Psychology, 4th ed., Cengage Learning India, 2008.
3. Gardenfors, Peter, Conceptual Spaces: The Geometry of Thought, MIT Press, 2000
4. Jay Friedenberg and Gordon Silverman " Cognitive Science : An Introduction to the study of Mind" Sage Publications, 2006

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Introduction and Philosophy**	
1.1	Foundation of Cognitive Science	1
1.2	Introduction to Mind	
1.3	Three classical philosophy about mind	1
1.4	Philosophy of science	1
1.4	Mind in cognitive Science	
1.5	Exploring the mental content	1
1.6	Logic and science of mind	1

Module No.	Topic	No. of Periods
2	**Psychology**	
2.1	The place of psychology within cognitive science	1
2.2	History of psychology	1
2.3	Science of information processing	1
3	**Neurosciences**	
3.1	Cognitive neuroscience – origin of cognitive neuroscience	1
3.2	Sensation, association, perception and meaning	1
3.3	Stages of perceptual representation	
3.4	Consciousness	1
3.5	Emotions	1
3.6	A promise of future	
4	**Computational Intelligence**	
4.1	Machines and cognition	1
4.2	Architectures of cognition, Common Model for Cognition	1
4.3	Knowledge based systems	1
5	**Logical Decision Making**	
5.1	Basics, Representation and reasoning under uncertainty	1
5.2	Decision making under uncertainty	1
5.3	Learning	1
5.4	Language	
6	**Case Study**	
6.1	Game design	1
6.2	Military Agent Modelling	1
6.3	Diagnostic Criteria in early detection of physical and mental health issues	2
6.4	Real time applications of Cognitive Modelling	2
	Total	24

Course Designer(s):

1. Dr.D.Tamilselvi, Professor, IT dtamilselvi@tce.edu
2. Ms.P.Vijaya Praba, Assistant Professor, IT pvpit@tce.edu

22IT770	VIRTUALIZATION TECHNOLOGIES LAB	Category	L	T	P	Credit
		PCC	0	0	2	1

Preamble

This course aims to provide practice on the installation of virtualization platforms to meet given requirements. The course also provides insights into Virtual Machine and image Management, Configuration of different hypervisors and Migration Techniques.

Prerequisite

Nil

Course Outcomes

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

CO	Course Outcome 1 (CO1)	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Configure Type-1/Type-2 hypervisors and create virtual machines	TPS 3	70	80
CO2	Implement cold/migration of Virtual machines and files from one host to another as per requirements	TPS 3	70	80
CO3	Perform Virtual Machines management activities such as Image resizing and conversion	TPS 3	70	80
CO4	Experiment with virtual switches such as OpenVSwitch and Linux bridge for virtual server environments	TPS 3	70	80
CO5	Demonstrate Storage virtualization techniques	TPS 3	70	80
CO6	Apply appropriate tools to deploy and manage applications in a virtual environment for an application	TPS 3	70	80

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	S	M	L		L			S	L	L		S	S	L	M
CO2.	S	M	L		L			S	L	L		S	S	L	M
CO3	S	M	L		L			S	L	L		S	S	L	M
CO4	S	M	L		L			S	L	L		S	S	L	M
CO5	S	M	L		L			S	L	L		S	S	L	M
CO6	S	M	L		L			S	L	L		S	S	L	M

S- Strong; M-Medium; L-Low

Assessment Pattern

Cognitive Levels	Model Examination	Terminal Examination
Remember	0	0
Understand	0	0
Apply	100	100
Analyse	0	0
Evaluate	0	0
Create	0	0

Syllabus

S.No	List of Experiments	No. of Sessions	COs
1	a) Study on Virtualization types and tools	1	CO1
	b) Review of Linux commands		CO1
2	a) Creating a VM and adding Storage, Memory, and Network to a VM	1	CO1
	b) VM-VM ping, VM-Native Ping		CO1
3	Cold Migration of VM from one host to another	1	CO2
4	a) Installation of Citrix XenServer	1	CO2
	b) Live Migration of Virtual Machines using Xen Center		CO2
5	Transfer of files from one Virtual Machine to another	1	CO2
6	a) Installation of KVM and creation of Virtual instances	1	CO6
	b) KVM – Create Images from ISO, Image Resizing, and Image Conversion	1	CO3
7	a) Configuration of HyperV on Windows	1	CO6
	b) Creation of VM, Powershell commands, Management of VMs		CO3
8	Network Virtualization - OpenVswitch and Linux bridge	1	CO4
9	Installation of OpenStack and creation of Virtual machines	2	CO6
10	Creation of VHD on Windows and restoring on different host	1	CO5
	Total sessions	12	

Course Designer(s):

1. Dr. K Indira, Assistant Professor, IT kiit@tce.edu
2. S. Thiruchadai Pandeeswari, Assistant Professor, IT eshwarimsp@tce.edu

22IT780	Multimedia Lab

Category	L	T	P	Credit
PCC	0	0	2	1

Preamble

The course focuses on encouraging students to unleash their creativity and implement their own unique concepts in practical scenarios. The aim of this laboratory is to inspire students to gain expertise in different photo editing tools, 2D and 3D techniques, AR/VR and exhibit their mastery in creating multimedia presentations and to equip students with the skills to create innovative multimedia presentations with a high level of proficiency.

Prerequisite

None

Course Outcomes

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

COs	Course Outcomes	TCE Proficiency Scale	Expected Proficiency (%)	Expected Attainment Level (%)
CO1	Adapt a comprehension of the fundamental necessities of multimedia systems and the different file formats and tools available.	TPS3	70	80
CO2	Illustrate the utilization of image manipulation and text art techniques.	TPS3	70	80
CO3	Experiment diverse visual effects with audio editing tools for any given theme.	TPS3	70	80
CO4	Adapt creative skills in video content creation and editing	TPS3	70	80
CO5	Use 2D and 3D tools for various applications	TPS3	70	80
CO6	Use AR/VR tools for creating domain-based applications	TPS3	70	80

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L		S	L			S	S			M	M	L
CO2	S	M	L		S	M			S	M			M	M	L
CO3	S	M	L		S	M			S	M	L	M	M	L	L
CO4	S	M	L		S			M		M		M	M	L	L
CO5	S	M	L		S			M		M		S	M	L	L
CO6	S	M	L		S			M		M		S	M	L	L

S- Strong; M-Medium; L-Low

Assessment Pattern

Cognitive Levels	Model Examination	Terminal Examination
Remember	0	0
Understand	0	0
Apply	100	100
Analyse	0	0
Evaluate	0	0
Create	0	0

Course Contents

Ex. No.	Topic	No. of Sessions	COs Mapping
1	Study about basics of multimedia data types and tools	1	CO1
2	Use of Image manipulation and text art techniques [Photo Editing/Poster/Infographic/Logo/Design/Meme/Certificate/ Presentations]	2	CO2
3	Implementation of audio editing/ mixing of sound	1	CO3
4	Creation of Video Content [Live/Short film/Insta Reels/ YouTube Short]	1	CO4
5	Implementation of 2D [Animation/Gaming/Advertisement]	2	CO5
6	Use of 3D[Animation/Gaming/Industrial Modelling]	2	CO5
7	Study and Implementation of AR/VR tools for various domains.	3	CO6
	Total Lecture Hours	**12**	

Theme areas not limited to

- Industrial IoT
- Asset Management
- Industrial Design
- Communication Design
- Supply Chain
- Energy Saving
- Agriculture
- Health Care
- Finance Management.

Course Designer(s):

1. S.Pudumalar, Assistant Professor IT, spmit@tce.edu
2. C.V.Nisha Angeline, Assistant Professor, IT cvnait@tce.edu

B. TECH INFORMATION TECHNOLOGY DEGREE PROGRAMME

SCHEDULING OF COURSES

&

CURRICULUM AND DETAILED SYLLABI

FOR

EIGHTH SEMESTER

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2022-23 ONWARDS

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Passed in Board of Studies Meeting on 27.4.2023 65th Academic Council meeting on 27.05.2023

CREDIT DISTRIBUTION FOR STUDENTS ADMITTED IN THE YEAR 2022 ONWARDS

S.No	Category	Credits
A	Foundation Courses (FC)	54-62
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	Basic Science Courses (BSC)	24- 27
	Engineering Science Courses (ESC)	21 -27
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	Interdisciplinary Elective (IE)	3-6
	Basic Science Elective (BSE)	3-6
E	Project work	12
F	Internship and Mandatory Audit Courses as per Regulatory authorities	Non-Credit (Not included for CGPA)
	Minimum Credits to be earned for the award of the Degree	160 (from A to E) and the successful completion of Mandatory Courses

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

COURSES OF STUDY
(For the candidates admitted from 2022-23 onwards)

EIGHTH SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			credits
			L	T	P	
THEORY						
22ITPX0	Programme Elective	PEC	3	-	-	3
22ITPX0	Programme Elective	PEC	3	-	-	3
PROJECT						
22IT890	Project -IV	PW	-	-	6	3
Total			**6**	**-**	**6**	**9**

BS : Basic Science
HSS : Humanities and Social Science
ESC : Engineering Science

L : Lecture
T : Tutorial
P : Practical

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

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

SCHEME OF EXAMINATIONS
(For the candidates admitted from 2022-23 onwards)

EIGHTH 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	22ITPX0	Programme Elective	3	40	60	100	27	50
2	22ITPX0	Programme Elective	3	40	60	100	27	50
PROJECT								
3	22IT890	Project -IV	3	40	60	100	27	50

* CA evaluation pattern will differ from course to course and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.