OUTCOME BASED EDUCATION

CURRICULUM AND DETAILED SYLLABI

FOR

B.Tech. INFORMATION TECHNOLOGY DEGREE PROGRAMME

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2022-23 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING

(A Government Aided ISO 9001:2008 certified Autonomous Institution affiliated to Anna University)

MADURAI – 625 015, TAMILNADU

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VISION AND MISSION OF THE INSTITUTION

Vision

World class quality technical education with strong ethical values.

Mission

We at TCE shall strive continuously,

- Academic excellence in Science, Engineering and Technology through dedication to duty, commitment to research, innovation in learning and faith in human values.
- Enable the students to develop into outstanding professionals with high ethical standards capable of creating, developing and managing global engineering enterprises.
- Fulfill expectations of the society and industry by equipping students with state of art technology resources for developing sustainable solutions.
- Achieve these through team efforts making Thiagarajar College of Engineering the socially diligent trend setter in technical education.

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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 2023-24 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)	23PH120 PHYSICS (BSC-3)	22CH130 CHEMISTRY (BS-3)	22EG140 TECHNICAL ENGLISH (HSMC-2)	22IT150 ENGINEERING EXPLORATION (ESC-2)	22IT161 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)	23IT250 DIGITAL SYSTEM DESIGN (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 Engineering Economics and Financial Accounting 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

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CREDIT DISTRIBUTION FOR STUDENTS ADMITTED IN THE YEAR 2022 ONWARDS

S.No	Category	Credits
A	Foundation Courses (FC)	54-66
	Humanities and Social Sciences including Management Courses (HSMC)	9-12
	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

CURRICULUM AND DETAILED SYLLABI

For

B.Tech Information Technology

First Semester

For the students admitted from the
academic year 2022 - 2023 onwards

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

Approved in 63rd Academic Council Meeting on 25.06.2022

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

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

FIRST SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			credits
			L	T	P	
THEORY						
22MA110	Calculus For Engineers	BSC	3	1	-	4
22PH120	Physics	BSC	3	-	-	3
22CH130	Chemistry	BSC	3	-	-	3
22EG140	Technical English	HSMC	2	-	-	2
22IT150	Engineering Exploration	ESC	1	1	-	2
THEORY CUM PRACTICAL						
22IT160	Problem solving using Computers	ESC	2	-	2	3
PRACTICAL						
22EG170	English Laboratory	HSMC	-	-	2	1
22PH180	Physics Laboratory	BSC	-	-	2	1
22CH190	Chemistry Laboratory	BSC	-	-	2	1
Total			**14**	**2**	**8**	**20**

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

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)

FIRST SEMESTER

S.No.	Course Code	Name of the Course	Duration of Terminal Exam. in Hrs.	Marks			Minimum Marks for Pass	
				Continuous Assessment *	Terminal Exam **	Max. Marks	Terminal Exam	Total
THEORY								
1	22MA110	Calculus For Engineers	3	40	60	100	27	50
2	22PH120	Physics	3	40	60	100	27	50
3	22CH130	Chemistry	3	40	60	100	27	50
4	22EG140	Technical English	3	40	60	100	27	50
5	22IT150	Engineering Exploration	3	40	60	100	27	50
THEORY CUM PRACTICAL								
6	***22IT160	Problem Solving Using Computers	3	50	50	100	25	50
PRACTICAL								
7	22EG170	English Laboratory	3	60	40	100	18	50
8	22PH180	Physics Laboratory	3	60	40	100	18	50
9	22CH190	Chemistry Laboratory	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.

*NOTE: ***22IT160PROBLEM SOLVING USING COMPUTERS-TERMINAL EXAM TYPE-**PRACTICAL***

22MA110	CALCULUS FOR ENGINEERS	Category	L	T	P	Credits
		BSC	3	1	0	4

Preamble

This course aims to provide technical competence of modeling engineering problems using calculus. In this course, the calculus concepts are taught geometrically, numerically, algebraically and verbally. Students will apply the main tools for analyzing and describing the behavior of functions of single and multi-variables: limits, derivatives, integrals of single and multi-variables to model and solve complex engineering problems using analytical methods and MATLAB.

Prerequisite

- Nil

Course Outcomes

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

CO	Course Outcome Statement	TCE Proficiency Scale	Expected Proficiency (in %)	Expected Attainment Level (in %)
CO1	Cognize the concept of functions, limits and continuity	TPS2	75	70
CO2	Compute derivatives and apply them in solving engineering problems	TPS3	70	65
CO3	Employ partial derivatives to find maxima minima of functions of multi variables	TPS3	70	65
CO4	Demonstrate the techniques of integration to find the surface area of revolution of a curve.	TPS3	70	65
CO5	Utilize double integrals to evaluate area enclosed between two curves.	TPS3	70	65
CO6	Apply triple integrals to find volume enclosed between surfaces	TPS3	70	65

Mapping with Programme Outcomes and Programme Specific Outcomes

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

S – Strong M – Medium L – Low

Assessment Pattern

CO	Assessment 1 (%)						Assessment 2 (%)						Terminal (%)			
	CAT 1			Assignment 1			CAT 1			Assignment 1						
TPS	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	Total
CO1	20			50			-			-			-	10	-	10
CO2	32						-			-			-	-	16	16
CO3	36						-			-			-	-	18	18
CO4	12			-			39			50			-	-	25	25
CO5	-			-			35						-	-	17	17
CO6	-			-			26						-	-	14	14
MATLAB	-			50			-			50			-	-	-	-
TOTAL	100			100			100			100			-	10	90	100

***** Assignment 1: (i) Application Problems in CO1, CO2 and CO3 (50%)
(ii) MATLAB Onramp & Introduction to symbolic Math with MATLAB (50%).
**Assignment 2: (i) Application Problems in CO4, CO5 and CO6 (50%).
(ii) Application problems using MATLAB. (50%).
*******Terminal examination should cover all Course Outcomes in the appropriate TPS Scale level.

Syllabus

DIFFERENTIAL CALCULUS
Functions - New functions from old functions - Limit of a function - Continuity - Limits at infinity - Derivative as a function - Maxima and Minima of functions of one variable – Mean value theorem - Effect of derivatives on the shape of a graph- Application problems in engineering using MATLAB.

FUNCTIONS OF SEVERAL VARIABLES:
Function of several variables- Level curves and level surfaces - Partial derivatives – Chain rule - Maxima and minima of functions of two variables –Method of Lagrange's Multipliers - Application problems in engineering using MATLAB.

INTEGRAL CALCULUS:
The definite integral – Fundamental theorem of Calculus – Indefinite integrals and the Net Change Theorem – Improper integrals – Area of surface of revolution - Volume of solid of revolution -Application problems in engineering using MATLAB.

MULTIPLE INTEGRALS:
Iterated integrals-Double integrals over general regions-Double integrals in polar coordinates-Applications of double integrals (density, mass, moments & moments of inertia problems only)-triple integrals- triple integrals in cylindrical coordinates- triple integrals in spherical coordinates-change of variables in multiple integrals - Application problems in engineering using MATLAB.

Text Book(s)

1. James Stewart, "Calculus Early Transcendentals", 9th Edition, Cengage Learning, New Delhi, 2019.
    a. DIFFERENTIAL CALCULUS: [Sections: 1.3, 2.2, 2.5, 2,6,2.8, 4.1, 4.2 and 4.3.]
    b. FUNCTIONS OF SEVERAL VARIABLES: [Sections: 14.1,14.3,14.5,14.7 and 14.8.]
    c. INTEGRAL CALCULUS: [Sections: 5.2, 5.3, 5.4, 7.8, 8.2 and 6.2.]
    d. MULTIPLE INTEGRAL: [Sections: 15.1-15.4, 15.6-15.9]

2. Lecture Notes on Calculus Through Engineering Application Problems and Solutions, Department of Mathematics, Thiagarajar College of Engineering, Madurai.

Reference Books & Web Resources

1. George B. Thomas, "Thomas Calculus: early Transcendentals", 14thedition, Pearson, New Delhi, 2018.
2. Howard Anton, Irl Bivens and Stephen Davis, “Calculus: Early Transcendentals”, 12the, John Wiley & Sons, 2021.
3. Kuldeep Singh, "Engineering Mathematics Through Applications", 2nd edition, Blooms berry publishing, 2019.
4. Kuldip S. Rattan, Nathan W. Klingbeil, Introductory Mathematics for Engineering Applications, 2nd e John Wiley& Sons, 2021

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**DIFFERENTIAL CALCULUS**	
1.1	Functions and New functions from old functions	2
1.2	Limit of a function &Continuity of a function	1
	Tutorial	**1**
1.3	Limits at infinity	1
1.4	Derivative as a function	2
	Tutorial	**1**
1.5	Maxima and Minima of functions of single variable	2
1.6	The Mean value theorem and effect of derivatives on the shape of a graph of a function	1
	Tutorial	**1**
1.7	Application problems in engineering using MATLAB	1
2	**FUNCTIONS OF SEVERAL VARIABLES**	
2.1	Level curves and level surfaces	2
2.2	Partial derivatives – Chain rule	1
	Tutorial	**1**
2.3	Maxima and minima of functions of two variables	2
2.4	Method of Lagrange’s Multipliers	1
	Tutorial	**1**
2.5	Application problems in engineering using MATLAB	1
3	**INTEGRAL CALCULUS**	
3.1	The definite integral	1
3.2	Fundamental theorem of Calculus	2
	Tutorial	**1**
3.3	Indefinite integrals and the Net Change Theorem	1
3.4	Improper integrals	2
	Tutorial	**1**
3.5	Area of surface of revolution	1

Module No.	Topic	No. of Periods
3.6	Volume of solid of revolution.	2
3.7	Application problems in engineering using MATLAB	1
4	**MULTIPLE INTEGRALS**	
4.1	Iterated integrals	1
4.2	Double integrals over general regions	2
	Tutorial	**1**
4.3	Double integrals in polar coordinates	1
4.4	Applications of double integrals (density, mass, moments & moments of inertia problems only)	2
	Tutorial	**1**
4.5	Triple integrals	1
4.6	Triple integrals in cylindrical coordinates	1
4.7	Triple integrals in spherical coordinates	1
	Tutorial	**1**
4.8	Change of variables in multiple integrals	1
4.9	Application problems in engineering using MATLAB	1
	Total	**48**

Course Designers:

1. Dr. B. Vellaikannan, bvkmat@tce.edu
2. Dr. C.S. Senthilkumar, kumarstays@tce.edu
3. Dr. S.P. Suriya Prabha, suriyaprabha@tce.edu
4. Dr. S. Saravanakumar, sskmat@tce.edu
5. Dr. M. Sundar, msrmat@tce.edu

22PH120	PHYSICS	Category	L	T	P	Credits
		BSC	3	0	0	3

Preamble

The course work aims in imparting fundamental knowledge of mechanics, oscillations and waves and optics, electromagnetism and quantum mechanics which are essential in understanding and explaining engineering devices.

Prerequisite

- Nil

Course Outcomes

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

CO	Course Outcome Statement	TCE Proficiency Scale	Expected Proficiency (in %)	Expected Attainment Level (in %)
CO1	Apply the vector calculus approach and Newton's law in polar coordinates to solve problems in mechanics	TPS3	85	80
CO2	Solve for the solutions and describe the behaviour of a damped harmonic oscillator and waves.	TPS3	85	80
CO3	Introduce Schrodinger equation to arrive at the energy values of particle in a box and linear harmonic oscillator	TPS3	85	80
CO4	Use the principle of quantum mechanics for quantum mechanical tunnelling, quantum confinement and quantum computation	TPS2	85	80
CO5	Use the laws of electrostatics and magnetostatics to explain electromagnetic wave propagation	TPS3	85	80
CO6	Explain the fundamentals of optical phenomena and its applications	TPS2	85	80

Mapping with Programme Outcomes and Programme Specific Outcomes

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

S – Strong M – Medium L – Low

Assessment Pattern

CO	Assessment 1 (%)						Assessment 2 (%)						Terminal (%)			
	CAT 1			Assignment 1			CAT 2			Assignment 2						
TPS	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	Total
CO1	8	15	22	100			-	-	-	-	-	-	6	6	10	22
CO2	8	10	15				-	-	-	-	-	-	4	3	10	17
CO3	4	5	13				-	-	15	100			-	2	15	17
CO4	-	-	-				4	15	-				4	6	-	10
CO5	-	-	-				-	-	35				-	3	15	18
CO6	-	-	-				16	15	-				6	10	-	16
Total	20	30	50	100			20	30	50	100			20	30	50	100

*Assignment I, II –Quiz/ Puzzle/ Case analysis/ Problem-solving/ Presentation/ Writing tasks
*****Terminal examination should cover all Course Outcomes in the appropriate TPS Scale level.

Syllabus

Mechanics of Particles:
Scalars and vectors under rotation transformation - Coordinate system - Cartesian, Polar, Spherical, Cylindrical - Newton's second law of motion - Forces in nature - Central forces - Conservative and non-conservative forces - Work - Energy theorem - Conservation of angular momentum - Satellite manoeuvres

Oscillations and Waves:
Simple harmonic oscillators - Energy decay in a Damped harmonic oscillator - Q factor- Impedance matching- Wave groups and group velocity - Non dispersive Transverse and Longitudinal waves - Waves with dispersion - Water waves - Acoustic waves - Earthquake and Tsunami waves

Quantum Mechanics:
Wave nature of particles - wave function - probability current density and expectation values - Schrodinger wave equation - Uncertainty principle - Particle in a box in 1D - Linear harmonic oscillator - Quantum tunnelling – Quantum confinement in 0D, 1D, 2D systems - Scanning tunnelling microscope - Quantum Cascade lasers - Quantum computation (qubit) - Entanglement - Teleportation

Electromagnetic Fields and Waves:
Electric potential and Electric field of a charged disc - Magnetic Vector potential - Maxwell's equation - Equation of continuity – Poynting Vector - Energy and momentum of EM waves - CT/MRI scan

Optics:
Ray paths in inhomogeneous medium and its solutions – Applications - Fibre optics - Numerical Aperture& Acceptance angle - Fibre optic sensors - Liquid Level & Medical Applications - Interference in non-reflecting films - Fabry-Perot interferometer - Diffraction - Fraunhofer diffraction due to double slit.

Text Book(s)

1. Principles of Physics, Halliday, Resnick and Jearl Walker, 9th Edition, Wiley, 2011
2. Paul A. Tipler and G. Mosca, Physics for Scientists and Engineers, 6th Edition, Freeman, 2008

Reference Books & Web Resources

MECHANICS OF PARTICLES

1. Paul A. Tipler and Gene Mosca, Physics for Scientists and Engineers, 6th Edition, Freeman, 2008 (Chapters – 4, 9 & 10).
2. Manoj K. Harbola, Engineering Mechanics, 2nd Edition, Cengage, 2018.

OSCILLATIONS AND WAVES

3. Paul A. Tipler and Gene Mosca, Physics for Scientists and Engineers, 6th Edition, Freeman, 2008 (Chapters – 14 & 15).
4. H. J. Pain, The Physics of Vibrations and Waves, 6th Edition, John Wiley, 2005 (Chapters 2, 5 & 6).

ELECTROMAGNETIC FIELDS AND WAVES

5. Principles of Physics, Halliday, Resnick and Jearl Walker, 9th Edition, Wiley, 2011 (Chapters - 23, 24, 32 & 33)
6. Paul M. Fishbane, Stephen G. Gasiorowicz and Stephen T. Thornton, Physics for Scientists and Engineers with Modern Physics, 3rd Edition, Pearson, 2005 (Chapters - 26, 28, 31 & 34).

OPTICS

7. Paul A. Tipler and Gene Mosca, Physics for Scientists and Engineers, 6th Edition, Freeman, 2008 (Chapters – 31 & 33).
8. Ajoy Ghatak, Optics, 5th Edition, Tata McGraw Hill, 2012 (Chapters – 3, 18, 20)

QUANTUM MECHANICS

9. Paul A. Tipler and Gene Mosca, Physics for Scientists and Engineers, 6th Edition, Freeman, 2008 (Chapters – 34 & 35).
10. Stephen T. Thornton and Andrew Rex, Modern Physics for Scientists and Engineers, 4th Edition, Cengage, 2013. (Chapters - 5 & 6).
11. R. Shankar, Fundamentals of Physics – I, II, Yale University Press, 2014, 2016.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Mechanics of Particles**	**8**
1.1	Scalars and vectors under rotation transformation	2
1.2	Coordinate system - Cartesian, Polar, Spherical, Cylindrical	2
1.3	Newton's second law of motion - Forces in nature - Central forces	2
1.4	Conservative and non-conservative forces - Work - Energy theorem - Conservation of angular momentum - Satellite maneuvers	2
2	**Oscillations and Waves**	**6**
2.1	Simple harmonic oscillators - Energy decay in a Damped harmonic oscillator	2
2.2	Q factor- Impedance matching – Wave groups and group velocity	2
2.3	Non-dispersive transverse and Longitudinal waves	1
2.4	Waves with dispersion- Water waves -Acoustic waves – Earthquake and Tsunami waves	1
3	**Quantum Mechanics**	**10**

3.1	Wave nature of particles - wave function -probability current density and expectation values - Schrodinger wave equation	3
	CAT-I after 18 contact hours	
3.2	Uncertainty principle - Particle in a box in 1D – Linear harmonic oscillator	3
3.3	Quantum tunnelling – Quantum confinement in 0D, 1D, 2D systems - Scanning tunnelling microscope – Quantum Cascade lasers – Quantum computation (qubit) – Entanglement - Teleportation	4
4	**Electromagnetic Fields and Waves**	**6**
4.1	Electric potential and Electric field of a charged disc	1
4.2	Magnetic Vector potential – Maxwell's Equations	2
4.3	Equation of continuity-Poynting Vector-Energy and momentum of EM waves	2
4.4	CT/MRI scan	1
5	**Optics**	**6**
5.1	Ray paths in inhomogeneous medium & its solutions–Applications – Fiber optics	2
5.2	Numerical Aperture& Acceptance angle - Fiber optic sensors - Liquid Level & Medical Applications	2
5.3	Interference in non-reflecting films - Fabry- Perot interferometer - Diffraction - Two slit Fraunhofer diffraction	2
	CAT-II after 18 contact hours	
	Total	**36**

Course Designers:

1. Dr. M. Mahendran, Professor, manickam-mahendran@tce.edu
2. Mr. V. Veeraganesh, Assistant Professor, vvgphy@tce.edu
3. Dr. A LSubramaniyan, Assistant Professor, alsphy@tce.edu
4. Dr. A. Karuppusamy, Assistant Professor, akphy@ce.edu

22CH130	CHEMISTRY	Category	L	T	P	Credits
		BSC	3	0	0	3

Preamble

The objective of this course is to bestow basic concepts of chemistry and its applications in engineering domain. It imparts knowledge on properties and treatment methods of water, spectroscopic techniques and their applications. This course provides exposure on electrochemical techniques for corrosion control, surface coatings and energy storage devices and also emphasis the properties and applications of engineering materials.

Prerequisite

- Nil

Course Outcomes

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

CO	Course Outcome Statement	TCE Proficiency Scale	Expected Proficiency (in %)	Expected Attainment Level (in %)
CO1	Explain the essential water quality parameters of water	TPS2	70	70
CO2	Determine hardness of water and identify suitable water treatment method	TPS3	70	70
CO3	Explain the electrochemical process involved in energy storage devices and corrosion of metals	TPS2	70	70
CO4	Interpret the electrochemical principles in modern energy storage devices and corrosion control methods	TPS3	70	70
CO5	Identify the appropriate spectroscopic technique for various applications	TPS3	70	70
CO6	Select the materials based on the properties for Engineering applications	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
CO1	M	L	-	-	-	-	-	-	-	-	-	-	-	-
CO2	S	M	L	-	-	-	L	-	-	-	-	-	-	-
CO3	M	L	-	-	-	-	-	-	-	-	-	-	-	-
CO4	S	M	L	-	-	-	-	-	L	-	-	-	-	-
CO5	S	M	L	-	-	-	L	-	L	-	-	-	-	-
CO6	S	M	L	-	-	-	-	-	-	-	-	-	-	-

S – Strong M – Medium L – Low

Assessment Pattern

CO	Assessment 1 (%)						Assessment 2 (%)						Terminal (%)			
	CAT 1			Assignment 1			CAT 2			Assignment 2						
TPS	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	Total
CO1	4	20	0	-	-	-	-	-	-	-	-	-	2	8	-	10
CO2	4	0	20	-	-	50	-	-	-	-	-	-	2	4	10	16
CO3	4	20	0	-	-	-	-	-	-	-	-	-	2	8	-	10
CO4	8	0	20	-	-	50	-	-	-	-	-	-	2	4	10	16
CO5	-	-	-	-	-	-	12	20	20	-	-	50	6	8	10	24
CO6	-	-	-	-	-	-	8	20	20	-	-	50	6	8	10	24
Total	20	40	40	100			20	40	40	100			20	40	40	100

*Assessment type of Assignments: Quiz / Test /Presentation

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

Syllabus

Water:

Water-sources- physical - characteristics - alkalinity - hardness of water – types -determination of hardness by EDTA method. Boiler trouble-Softening of water: internal and External treatment methods. Waste water treatment process.

Electrochemical technologies for energy storage and surface engineering:

Electrochemistry and Energy storage: Basics of electrochemistry. Batteries **-** Primary and Secondary batteries. Fuel cells. Hydrogen generation and storage. Corrosion and Surface Engineering–Basics –Corrosion - causes- factors- types - corrosion of metal and computer components- Corrosion control. Electroplating - Electroless process.

Spectroscopic technique and applications:

Principle, instrumentation, and applications: X-ray-diffraction - UV–Visible spectroscopy- Atomic Absorption Spectroscopy - Fluorescence spectroscopy - Inductively Coupled Plasma - Optical Emission Spectroscopy- Infra-red spectroscopy - Nuclear magnetic resonance spectroscopy**.**

Engineering materials:

Bonding and their influences on the property of materials - melting point - brittleness, ductility – thermal, electrical, and ionic conductivity - optical – magnetic properties, hydrophobic, hydrophilic. Polymer composites - structure and properties-applications. Ceramics and advanced ceramics - types-properties-applications Nano-materials – Synthesis, structure, and properties –applications.

Text Book(s)

1. P.C. Jain and Monica Jain, A Textbook of Engineering Chemistry, DhanpatRai publications, New Delhi, 16thedition, 2015.

Reference Books & Web Resources

1. S.S. Dara and S.S. Umare, “A Textbook of Engineering Chemistry”, S.Chand& Company, 12thEdition, Reprint, 2013.
2. Shashi Chawla, “ A text book of Engineering Chemistry”, DhanpatRai& Co.(pvt) ltd, 3rd edition, reprint 2011.
3. C. N. Banwell and E.M. McCash, “Fundamentals of Molecular Spectroscopy”, Tata McGraw-Hill (India), 5thEdition, 2013.

4. W.F. Smith, Principles of Materials Science and Engineering: An Introduction; Tata Mc-Graw Hill, 2008.
5. V. Raghavan, Introduction to Materials Science and Engineering; PHI, Delhi, 2005.
6. M. Akay, 2015, An introduction to polymer matrix composites," from: https://www.academia.edu/37778336/An_introduction_to_polymer_matrix_composites

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Water**	
1.1	Importance of water, sources, standards for drinking water, (WHO, BIS & ICMR standards) physical, chemical & biological characteristics, Alkalinity (principle only)	1
1.2	Hardness of water - types, units. Determination of hardness by EDTA method and numerical problems	2
1.3	**boiler trouble:** Scale and sludge formation, boiler corrosion, priming and foaming, caustic embrittlement	1
1.4	**Internal treatment methods:** Carbonate, Phosphate, Colloidal, Calgon conditioning	1
1.5	**softening of water:** External treatment methods: Lime-soda process (concept only), zeolite process, ion exchange process	2
1.6	Desalination- reverse osmosis, electro dialysis, solar and multistage flash distillation, nano-filtration	1
1.7	Waste water treatment – primary, secondary, and tertiary treatment	1
2	**Electrochemical technologies for energy storage and surface engineering**	
2.1	**Electrochemistry and Energy storage**: Introduction**–** Basics of electrochemistry – Redox process, EMF	1
2.2	**Energy storage** – Batteries, Battery quality parameters	1
2.3	Primary battery – Dry cell and Alkaline cell	1
2.4	Secondary battery – Lead-acid battery, Lithium-ion battery	1
2.5	Fuel cells – Fundamentals, types and applications. Hydrogen generation and storage	1
2.6	**Corrosion and Surface Engineering**- Basics –Corrosion - causes- factors- types	1
2.7	chemical, electrochemical corrosion (galvanic, differential aeration), corrosion of metal and computer components-	1
2.8	Corrosion control - material selection and design aspects - electrochemical protection – sacrificial anode method and impressed current cathodic method	1
2.9	Electroplating –Introduction, Process, Applications (Gold and nickel plating). Electroless plating – Principle, process, Applications (PCB manufacturing)	1
3	**Spectroscopic technique and applications**	
3.1	Introduction to Electromagnetic Radiation, Types of atomic and molecular spectra	1
3.2	**Principle, Instrumentation and Applications:** X-ray-diffraction	1

Module No.	Topic	No. of Periods
3.3	UV–Visible spectroscopy, Atomic Absorption Spectroscopy	2
3.4	Fluorescence spectroscopy, Inductively Coupled Plasma - Optical Emission Spectroscopy	2
3.5	Infra-red spectroscopy	2
3.6	Nuclear magnetic resonance spectroscopy – Magnetic resonance imaging	1
4	**Engineering materials**	
4.1	Bonding and its influence on the property of materials	1
4.2	Properties of materials- melting point - brittleness, ductility - thermal, electrical and ionic conductivity	1
4.3	optical – magnetic properties, hydrophobic, hydrophilic	1
4.4	**Polymer composites** - structure and properties	1
4.5	applications -automotive, aerospace, marine, biomedical, and defense	1
4.6	**Ceramics and advanced ceramics** - types-properties	1
4.7	applications- medicine, electrical, electronics, space	1
4.8	**Nano-materials** – Synthesis, structure and properties	1
4.9	applications - sensors, drug delivery, photo and electro-catalysis, and pollution control	1
	Total	36

Course Designers:

1. Dr. M. Kottaisamy, Professor, Chemistry, hodchem@tce.edu
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22EG140	TECHNICAL ENGLISH	Category	L	T	P	Credits
		HSMC	2	0	0	2

Preamble

The course aims at fostering the students 'ability to communicate effectively in various academic, professional, and social settings through oral and written forms. Besides imparting the basic skills namely Listening, Speaking, Reading and Writing (LSRW), significant emphasis is placed on enriching their analytical, descriptive, and creative skills, enabling them to develop and demonstrate a holistic English language proficiency.

Prerequisite

- Nil

Course Outcomes

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

CO	Course Outcome Statement	TCE Proficiency Scale	Expected Proficiency (in %)	Expected Attainment Level (in %)
CO1	**Relate** the fundamentals of language in terms of vocabulary, grammar and pronunciation in technical communication.	Understand	70%	80%
CO2	**Infer** ideas from technical and general contexts by identifying main ideas, specific details, predicting and note making	Understand	70%	80%
CO3	**Make use of** language in professional and social contexts with clarity and conciseness.	Apply	60%	70%
CO4	**Identify** specific contexts in technical writing, where appropriate lexical and grammatical functions are applied	Apply	60%	70%
CO5	**Develop** the skills such as understanding, evaluating, analysing and summarising the text and graphical representations.	Apply	60%	70%
CO6	**Organise** ideas with coherence, cohesion and precision in formal written communication	Apply	70%	80%

Mapping with Programme Outcomes and Programme Specific Outcomes

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

S – Strong M – Medium L – Low

Assessment Pattern

CO	Assessment 1 (%)						Assessment 2 (%)						Terminal (%)		
	CAT 1			Assignment 1			CAT 2			Assignment 2					
TPS	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
CO1	-	24	-	100			-	-	-	-	-	-	-	10	-
CO2	-	34	-				-	-	-	-	-	-	-	20	-
CO3	-	-	14				-	-	24	-	-	-	-	-	20
CO4	-	-	14	-	-	-	-	-	34	100			-	-	10
CO5	-	-	14	-	-	-	-	-	-				-	-	20
CO6	-	-	-	-	-	-	-	-	42				-	-	20
Total	100			100			100			100			100		

***** Assignment 1: Speaking activities in CO1, CO2, and CO3 (100%).
**Assignment 2: Writing activities in CO4, CO5, and CO6 (100%).
*******Terminal examination should cover all Course Outcomes in the appropriate TPS Scale level.

Syllabus

MODULE- I - Basics of Language (CO1)
Vocabulary - Word Building, Prefix, Suffix and Root Words, Basics of Grammar – Parts of Speech, Tenses, Phonetics - Phonemes, Syllables and Stress.

MODULE- II– Reading (CO2)
Reading- Skimming and Scanning of Short Comprehension Passages and Answering Questions or Cloze exercises based on the text prescribed for extensive reading, Note-Making.

MODULE- III–Functional English (CO3)
Framing Questions (WH and Yes/No), Modals, Manual Writing, Recommendations Writing, Agenda and Minutes of Meeting.

MODULE-IV – Technical Notions (CO4)
Technical Notions - Subject-Verb Agreement, Relative Clause, Phrasal Verbs, Impersonal Passive Voice, Noun Compounds, Classifications and Definitions, Cause and Effect, Purpose and Function, Numerical Adjectives.

MODULE-V – Analytical Writing and Business Correspondence (CO5 & CO6)
Summary Writing, Interpretation of Graphics, Jumbled Sentences, Paragraph Writing, Formal Letters (Seeking Permission for Industrial Visit / internship / Bonafide), E-mail Writing (BEC Vantage Writing Task I)

Text Book(s)

1. Murphy, Raymond, English Grammar in Use with Answers; Reference and Practice for Intermediate Students, Cambridge: CUP, 2004
2. Jones, Daniel. An English Pronouncing Dictionary, Cambridge: CUP, 2006
3. Brook-Hart, Guy. Cambridge English- Business Benchmark-Upper Intermediate, CUP,2013.
4. Dhanavel, S.P. English and Communication Skills for Students of Science & Engineering, Orient BlackSwan, Chennai: 2016.
5. Swan, Michael. Practical English Usage.4thEdn. OUP. 2017.
6. Elbow, Peter. Writing with Power: Techniques for Mastering the Writing Process. New York, Oxford University Press, 1998.

Reference Books & Web Resources

1. Anthology of Select Five Short Stories
2. Tagore, Rabindranath. Chitra, a Play in One Act. London, Macmillan and Co., 1914.
3. www.englishclub.com
4. owl.english.purdue.edu
5. www.oxfordonlineenglish.com
6. www.bbclearningenglish.com
7. tcesrenglish.blogspot.com

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1.	Word Building, Prefix, Suffix and Root Words	1
2.	Parts of Speech	1
3.	Tenses	1
4.	Skimming and Scanning of Short Comprehension Passages	1
5.	Manual Writing	1
6.	Recommendations	1
7.	Note-Making	1
8.	Subject-Verb Agreement	1
9.	Phonemes	1
10.	Syllables and Stress	1
11.	Answering Questions or Cloze exercises based on the text prescribed for extensive reading	1
12.	Noun Compounds, Classifications and Definitions	1
13.	Cause and Effect, Purpose and Function	1
14.	Summary Writing	1
15.	Interpretation of Graphics	1
16.	Jumbled Sentences	1
17.	Formal Letters (Seeking Permission for Industrial Visit / internship / Bonafide)	1
18.	Phrasal Verbs and Impersonal Passive Voice	1
19.	Numerical Adjectives	1
20.	Framing Questions (WH and Yes/No) and Modals	1
21.	Agenda and Minutes of Meeting	1
22.	Relative Clause	1
23.	E-mail Writing (BEC Vantage Writing Task I)	1
24.	Paragraph Writing	1
Total		**24**

Course Designers:

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3. Dr. G. JeyaJeevakani, gjjeng@tce.edu
4. Dr. R. TamilSelvi, rtseng@tce.edu
5. Mrs M Sarpparaje, mseeng@tce.edu

22IT150	ENGINEERING EXPLORATION	Category	L	T	P	Credits
		ESC	1	1	0	2

Preamble

The course Engineering Exploration provides an introduction to the engineering field. It is designed to help the student to learn about engineering and how it affects our everyday lives. On the successful completion of the course, students will be to explain how engineering is different from science and technology and how science, mathematics and technology are an integral part of engineering design. Students will understand the basic computer engineering concepts.

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 technological & engineering development, change and impacts of engineering	TPS2	B	80
CO2	Draw a product in enough detail that others can accurately build it and write specification sheet for a given product	TPS3	B	80
CO3	Complete initial steps (Define a problem, list criteria and constraints, brainstorm potential solutions and document the ideas) in engineering design process	TPS3	B	80
CO4	Draw sketches to a design problem and provide a trade-off matrix	TPS3	B	80
CO5	Communicate possible solutions through drawings and prepare project report	TPS3	B	80
CO6	Apply Combinational and Sequential circuit design procedure for a given scenario with the knowledge of Boolean expression and Logic gates.	TPS3	B	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		
CO2	S	M	L										M		
CO3	S	M	L										M		
CO4	S	M	L										M		
CO5	S	M	L										M		
CO6	S	M	L										M		
CO7	S	M	L										M		

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	Worksheet-1			Worksheet-2			CAT			Terminal (Theory)
TPS Scale	1	2	3	1	2	3	1	2	3	
CO1	5	20							5	10
CO2		5	20						5	10
CO3					5	20			10	20
CO4					5	20			10	20
CO5									10	20
CO6									10	20

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

Syllabus

What is Engineering: Engineering Requirement, Knowledge within Engineering disciplines, Engineering advancements

Engineering Design: Problem definition, idea generation through brainstorming and researching, solution creation through evaluating and communicating, text/analysis, final solution and design improvement.

Defining problems and Brainstorming: Researching design, sketching problem solving

Communicating solution: Dimensioning orthographic drawing, perspective drawing

Modelling and Testing final output: Product evaluation, reverse engineering, final project report.

Information Technology: Number Systems Representation, Logic Gates, Combinational Circuits and its Applications, Sequential Circuits and its Applications.

Text Book

1. Ryan A.Brown, Joshua W.Brown and Michael Berkihiser: “Engineering Fundamentals: Design, Principles, and Careers”, Goodheart-Willcox Publisher, Second Edition, 2014.
2. Saeed Moaveni ,“Engineering Fundamentals: An Introduction to Engineering”, Cengage learning, Fourth Edition, 2011.
3. Morris Mano M. “Digital Design: with an Introduction to Verilog HDL :”, Pearson Education, Fifth Edition,2013

Course Contents and Lecture Schedule

No.	Topic	No. of Lectures
1.	**What is Engineering**	
1.1	Engineering Requirement	1
1.2	Knowledge within Engineering disciplines,	1
1.3	Engineering advancements	1
2	**Engineering Design**	
2.1	Problem definition,	1
2.2	idea generation through brainstorming and researching	1

No.	Topic	No. of Lectures
2.3	solution creation through evaluating and communicating,	1
2.4	text/analysis	1
2.5	final solution and design improvement	1
3	**Defining problems and Brainstorming:**	
3.1	Researching design	1
3.2	sketching problem solving	2
4	**Communicating solution**	
4.1	Dimensioning orthographic drawing	1
4.2	perspective drawing	1
5	**Modelling and Testing final output**	
5.1	Product evaluation	1
5.2	reverse engineering	1
5.3	final project report	1
6	**Information Technology**	
6.1	Number Systems Representation	2
6.2	Logic Gates	2
6.3	Combinational Circuits and its applications	2
6.4	Sequential Circuits and its applications	2
	Total	**24**

Course Designers

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2. R.Parkavi rpit@tce.edu
3. P.VijayaPrabha pvpit@tce.edu

22IT161	PROBLEM SOLVING USING COMPUTERS	Category	L	T	P	Credit
		ESC	1	0	4	3

Terminal Exam Type: Practical

Preamble

The course on problem solving using computers is intended to introduce the students about computational thinking, the methodology of programming with emphasis on modularity and the coding of computer programs. The purpose of this course is to introduce the field of programming using Python language.

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 the following terms in the context of problem solving by a computer: Problem specification, input-output analysis, algorithm, flowchart, pseudo-code, High level language, assembly language, machine language, and compilation and execution.	TPS3	70	90
CO2	Solve the given problem statement using programming concepts such as data types, operators, conditions and loops	TPS3	70	90
CO3	Use of functions, scoping and abstraction in development of simple applications	TPS3	70	90
CO4	Use File I/O and exception handling in development of simple applications	TPS3	70	90
CO5	Examine the given problem to Implement, test and debug the solution using Python programming language.	TPS4	70	80
CO6	Use python libraries such as random, numpy, matplotlib, etc in the development of applications	TPS3	70	90

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	M	L	L
CO2	S	M	L		L							S	M	L	L
CO3	S	M	L		L							S	M	L	L
CO4	S	M	L		L							S	M	L	L
CO5	S	S	M	L	L							S	S	L	L
CO6	S	M	L		S			S	S	S	L	S	S	M	S

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	CAT 1						CAT 2						Model Lab & Record						Terminal Practical					
	Theory						Theory																	
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			
CO2	20	20	20												20						20			
CO3							10	10	20						20						20			
CO4							10	10	20						10						10			
CO5			20						20						20						20			
CO6															20						20			

Syllabus

Introduction to Problem Solving – Problem Specification, input-output analysis, Algorithms – Design and Analysis, Implementation of Algorithms, Flowcharts, Programming – High level languages, language translators, syntax, semantics, compilation and execution, Debugging and Program verification

Fundamentals of Python – The basic elements of Python, Variable types, Operators, Expressions, Operator precedence, Conditions, Loops, Nested loops – Strings, Lists, Tuples – Data type Conversions **Problem Solving Techniques** – Simple Problems and Algorithms, Solving by Analogy, Factorization, Array Techniques

Functions, Scoping, Abstraction – Function definition, Keyword arguments, Default values, Variable arguments – Scoping – Global variables. **Problem Solving Techniques** Recursion

Structured types, Mutability, Higher Order Functions – Sets, Dictionaries - Mutable Immutable data types -– File I/O – Exceptions - Applications

Python Libraries and Modules – Math, Random, Numpy, Date & Time, Turtle, Tkinter - Applications

Text Book

1. John V.Guttag, “Introduction to Computation and Programming Using Python : With Application to Understanding Data”, Prentice-Hall International publishers, Second Edition, 2017
2. R.G.Dromey, “How to solve it by Computers”, Pearson Education India , First Edition, 2008
3. Meenu Kohli, “Basic Core Python Programming”, BPB Publications, First Edition, 2021.

Reference Books& web resources

1. MIT Open Courseware
2. SWAYAM/NPTEL Course – Joy of Computing using Python

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Introduction to Problem Solving**	
1.1	Problem Specification	1
1.2	Input - Output analysis	
1.3	Algorithms - Design and Analysis, Implementation of Algorithms	
1.4	Flowcharts	1

Module No.	Topic	No. of Periods
1.5	Programming – High level languages, language translators, syntax, semantics	
1.6	Compilation and Execution	
1.7	Debugging and Program verification	
2	**Fundamentals of Python**	
2.1	The basic elements of Python, Variable types	1
2.2	Operators, Expressions, Operator precedence,	
2.3	Conditions	
2.4	Problem Solving Techniques – Simple Problems and Algorithms	
2.5	Loops, Nested loops	1
2.6	Problem Solving Techniques – Solving by Analogy, Factorization	
2.7	Strings	1
2.8	Lists	1
2.9	Tuples	1
2.10	Data type Conversions	
2.11	Problem Solving Techniques – Array Techniques	
3	**Functions, Scoping, Abstraction**	
3.1	Function Definition	2
3.2	Keyword Arguments, Default values, Variable arguments	
3.3	Scoping – Global variables	
3.4	Problem Solving Techniques – Recursion	
4	**Structured types, Mutability, Higher Order Functions**	
4.1	Sets	1
4.2	Dictionaries	
4.3	Mutable Immutable data types	
4.4	File I/O	1
4.5	Exceptions	1
4.6	Applications	
	Total Hours	**12**

List of Experiments

Ex.No	Experiment Name	No. of Hours	COs
1.	Simple Programs	4	CO1, CO2, CO5
2.	Branching Programs	2	CO1, CO2, CO5
3.	Looping Programs	6	CO1, CO2, CO5
4.	Applications using Strings	2	CO1, CO2, CO5
5.	Applications using Lists	4	CO2, CO5
6.	Applications using Tuples	2	CO2, CO5
5.	Functions and Scoping	6	CO3, CO5
6.	Applications using Sets, Dictionary	4	CO3, CO5
7.	Matrix Applications	4	CO3, CO5
8.	Applications using built-in and user defined Exceptions	4	CO4, CO5
9.	Applications using File Handling	4	CO4, CO5
10.	Mini-project using Python Libraries	6	CO5, CO6
	Total Hours	**48**	

List of Problems/Applications but not limited to:

- Calculation of Simple and Compound Interest, Area and Volume for Geometry Shapes, Conversion of Currency, Temperature, etc
- Checking Leap Year, Finding the biggest/smallest number, Divisibility of Numbers
- Prime Number Generation, Fibonacci Series, Perfect Number , Armstrong Number, Pattern Generation
- Count number of vowels, consonants, digits, etc, Rotation of array/list elements, Encoder / Decoder
- Recursive approach for Factorial, Fibonacci, GCD, etc
- Merge two dictionaries, Sort dictionary based on keys/values, Set operations
- Matrix Problems like Sum of matrices, Product of Matrices, Sum of diagonal elements, Print upper/lower triangular matrix
- Copy contents of one file to another file, Print character/word/line count of file, Use Exception Handling mechanism for File I/O
- Use libraries like Turtle, Tkinter, PIL, Numpy, Random for Game Development

Course Designers

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2. A.M. Abirami abiramiam@tce.edu

22EG170	ENGLISH LABORATORY	Category	L	T	P	Credits
		HSMC	0	0	2	1

Preamble

This practical course enables the students to develop and evaluate their basic English language skills through individualized learning process at the Language Lab, using English Software and online resources. In addition, it facilitates students with the need-based student-centric presentation sessions in a multi-media driven classroom environment.

Prerequisite

- Nil

Course Outcomes

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

CO	Course Outcome Statement	TCE Proficiency Scale
CO1	Interpret words correctly through listening and watching general and technical online contents	Understand
CO2	Develop appropriate pronunciation skills through listening and speaking practices	Apply
CO3	Build and apply a wide range of lexicons in general and technical presentations	Apply
CO4	Identify and apply the key ideas and spoken English features learnt through auditory and visual listening tools	Apply
CO5	Experiment with inventiveness by creating a blog, vlog, or YouTube channel.	Apply
CO6	Prepare and deliver oral and written presentations using digital tools.	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

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

S – Strong M – Medium L – Low

Assessment Pattern

Students' performance will be assessed in the language lab/ classroom as given below:

- Spoken Task - General / Technical Presentation / Picture Description : 20 Marks
- Listening Task – (MCQs, Gap Filling Exercises) : 10 Marks
- Written Test - Phonetics, Grammar, Vocabulary, Reading : 20 Marks

External:

- Online Exam- Phonetics, Grammar, Vocabulary, Reading (45 Minutes) : 50 Marks
- Listening Test : 20 Marks
- Submission of Students' Record on Practical Tasks in the Class and Lab : 10 Marks
- BEC Vantage Speaking Tasks I and II : 20 Marks

List of Experiments

Sl. No.	Topic	Hours
	LAB ACTIVITIES (12 Hours)	
1	Listening to TED Talks/ Podcasts/ Product Advertisements/ News Bulletins.	2
2	Phonetics – Tutorials through Online Repositories, English Movie Clips and Software in the Lab(S-net)	2
3	Vocabulary Development through Movies / Short Films/ Documentaries	2
4	Language Development through English software S-net and Online Content (Tenses, Voices, SV Agreement, Prepositions, Coherence Markers, Relative Clauses, Modals, Punctuation)	2
5	Reading Comprehension – I (General / Technical, BEC Vantage Reading Task III)	2
6	Creating a Blog/Vlog/YouTube Channel –Uploading MP3/MP4 – Practice (Movie/Book/ Gadget Review, General/Tech Talks, Interview with Celebrities)	1
7	Revision – Model Online Aptitude Test	1
	CLASSROOM ACTIVITIES (12 Hours)	
8	Introduction of Spoken English Features	1
9	Self-introduction and Introducing others	1
10	Video Comprehension – Brainstorming and Note-Taking	2
11	Role-Play, Picture/Movie Description	1
12	Reporting the events from Media / Newspapers – Discussion	1
13	Interactive Games for Language Development	1
14	Reading / Note Making (Extensive Reading – News Paper Reports)	1
15	Presentation – I (Book /Movie Review, Story Telling, General Presentations)	2
16	Presentation – II (Technical Presentations)	2
	Total	24

Software Used:

1. English Software S Net
2. Business English Certificate-Vantage- Practice Software

Teaching Resources and Websites:

1. Open Online Repositories from Oxford / Cambridge / British Council/ Voice of America
2. Free Video Downloads from YouTube
3. www.ted.com
4. tcesrenglish.blogspot.com

Course Designers:

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3. Dr. RS. Swarnalakshmi, rssleng@tce.edu
4. Mrs. M. Sarpparaje, mseeng@tce.edu

22PH180	PHYSICS LABORATORY	Category	L	T	P	Credits
		BSC	0	0	2	1

Preamble

This course ensures that students are able to apply the basic physics concepts and carry out the experiments to determine the various physical parameters related to the material

- Learn the necessary theory to understand the concept involved in the experiment.
- Acquire the skills to carry out the experiment.
- Tabulate the observed data and use the formula to evaluate the required quantities.
- Plot the data in a graph and use it for calculation.

Prerequisite

- Nil

Course Outcomes

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

CO	Course Outcome Statement	TCE Proficiency Scale	Expected Proficiency (in %)	Expected Attainment Level (in %)
CO1	Analyse the mechanical & electrical oscillations and determine their resonance frequency	TPS3	85	90
CO2	Analyse the interference and diffraction patterns for micron sized objects	TPS3	85	90
CO3	Investigate the V-I characteristics of photodiode, phototransistor under dark and bright illumination conditions	TPS3	85	90
CO4	Determine the Planck's constant using LEDs	TPS3	85	90
CO5	Plot the VI characteristics of solar cell and find the fill factor	TPS3	85	90
CO6	Determine the reversibility of classical and quantum logic gates	TPS3	85	90
CO7	Identify the variation of magnetic field with distance for circular coils	TPS3	85	90

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	S	M	L	-	-	-	-	-	S	-	-	L	-	-
CO2	S	M	L	-	-	-	-	-	S	-	-	L	-	-
CO3	S	M	L	-	-	-	-	-	S	-	-	L	-	-
CO4	S	M	L	-	-	-	-	-	S	-	-	L	-	-
CO5	S	M	L	-	-	-	-	-	S	-	-	L	-	-
CO6	S	M	L	-	-	-	-	-	S	-	-	L	-	-
CO7	S	M	L	-	-	-	-	-	S	-	-	L	-	-

S – Strong M – Medium L – Low

List of Experiments

1. Quantum Logic Gate-Toffoli gate
2. Study of Optoelectronic Devices- Photodiode, Phototransistor.
3. Solar cell VI characteristics, fill factor & Optical fibre-Determination of numerical aperture.
4. Torsional pendulum – Determination of rigidity modulus of wire and moment of inertia of regular objects.
5. Laser Diffraction - Determination of wave length of the laser using grating and determination of micro particle size. (Observing diffraction pattern due to single and double slit)
6. Air wedge – Determination of thickness of a thin sheet/wire.
7. Determination of Planck's constant through V-I characteristics of LED.
8. Determination of magnetic field-Stewart and Gees.
9. LCR Circuit – Determination of resonant frequency

Course Designers:

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3. Dr. P.K. Kannan, Assistant Professor, akphy@ce.edu

22CH190	CHEMISTRY LABORATORY	Category	L	T	P	Credits
		BSC	0	0	2	1

Preamble

This course aims to provide the students, a basic practical knowledge in chemistry. The objective of this course is to develop intellectual and psychomotor skills of the students by providing hands on experience in quantitative, electrochemical and photo-chemical analysis.

Prerequisite

- Nil

Course Outcomes

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

CO	Course Outcome Statement	TCE Proficiency Scale
CO1	Estimate the chemical water quality parameters of sample water / effluent	Apply
CO2	Demonstrate presence of calcium ions in milk sample	Apply
CO3	Determine the surface tension of solvent mixtures	Apply
CO4	Estimate pH and acid content of samples using pH metric and conductometric titrations	Apply
CO5	Illustrate the strength of oxidisable materials present in given sample by potentiometric method	Apply
CO6	Determine Fe2+ ion in effluent using colorimetric method	Apply
CO7	Calculate the efficiency of electroplating	Apply
CO8	Determine the rate of corrosion of metal & alloy using potentio-dynamic polarisation method	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	S	M	L	-	M	-	-	-	L	-	-	-	-	-
CO2	S	M	L	-	M	-	-	-	L	-	-	-	-	-
CO3	S	M	L	-	M	-	-	-	L	-	-	-	-	-
CO4	S	M	L	-	M	-	-	-	L	-	-	-	-	-
CO5	S	M	L	-	M	-	-	-	L	-	-	-	-	-
CO6	S	M	L	-	M	-	-	-	L	-	-	-	-	-
CO7	S	M	L	-	M	-	-	-	L	-	-	-	-	-
CO8	S	M	L	-	M	-	-	-	L	-	-	-	-	-

S – Strong M – Medium L – Low

List of Experiments

Experimental List	CO
Quantitative Analysis	
Estimation of total hardness of water sample	CO1
Estimation of COD of industrial effluent	CO1
Determination of calcium ion in milk sample	CO2
Determination of surface tension of solvent mixture	CO3
Electrochemical and Photochemical Analysis	
Determination of the Phosphoric acid content in soft drinks using conductometric titration	CO4
Determination of pH of soil by pH metric titration	CO4
Potentiometric redox titration ($K_2Cr_2O_7$vs FAS, $KMnO_4$vs FAS)	CO5
Estimation of iron content in water sample using colorimeter	CO6
Estimation of current density of electroplating process using Hull cell	CO7
Determination of rate of corrosion of metal and alloy using potentio-dynamic polarisation technique (TAFEL)	CO8

Learning Resources:

1. Vogel's Textbook of Quantitative Chemical Analysis (8THedition, 2014)
2. Laboratory Manual – Department of Chemistry, Thiagarajar College of Engineering (2022)

Course Designers:

1. Dr. M. Kottaisamy, hodchem@tce.edu
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THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.E. / B.Tech. Degree Programmes

COURSES OF STUDY
(For the candidates admitted from 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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22IT221	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 case studies with Linux, Windows and mobile 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	TPS2	70	75
CO2	Use process synchronization to handle critical section problem	TPS3	70	65
CO3	Report various scheduling mechanisms like CPU scheduling and thread scheduling	TPS3	70	65
CO4	Demonstrate deadlock with system model and how to handle deadlocks	TPS3	70	65
CO5	Report various memory management techniques such as paging and segmentation	TPS3	70	65
CO6	Review different operating systems like Linux, Windows with case studies.	TPS2	70	65

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		
CO2	S	M	L					M	M	M			M		L
CO3	S	M	L					M	M	M			M		L
CO4	S	M	L										M		
CO5	S	M	L					M	M	M			M		L
CO6	M	L											L		

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	1	2	3	1	2	3	1	2	3	1	2	3
CO1	4	16			25								2	5	
CO2	4	16	20			25							2	5	10
CO3	4	16	20			50							2	10	10
CO4							4	16	20			50	2	10	10
CO5							4	16	20			50	2	10	10
CO6							4	16						10	

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

Syllabus

Operating Systems Overview – OS Structure - Operations – OS Types – Resource Management - Kernel Data structures - Free and open source operating systems– System Calls – Programs- Security: The Security Problem-Program Threats-System and Network Threats

Process Management – Scheduling – operations – Inter-process Communication – Threads: Multicore programming – Multi-threading models- Libraries– Process Synchronization: The critical section problem- Mutex locks – Semaphores – Case Study: problems of synchronization-Bounded Buffer Problem, Reader's Writer's Problem, Dining Philosopher's Problem.

Scheduling - CPU Scheduling: Scheduling algorithm – Multiple processor scheduling – Thread scheduling – Real-time CPU scheduling – Algorithm Evaluation

Deadlock: System Deadlock Model, Deadlock characterization - Deadlock Detection - Deadlock Avoidance - Deadlock Prevention - Deadlock Recovery

Memory Management – Main Memory: Swapping – Continuous Memory allocation – Segmentation – Paging – Page table– Virtual Memory: Demand Paging- Copy-on-Write-Page Replacement– File systems : Structure and Implementation – Storage : Disk Scheduling – I/O: Kernel I/O Subsystem.

Case studies – Linux: Components, Process Management, Scheduling, Windows: Terminal Services, File System, Distributed Operating Systems: Needs and Design Goals Mobile OS**:** comparison of Android OS and MAC OS.

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", PearsonEducation, 2019.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Operating Systems Overview**	
1.1	OS Structure - Operations – OS Types	1
1.2	Resource Management - Kernel Data structures	1
1.3	Free and Open source operating systems	1
1.4	System Calls – Programs	1
1.5	Security: The Security Problem-Program Threats-System and Network Threats	2
2	**Process Management**	
2.1	Scheduling – Operations	1
2.2	Inter-process Communication, Threads: Multicore programming	1
2.3	Multi-threading models- Libraries	1
2.4	Process Synchronization: The critical section problem	1
2.5	Mutex locks – Semaphores	1
2.6	Case Study: problems of synchronization-Bounded Buffer Problem, Reader's Writer's Problem, Dining Philosopher's Problem	3
3	**Scheduling**	
3.1	CPU Scheduling: Scheduling algorithm	3
3.2	Multiple processor scheduling	1
3.3	Thread scheduling	1
3.4	Real-time CPU scheduling – Algorithm Evaluation	1
4	**Deadlock**	
4.1	System Deadlock Model, Deadlock characterization	1
4.2	Deadlock Detection	1
4.3	Deadlock Avoidance	1
4.4	Deadlock Prevention	1
4.5	Deadlock Recovery	
5	**Memory Management**	
5.1	Main Memory: Swapping – Continuous Memory allocation	1
5.2	Segmentation – Paging – Page table	1
5.3	Virtual Memory– Demand paging	1
5.4	Copy-on-write, Page Replacement	2
5.5	File systems: Structure and Implementation	1
5.6	Storage: Disk scheduling	1
5.7	I/O: Kernel I/O Subsystem	1
6	**Case studies**	
6.1	Linux: Components, Process Management, Scheduling,	1
6.2	Windows: Terminal Services, File System,	1
6.3	Distributed Operating Systems: Needs and Design Goals	1
6.4	Mobile OS**:** comparison of Android OS and MAC OS	1
	Total Lecture Hours	**36**

Course Designer(s):

1. R.Parkavi, Assistant Professor, rpit@tce.edu, Information Technology
2. M.Akila Rani, Assistant Professor, marit@tce.edu, Information Technology

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	-	-	-		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):

1. K.V.Uma kvuit@tce.edu
2. R.Parkavi rpit@tce.edu

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						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):

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

23IT250 DIGITAL SYSTEM DESIGN

Category	L	T	P	Credit
ESC	3	0	0	3

Preamble

The main objective of this subject is to make the students understand the basic building blocks of computers, logic gates, Combinational and sequential circuits.

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 different number systems and number base conversions.	TPS2	70	75
CO2	Explain the Boolean Laws and verify the Boolean theorems with Truth table.	TPS2	70	65
CO3	Simplify the Boolean expression using Map and Tabulation techniquesand realize it using Logic gates.	TPS3	70	65
CO4	Design Combinational circuits like BCD to Seven Segment decoder, Code converter etc.	TPS3	70	65
CO5	Design Sequential circuits like Counters ,Sequence detectors using Flip flops.	TPS3	70	65
CO6	Design a Combinational and Sequential circuit using Open Source Simulator such as Multisim.	TPS3	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	**M**	**L**											**L**		
CO3	**S**	**M**	**L**										**M**		
CO4	**S**	**M**	**L**										**M**		
CO5	**S**	**M**	**L**										**M**		
CO6	**S**	**M**	**L**		**L**			**S**	**L**	**L**			**M**	**L**	**L**

S- Strong; M-Medium; L-Low

Assessment Pattern

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

Syllabus

Binary Systems: Representation of Data- Number systems and codes, Representation of unsigned and signed integers, Fixed-point representation of real numbers, Floating-point representation of real numbers, Representation of character data, Representation of signals.

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

Simplification of Boolean Expressions and Functions: Algebraic methods, Canonical forms of Boolean functions, Minimization of functions using Karnaugh maps, Minimization of functions using Quine-McClusky method.

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

Sequential Logic: Synchronous Sequential Logic: Models of sequential circuits - Moore machine and Mealy machine. Latches and Flip Flops. Analysis and Design Procedures – State Reduction and State Assignment. Shift Registers and Counters.

Asynchronous Sequential Logic: Analysis and Design of Asynchronous Sequential Circuits – Reduction of State and Flow Tables –Race-free State Assignment – Hazards.

Text Book

1.M. Morris Mano,"Digital Design :With an Introduction to the Verilog HDL, VHDL, and System Verilog ",Pearson,6th edition,2018.

2. M. Morris Mano,"Digital Design :Introduction to Verilog HDL",Prentice Hall of India Private Ltd,5th edition,2013.

Reference Books& web resources

1. Charles H.Roth, Larry L.Kinney, "Fundamentals of Logic Design:, 7thEdition,Jaico Publishing House,2013.
2. Donald D.Givone," Digital Principles and Design",Tata McGraw Hill,2003.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
1	**Binary Systems**	
1.1	Representation of Data- Number systems and codes	1
1.2	Representation of unsigned and signed integers	1
1.3	Fixed-point representation of real numbers	1
1.4	Floating-point representation of real numbers	1
1.5	Representation of character data	1
1.6	Representation of signals	1
2	**Switching Theory**	
2.1	Laws of Boolean algebra	1
2.2	Theorems of Boolean algebra	1
2.3	Switching functions	1
2.4	Methods for specification of switching functions - Truth tables and Algebraic forms	2
2.5	Realization of functions using logic gates	1
3	**Simplification of Boolean Expressions and Functions**	
3.1	Algebraic methods	1
3.2	Canonical forms of Boolean functions	1
3.3	Minimization of functions using Karnaugh maps	1
3.4	Minimization of functions using Quine-McClusky method	1
4	**Combinational Logic**	
4.1	Combinational Circuits - Analysis and Design Procedure	2
4.2	Binary Adder- Subtractor	1
4.3	Decimal Adder - Binary Multiplier	1
4.4	Magnitude Comparator	1
4.5	Decoders and Encoders	1
4.6	Multiplexers	1
4.7	Simulation of Combinational Circuits	1
5	**Sequential Logic**	
5.1	**Synchronous Sequential Logic**	
5.1.1	Models of sequential circuits - Moore machine and Mealy machine	1
5.1.2	Latches and Flip Flops	1
5.1.3	Analysis and Design Procedures	2
5.1.4	State Reduction and State Assignment	1
5.1.5	Shift Registers and Counters	1
5.1.6	Simulation of Sequential Circuits	1
5.2	**Asynchronous Sequential Logic**	
5.2.1	Analysis and Design of Asynchronous Sequential Circuits	2
5.2.2	Reduction of State and Flow Tables	1
5.2.3	Race-free State Assignment	1
5.2.4	Hazards	1
	Total Lectures	36

Course Designer(s):

1. Dr.K.V.Uma,Assistant Professor, Department of Information Technology kvuit@tce.edu
2. Mrs.R.Parkavi, Assistant Professor, Department of Information Technology rpit@tce.edu

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

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
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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	10
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	2	3	1	2	3	1	2	3	1	2	3	1	2	3
	10	30	60	-	-	100	10	30	60	-	-	100	-	30	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						Practical				Terminal		
	CAT 1			CAT 2			TEST			OCR	(Theory)		
TPS Scale	1	2	3	1	2	3	1	2	3		1	2	3
CO1	20	-		-	-	-	-	-	-	-	10	10	-
CO2	-	-	40	-	-	20	-	-	20	20	-	-	20
CO3	-	20	20	-	-	-	-	-	20	20	-	5	20
CO4	-	-	-	10	20	20	-	-	20	20	-	-	10
CO5	-	-	-	10	20	-	-	-	20	20	5	5	10
CO6	-	-	-	-	-	-	-	-	20	20	-	-	5

***** 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):

1. S.Muthuramalingam, Professor, Department of Information Technology , smrit@tce.edu
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):

1. S.Sridevi, Associate Professor, Department of IT sridevi@tce.edu
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	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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

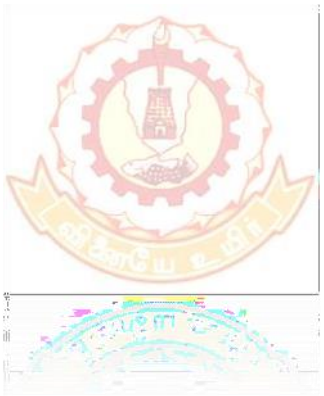
1. William Stallings, “Cryptography and Network Security: Principles and Practice”, Prentice Hall,Seventh Edition, 2017.
2. Bernard L Menezes, and Ravinder Kumar “Cryptography, Network Security and Cyber Laws”, Cengage Learning India Pvt Limited, 2018.
3. Charlie Kaufman and Radia Perlman, Mike Speciner, “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					
	CAT 1				Assignment 1				CAT 2				Assignment 2				(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	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

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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)

SIXTH SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			credits
			L	T	P	
THEORY						
22IT610	Engineering Economics and Financial Accounting	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	Engineering Economics and Financial Accounting	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.

22IT610	ENGINEERING ECONOMICS AND FINANCIAL ACCOUNTING	Category	L	T	P	Credit
		HSS	3	0	0	3

Preamble

This course explains the basic principles of managerial economics, accounting and current business environment underlying business decision making. In the process of managing organizations, the managers at different levels should take appropriate economic decisions which will help in minimizing investment, operating and maintenance expenditures besides increasing the revenue, savings and such other gains of the organization. This course deals with how an engineer should deal with organisation's operational and non- operational data to take decisions of these kinds and also emphasize the quantitative and qualitative applications of economic principle to business analysis. The course explores the role of AI in financial sectors using few case studies.

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	Understand the economic theories and concepts, demand and supply chain analysis to take economically sound managerial decisions.	TPS2	70	85
CO2	Prepare financial statements, common size statements, comparative statements for any given financial data.	TPS3	70	85
CO3	Determine the cut off production volume for a company to make profit by performing break even analysis with an understanding of various costs involved in the production cost centre.	TPS3	70	85
CO4	Choose the best project option from among a set of competing alternatives. .	TPS3	70	85
CO5	Apply the appropriate sources of finance and mobilize the right quantum of finance and use them in most profitable investment avenues.	TPS3	70	85
CO6	Build machine learning models for aiding economic policy design with a comprehension of the impact of AI in economic and finance theories.	TPS3	70	85

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	CAT			Assignment			CAT			Assignment			Terminal					
	1			1			2			2								
TPS Scale	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	8	10											5	5				
CO2	8	10	30			50							3	5	15			
CO3	4	10	20			50							2	5	15			
CO4							4	10	20			30	2	5	15			
CO5							8	10	20			20	3	5	5			
CO6							8	10	10			50	5	5				

CO6 COVERED THROUGH MINI PROJECT

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

Syllabus

Demand & Supply Analysis Firms: Types, objectives and goals - Managerial economics - Decision analysis. Demand - Types of demand - Determinants of demand - Demand function - Demand elasticity- Demand forecasting - Supply - Determinants of supply - Supply function -Supply elasticity.

Financial Accounting: Functions of accounting, accounting principles. Preparation of financial statements -Balance sheet and related concepts - Profit & Loss Statement and related concepts - Comparative financial statements - Analysis & Interpretation of financial statements

Cost analysis and Marginal costing-. Elements of cost- classification of cost-, Preparation of cost sheet and its applications-Depreciation-Break-Even Analysis - Profit/Volume Ratio (P/V Ratio)- Applications in make or buy decision.

Capital budgeting- Investments –Time value of money -Comparison of Project Alternatives: Risks and return evaluation of investment decision - Average rate of return - Payback Period - Net Present Value - Internal rate of return.

Financial Markets: Sources of finance and financial institutions, Venture capital, various Business models.

Case studies in Machine Learning for Finance: Case Studies on prediction of real estate prices, market basket analysis and economic growth using Python and spreadsheet.

Reference Books& web resources

1. Panneerselvam R, Engineering Economics, PHI Learning Private Limited; 2nd edition, 2013.
2. M.C.Shukla,T.S.Grewal,"AdvancedAccounts-Volume-I,2010 Reprint, S. Chand & company Ltd.,2010.
3. Prasanna Chandra, "Financial Management-Theory and practice" seventh Reprint,Tata McGraw-Hill publishing company Limited,2010.
4. V.L.Mote, Samuel Paul and G.S.Gupta, " Managerial Economics – concepts and cases", McGraw Hill Education (India), 2017.
5. P.S.BoopathiManickam "Financial and Management Accounting" PSG publications 2009.
6. Don R. Hansen and Maryanne M. Mowen "Cost Management: Accounting and Control, Fifth Edition" Thomson, 2006.
7. Paramasivan.C, Subramanian.T, "Financial management" New Age international Publishers, 2014.
8. https://nptel.ac.in/courses/110/101/110101131:Financial Accounting, Dr. Varadraj Bapat, IIT Bombay.
9. https://nptel.ac.in/courses/112107209 :NPTEL course on Engineering Economic Analysis

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**DEMAND & SUPPLY ANALYSIS**	
1.1	Firms: Types, objectives and goals	1
1.2	Managerial Economics - Decision analysis	1
1.3	Demand - Types of demand - Determinants of demand - Demand function - Demand elasticity Demand forecasting	2
1.4	Supply - Determinants of supply - Supply function - Supply elasticity.	2
2	**Financial Accounting**	
2.1	Functions of accounting, accounting principles	1
2.2	Preparation of financial statements -Balance sheet and related concepts	3
2.3	Profit & Loss Statement and related concepts	2
2.4	Comparative financial statements - Analysis & Interpretation of financial statements	2
3	**Cost analysis and Marginal costing**	
3.1	Elements of cost- classification of cost	1
3.2	Preparation of cost sheet and its applications	2
3.3	Depreciation-Methods	2
3.4	Break-Even Analysis -Profit/Volume Ratio (P/V Ratio)- Applications in make or buy decision.	3
4	**Capital budgeting**	

Module No.	Topic	No. of Periods
4.1	Investments –Time value of money	2
4.2	Comparison of Project Alternatives: Risks and return evaluation of investment decision	2
4.3	Average rate of return - Payback Period	2
4.4	Net Present Value - Internal rate of return	2
5	**Financial Markets**	
5.1	Sources of finance and financial institutions	2
5.2	Venture capital, various Business models	2
6	**Case studies in Machine Learning for Finance(Not limited to)**	
6.1	Prediction of real estate prices	1
6.2	market basket analysis and economic growth. Using python and spreadsheet	1
	Total	36

Course Designer(s):

1. A.M.Abirami, Associate Professor, abiramiam@tce.edu, Information Technology
2. Pudumalar.S, Assistant Professor, spmit@tce.edu, Information Technology
3. Parkavi.R, Assistant Professor, rpit@tce.edu, Information Technology

		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						CAT 2						Model Lab & Record						Terminal					
	Theory						Theory												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

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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
	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)

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.

CURRICULUM AND DETAILED SYLLABI

FOR

B.TECH. INFORMATION TECHNOLOGY DEGREE PROGRAMME

PROGRAMME ELECTIVES

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2022-23 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING
(A GOVERNMENT AIDED ISO 9001:2008 CERTIFIED
AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY)
MADURAI – 625 015, TAMILNADU

PHONE: 0452 – 2482240, 41
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Passed in Board of Studies Meeting on 17.11.2023 Approved in 66th Academic Council Meeting on 16.12.2023

VERTICALS FOR B.TECH. (HONOURS)
INFORMATION TECHNOLOGY
PROFESSIONAL ELECTIVES

	Honours				Minor
Professional Electives	**Vertical I**	**Vertical II**	**Vertical III**	**Vertical IV**	**Vertical V**
	Data Engineering	**Cyber Security and Data Privacy**	**Cloud Technologies**	**Emerging Technologies**	**Data science**
1.	Deep Learning	Ethical Hacking	Distributed Application Development.	MERN Stack Technologies	Artificial Intelligence
2.	Natural Language Processing	Secure Software Development	Virtualization Technologies.	Mixed Reality	Applied Data Science with Visualization
3.	Big data Technologies	Advanced Cryptography	Service Oriented Computing.	Cross Platform Application Development using Flutter	Decision Support System
4.	Business Analytics	Privacy and Security on Online Social Media	5G and SDN.	Application Oriented Programming Using GOLANG	Business Analytics
5.	Information Retrieval	Cyber Physical Systems	Edge Intelligence.	C# and .Net Framework	Statistical Analysis and Computing
6.	Statistical Analysis and Computing	Information Security Auditing and Management	Enterprise Design Pattern.	Wireless and mobile communication	Machine Learning
TCE MOOC COURSE	Social Network Analysis	Blockchain Technologies	Edge computing for smart systems	Android Application Development using Kotlin	Social Network Analysis

22ITPA0 SOCIAL NETWORK ANALYSIS

Category	L	T	P	Credit
PSE	3	0	0	3

Preamble

The course introduces concepts and methods of social network analysis. It aims to provide students with essential knowledge on network analysis applicable to real world data. Students will learn to extract, manage and visualize data about its structure and dynamics.

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 the visualization of network data through the use of social network analysis packages	TPS3	70	70
CO2	Utilize social network measures to analyze the web graph	TPS3	70	70
CO3	Illustrate the process of graph mining and cascading effects in social networks	TPS3	70	70
CO4	Examine social network behavior by analyzing network properties	TPS3	70	70
CO5	Employ social network theory and software packages to construct models for social networks	TPS4	70	60
CO6	Identify the appropriate network type for modelling real networked data	TPS4	70	60

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		S			S		L		L	M	M	L
CO2	S	M	L		S			S		L		L	M	M	L
CO3	S	M	L		S			S		L		L	M	M	L
CO4	S	M	L		S			S		L		L	M	M	L
CO5	S	S	M	L	S	S	S	S	S	S	S	S	S	S	S
CO6	S	S	M	L	S	S	S	S	S	S	S	S	S	S	S

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	1	2	3	1	2	3	4	1	2	3	4	1	2	3	4
CO1	4	16													5			
CO2	4	16	20			50									5	5	10	
CO3	4	16	20			50									5	5	10	
CO4							4	6	20						5	5	10	
CO5							4	6	15	10				50		5	10	
CO6							4	6	15	10				50			10	10

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

Syllabus

Introduction: Motivation, Web Graph, Types of Social Networks, Social Network Datasets and formats, Social Network Data Visualization Tools - Networkx, Gephi, Pajek.

Properties: Connectedness, Clustering Coefficient, Distance Measures, Connected Components, Network Robustness, Degree and Closeness Centrality, Betweenness Centrality, Neighbourhood overlap, Bipartite graph, Homophily, Positive Negative Relationships.

Mining Graphs: Community and Cluster detection, Link Analysis - Random Walk, Page Rank algorithms, Hubs and Authorities, Link Prediction.

Cascading Networks: Diffusion in networks, Power law, Preferential Attachment Models, Small World Network.

Social Network Models: Granovetter Model, Schelling Model, Balance Theorem.

Case Study: Analyzing various social networks such as analyzing Facebook friendship networks, LinkedIn professional networks, research collaboration networks, epidemiological networks, influence networks in marketing.

Learning Resources

1. Ian A. McCulloh, Helen L. Armstrong, Anthony N. Johnson, “Social Network Analysis with Applications”, Wiley, 2013, First Edition
2. Charles Kadushin, “Understanding Social Networks: Theories, Concepts and Findings”, Oxford University Press, 2011, First Edition
3. SWAYAM - NPTEL Course, “Social Networks”, https://onlinecourses.nptel.ac.in/noc19_cs66/preview
4. Coursera - “Applied Social Network Analysis in Python”, https://www.coursera.org/learn/python-social-network-analysis
5. Xiaoming Fu, JarDer Luo, Margarete Boos, “Social Network Analysis Interdisciplinary Approaches and Case Studies”, CRC Press, 2017, First Edition
6. P.M. Krishna Raj, Ankith Mohan, K.G. Srinivasa, “Practical Social Network Analysis with Python”, Springer, 2018, First Edition
7. Stanley Wasserman, Katherine Faust, “Social Network analysis: methods and Applications”, Cambridge University Press, 1994 (Reprinted 1999), First Edition.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours
1	**Introduction**	
1.1	Motivation	1
1.2	Web Graph	1
1.3	Types of Social Network	1
1.4	Social Network Datasets and formats	1
1.5	Social Network Data Visualization Tools - Networkx, Gephi, Pajek	2
2	**Properties**	
2.1	Connectedness	1

2.2	Clustering Coefficient, Distance Measures	1
2.3	Connected Components	1
2.4	Network Robustness	1
2.5	Degree and Closeness Centrality, Betweenness Centrality	2
2.6	Bipartite Graph, Homophily	1
2.7	Positive Negative Relationships	1
3	**Mining Graphs**	
3.1	Community and Cluster Detection	2
3.2	Link Analysis	2
3.3	Random Walk Algorithm	1
3.4	Page Rank Algorithm	2
3.5	Hubs and Authorities	2
3.6	Link Prediction	1
4	**Cascading Networks**	
4.1	Diffusion in Networks	1
4.2	Power Law	1
4.3	Preferential Attachment Models	1
4.4	Small World Network	2
5	**Social Network Models**	
5.1	Granovetter Model	1
5.2	Schelling Model	1
5.3	Balance Theorem	1
6	**Applications**	
6.1	Analyzing various social networks such as analyzing Facebook friendship networks, LinkedIn professional networks	2
6.2	Research collaboration networks, epidemiological networks, influence networks in marketing.	2
	Total Lecture Hours	36

Course Designer(s):

1. Deisy.C, Professor, cdcse@tce.edu, Information Technology
2. Parkavi.R, Assistant Professor, rpit@tce.edu, Information Technology

22ITPB0	Business Analytics

Category	L	T	P	Credit
PSE	3	0	0	3

Preamble

The course aims to provide the detailed knowledge in Business Analytics for decision-making process. The course enables the learners to enhance their management and decision-making skills with selecting suitable data modelling and analytics tools and techniques.

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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 fundamental concepts of Business Analytics.	TPS2	70	80
CO2	Use descriptive analytics to summarize and interpret the data.	TPS3	70	70
CO3	Demonstrate the performance of various predictive analytics techniques.	TPS3	70	70
CO4	Apply Excel Functions, queries, and Visualization in solving the business-related problems.	TPS3	70	70
CO5	Demonstrate the practical applications of social media analytics in marketing, brand management and social media strategy etc.	TPS3	70	70
CO6	Analyze the data using statistical and data analytic techniques for the real time business problems.	TPS4	70	60

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	M	L										L	M		L
CO2	S	M	L		S							M	M	M	L
CO3	S	M	L		M							M	M	M	L
CO4	S	M	L		S							S	M	M	L
CO5	S	M	L	L	S							S	M	M	L
CO6	S	S	M	L	S				S	S		S	S	M	M

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

CO	CAT1			Assignment -I			CAT2				Assignment - II				Terminal			
TPS Scale	1	2	3	1	2	3	1	2	3	4	1	2	3	4	1	2	3	4
CO1	10	10			10										2	5		
CO2	5	5	30			50									2	5	10	
CO3		10	30			40									2	5	15	
CO4							5	5	20				30		2	5	15	
CO5							5	10	20				30		2		15	
CO6							5	10	10	10			20	20			5	10

Syllabus

Fundamentals of Business Analytics: Scope, Framework, Types of Data, Classification of Business Analytics, Trends of Business Analytics, and applications of Business Analytics

Descriptive Analytics: Populations and samples, Statistical notations, Measures of Dispersion, and Measures of Association, Statistical measures for summarizing the data, Analysis of Variance- ANOVA, mixed models ANOVA, MANOVA.

Predictive Analytics: Decision tree Classifier, Random Forest, moving average, Exponential smoothing, Trend, Cyclical and seasonality components, ARIMA (autoregressive integrated moving average), Seasonal Autoregressive Integrated Moving Average (SARIMA), Vector Autoregression (VAR), Forecasting using Prophet, Case Study

Social Media Analytics: Need, Key Performance Indicators - Digital Marketing: 7Ps of Marketing, Methods of Digital Marketing - SMA tools : Case Study with Google Analytics Tool

Analytics on Spreadsheets: Excel Formulas, Excel Functions, Data Queries, Spread Sheet – Add -Ins for Business Analytics (ChatGPT, AI based formula generator), Data Visualization, Case Study

Learning Resources

U.Dinesh Kumar , “Business Analytics: The Science of Data - Driven Decision Making”, Wiley, First Edition, 2017.

Galit Shmueli, Nitin R Patel, Peter C Bruce, “Data Mining for Business Intelligence: Concepts, Techniques and Applications in Microsoft Office Excel with XLMiner” Wiley, First Edition, 2008.

Foster Provost and Tom Fawcet, "Data Science for Business”, O’Reilly Media, First Edition, 2013.

James R Evans, “Business Analytics – Methods, Models and Decisions,” Pearson, Second Edition, 2017.

https://onlinecourses.nptel.ac.in/noc23_mg54/preview - Business Analytics For Management Decision By Prof. Rudra P Pradhan, IIT Kharagpur.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Fundamentals of Business Analytics**	
1.1	Scope, Framework, Types of Data	2
1.2	Classification of Business Analytics	1
1.3	Trends of Business Analytics and applications of Business Analytics	2
2	**Descriptive Analytics**	
2.1	Populations and samples	2
2.2	Statistical notations	1
2.3	Measures of Dispersion and Measures of Association	1
2.4	Statistical measures for summarizing the data	1
2.5	The Analysis of Variance- ANOVA, mixed models ANOVA, MANOVA.	2
3	**Predictive Analytics**	
3.1	Decision tree Classifier	2
3.2	Random Forest	1
3.3	Moving average	1
3.4	Exponential smoothing, Trend, Cyclical and seasonality components	2
3.5	ARIMA (autoregressive integrated moving average)	1
3.6	Seasonal Autoregressive Integrated Moving Average (SARIMA), Vector Autoregression (VAR)	2
3.7	Forecasting using Prophet	2
4	**Social Media Analytics**	
4.1	Need, Key Performance Indicators	1
4.2	Digital Marketing: 7Ps of Marketing	1
4.3	Methods of Digital Marketing	1
4.4	SMA tools	2
4.5	Case Study with Google Analytics Tool	2
5	**Analytics on Spreadsheets**	
5.1	Excel Formulas, Excel Functions	2
5.2	Data Queries, Spread Sheet	1
5.3	Add -Ins for Business Analytics (ChatGPT, AI based formula generator)	2
5.4	Data Visualization	1
	Total Hours	**36**

Course Designers:

1. Dr.S.Sridevi sridevi@tce.edu
2. Dr.K.V.Uma kvuit@tce.edu
3. Dr.S.Karthiga skait@tce.edu

22ITPC0 BLOCKCHAIN TECHNOLOGIES

Category	L	T	P	Credit
PSE	3	0	0	3

Preamble

The course on Blockchain Technologies covers the technical aspects of public distributed ledgers, blockchain systems, crypto currencies, and smart contracts. Students will learn how these systems are built, how to interact with them, how to design and to build secure decentralized applications using Ethereum and Hyperledger Fabric.

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 the need and usage of cryptographic algorithms in blockchain	TPS3	70	70
CO2	Explain the significance of blocks, proof-of-work, and consensus building in blockchain.	TPS2	80	80
CO3	Explain the functional/operational aspects of trading and mining using crypto currencies.	TPS2	80	80
CO4	Develop smart contracts to code business logic in Solidity.	TPS3	70	70
CO5	Develop decentralized applications for web 3.0 using Ethereum blockchain with node services like metamask, alchemy and frontend technologies like node.js	TPS3	70	70
CO6	Analyze the impact and challenges in Blockchain implementation in various domains like finance, Health care etc.	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		L								M		
CO2	M	L			L			M					M		
CO3	M	L			L			M					M		
CO4	S	M	L		M								M		
CO5	S	M	L		S								M		
CO6	S	S	M	L	M	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	1	2	3	1	2	3	4	1	2	3	4	1	2	3	4
CO1			24			20										5	10	
CO2	4	16			20										5	10		
CO3	4	16			20											10		
CO4	4	8	24			40	10	10	20							5	20	
CO5								20	20				50			5	20	
CO6										20				50				10

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

Syllabus

Introduction to Blockchain and Cryptographic primitives

Blockchain Technology- Architecture, Transactions and Blocks, P2P Systems, Types of Blockchain, , Applications of Collison-resistant hash functions – SHA 256, Digital signature - ECDSA, Public key cryptosystems for Authentication, zero-knowledge proof systems

Bitcoin Operation

Transactions in Bitcoin, Distributed Consensus atomic broadcast, Byzantine fault-tolerant consensus methods, Merkle Patricia Tree, Anonymity, Mining Mechanism – Proof of Work, Energy efficiency, Reward, Chain Policy, 51% Attack, Life of Blockchain application, Cryptocurrency as application of blockchain technology

Ethereum

Introduction to Ethereum, Consensus Mechanisms, Metamask Setup, Ethereum Accounts, Transactions, Receiving Ethers.

Develop Smart Contracts using Solidity – Datatypes, looping and branching constructs, Function modifiers, Access Specifiers, Inheritance and Polymorphism in smart contracts. Develop DAPPS for web 3.0 –Node Services – Alchemy, Infura, Frontend – HTML, Node.js, Ganache – Truffle suite – Creating Cryptocurrencies and Non Fungible Tokens

Hyperledger

Permissioned and Private Blockchains, Hyperledger and its components Hyperledger Fabric –Transactions life cycle, Deploying a chain code in test network

Blockchain – Use cases

Financial Services- KYC and Anti money Laundering,, Trade finance, Cross-border Payments, Healthcare, Digital Rights Management, Identity Management, Tax Payment and Land Registry Records, Supply Chain

Text Book

1. Lorne Lantz, Daniel Cawrey Mastering Blockchain: Unlocking the Power of Cryptocurrencies, Smart Contracts, and Decentralized Applications, O'Reilly, 2020
2. Elad Elrom, The Blockchain Developer: A Practical Guide for Designing, Implementing, Publishing, Testing, and Securing Distributed Blockchain-based Projects, Apress, 2019

Reference Books & web resources

1. Andreas Antonopoulos , "Mastering Bitcoin: Programming the open blockchain", O'Reilly, Second Edition, 2021.
2. Melanie Swa, "Blockchain – Blueprint for New Economy", O'Reilly, Second Edition 2017
3. Andreas Antonopoulos , "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", O'Reilly, Second Edition, 2018.
4. S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, „Blockchain Technology: Cryptocurrency and Applications", Oxford University Press, 2019.
5. Josh Thompson, „Blockchain: The Blockchain for Beginnings, Guide to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 2017.

6. Zero to Blockchain - An IBM Redbooks course, by Bob Dill, David Smits https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.html
7. Hyperledger Fabric - https://www.hyperledger.org/use/fabric
8. Bitcoin Notes - https://www.ee.iitb.ac.in/~sarva/courses/EE465/Autumn2019.html

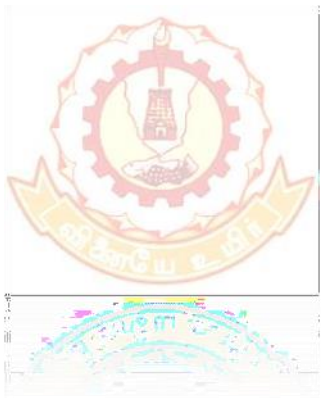
Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Introduction to Blockchain and Cryptographic primitives**	
1.1	Blockchain Technology- Architecture, Transactions and Blocks, P2P Systems, Types of Blockchain, ,	2
1.2	Applications of Collison-resistant hash functions – SHA 256	1
1.3	Digital signature -ECDSA, Public key cryptosystems for Authentication	1
1.4	Zero-knowledge proof systems	1
2	**Bitcoin Operation**	
2.1	Transactions in Bitcoin, Performing a transaction in Bitcoin testnets.	2
2.2	Distributed Consensus atomic broadcast, Byzantine fault-tolerant consensus method	2
2.3	Merkle Patricia Tree	1
2.4	Mining Mechanism – Proof of Work, Energy efficiency, Reward, Chain Policy	1
2.5	Life of Blockchain application, Cryptocurrency as application of blockchain technology	1
3	**Ethereum**	
3	Introduction to Ethereum, Consensus Mechanisms, Metamask Setup, Ethereum Accounts, Transactions, Receiving Ethers.	2
3.1	Develop Smart Contracts using Solidity – Datatypes, looping and branching constructs	1
3.2	Function modifiers, Access Specifiers	1
3.3	Inheritance and Polymorphism in smart contracts	1
3.4	Libraries in Solidity	1
3.5	Application Development in Solidity – Banking, Voting etc.,	3
3.6	Develop DAPPS for web 3.0 –Node Services – Alchemy, Infura, Frontend – HTML, Node.js, Ganache – Truffle suite – Creating Cryptocurrencies and Non Fungible Tokens	5
4	**Hyperledger**	
4.1	Permissioned and Private Blockchains, Hyperledger Project and its components	1
4.2	Transaction Lifecycle In Hyperledger Fabric	1
4.3	Deploying chaincodes in Testnetwork	2
	Blockchain – Usecases	
5.1	Financial Services- KYC and Anti money Laundering	1
5.2	Trade finance, Cross-border Payments	1
5.3	Healthcare	1
5.4	Digital Rights Management, Identity Management	1
5.5	Tax Payment and Land Registry Records	1
5.6	Supply Chain	1

Module No.	Topic	No. of Periods
	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



		Category	L	T	P	Credit
22ITPDO	**ETHICAL HACKING**	PSE	2	0	2	3

Preamble

New worms, malware, viruses, and ransomware are multiplying every day and are creating a need for ethical hacking services to safeguard the networks of businesses, government agencies or defense. The course on Ethical hacking enables the students to learn and perform hacking in a professional manner, and to prepare an analysis report highlighting the overall risk and vulnerabilities in an information system. The learners will be able to select and applythe best solution to protect against the vulnerabilities. The course provides the necessary fundamentals to earn certification in Ethical Hacking (CEH) from EC Council.

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 terminologies associated with Penetration testing, vulnerability assessment and various information security standards such as HIPAA, PCI-DSS, SOX, FISMA.	TPS2	80	80
CO2	Use network scanning, enumeration and footprinting for gathering information about host, network and people related to an organization, search engines, web servers, DNS and social networking sites.	TPS3	70	65
CO3	Deploy measures for protecting computer systems against password cracking, keyloggers, Spywares and Rootkits	TPS3	70	65
CO4	Use appropriate tools and techniques to identify various vulnerabilities in web server and perform web application testing for prevention against OWASP application risks.	TPS3	70	65
CO5	Provide security solutions for protection against evading of firewalls and Intrusion Detection Systems	TPS3	70	65
CO6	Using appropriate tools and techniques to perform penetration testing for a Websiteand prepare a report.	TPS4	70	60

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	M	L											M		
CO2	S	M	L		L			M	L	L		L	M	M	L
CO3	S	M	L		M			M	L	L		L	S	M	L
CO4	S	M	L		M			M	L	L		L	S	M	L
CO5	S	M	L		M			M	L	L		L	S	M	L
CO6	S	S	M	L	M	L	L	M	L	L	L	L	S	M	L

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	CAT 1				CAT 2				Model Lab & Record				Terminal (Theory)					
TPS Scale	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	5	6
CO1	2	10											2	5	12			
CO2	4	10	15	15							10	10	2	5	12			
CO3	4	10	15	15							10	10	2	5	12			
CO4					4	15	15	15			10	10	2	5	12			
CO5					6	15	15	15			10	10	2	5		12		
CO6											10	10		5				

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

Syllabus

Ethical Hacking - Scope and Limitations of Ethical Hacking Types of Penetration Testing Phases of Penetration Testing - Security Testing Methodology - Comparing Security Audit,Vulnerability Assessment, and Penetration Testing - Case Studies

Information Security Laws and Standards -Payment Card Industry Data Security Standard (PCI-DSS), ISO/IEC 27001:2013, Health Insurance Portability and Accountability Act (HIPAA), Sarbanes Oxley Act (SOX), The Digital Millennium Copyright Act (DMCA), Federal Information Security Management Act (FISMA).

Footprinting - Footprinting through Search Engines, Web Services - Social Networking Sites- Website Footprinting - Email Footprinting - Network Footprinting - Footprinting throughSocial Engineering

Scanning Networks: Check for live systems and live ports - Scanning beyond IDS - BannerGrabbing - Scan for vulnerability - Scanning Pen Testing

System Hacking - Cracking Passwords - Types of Password Attacks - Sniffing and Spoofing - Escalating Privileges - Keyloggers and AntiKeyloggers - Spywares and AntiSpywares - Rootkits and Anti Rootkits

Web Hacking -Web Server Hacking- Web Server Attacks- Web Server Password Cracking,Web Server Penetration Testing - Injection Flaws, Broken Authentication, XML External Entity (XXE), Broken Access Control, Cross-Site Scripting (XSS) Attacks, Insecure Deserialization, Using components with known vulnerabilities , Insufficient Logging and Monitoring

IDS Evasion Techniques - Insertion Attack – Evasion - Denial-of-Service Attack (DoS) -Session Splicing - Unicode Evasion - Fragmentation Attack

Firewall Evasion Techniques - IP Address Spoofing - Bypass a Firewall - TunnelingMethod - Protection against Firewall Evasion

Reference Books& web resources

1. EC-Council Certfied Ethical Hacking Review Guide, Wiley India Edition, 2020.
2. HEIN SMITH , HILARY MORRISON, ETHICAL HACKING: A Comprehensive Beginner'sGuide to Learn and Master Ethical Hacking, CreateSpace Independent PublishingPlatform 2018
3. RafayBaloch , Ethical Hacking and Penetration Testing Guidell, CRC Press, 2015
4. Patrick Engebretson, The Basics of Hacking and Penetration Testing, Elsevier, 2013.
5. https://www.darkwiki.in/certified-ethical-hacker-v10-course-free-download/
6. https://www.skillsoft.com/course/ceh-v11-wireless-hacking-countermeasures/

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Ethical Hacking**	
1.1 1.2 1.3	Ethical Hacking Scope and Limitations of Ethical Hacking Types of Penetration Testing	1
1.4 1.5 1.6	Phases of Penetration Testing Security Testing Methodology Comparing Security Audit, Vulnerability Assessment, and Penetration Testing	1
1.7	Case Studies	1
2	**Information Security Laws and Standards**	
2.1 2.2 2.3	Payment Card Industry Data Security Standard (PCIDSS), ISO/IEC 27001:2013, Health Insurance Portability and Accountability Act (HIPAA)	1

Module No.	Topic	No. of Periods
2.4 2.5 2.6	Sarbanes Oxley Act (SOX) The Digital Millennium Copyright Act (DMCA) Federal Information Security Management Act (FISMA)	1
3	**Footprinting**	
3.1 3.2 3.3	Footprinting through Search Engines, Web Services Social Networking Sites	1
3.4 3.5 3.6 3.7	Website Footprinting Email Footprinting Network Footprinting Footprinting through Social Engineering	1
4	**Scanning Networks**	
4.1 4.2 4.3	Check for live systems and live ports Scanning beyond IDS Banner Grabbing	1
4.5 4.6	Scan for vulnerability Scanning Pen Testing	1
5	**System Hacking**	
5.1 5.2 5.3 5.4	Cracking Passwords Types of Password Attacks Sniffing and Spoofing Escalating Privileges	1
5.5	Keyloggers and AntiKeyloggers	1
5.6 5.7	Spywares and Anti Spywares Rootkits and Anti Rootkits	1
6	**Web Hacking**	
6.1 6.2	Web Server Hacking Web Server Attacks	1
6.3 6.4	Web Server Password Cracking Web Server Penetration Testing	1
6.5 6.6	Injection Flaws Broken Authentication	1
6.7 6.8	XML External Entity (XXE) Broken Access Control	1
6.9	Cross-Site Scripting (XSS) Attacks	1
6.10 6.11	Insecure Deserialization Using components with known vulnerabilities	1
6.12	Insufficient Logging and Monitoring	1
7	**IDS Evasion Techniques**	
7.1 7.2 7.3	Insertion Attack Evasion Denial-of-Service Attack (DoS)	1
7.4 7.5 7.6	Session Splicing Unicode Evasion Fragmentation Attack	1

Module No.	Topic	No. of Periods
8	**Firewall Evasion Techniques**	
8.1 8.2	IP Address Spoofing Bypass a Firewall	1
8.3	Tunneling Method	1
8.4	Protection against Firewall Evasion	1
	Total	**24**

List of Experiments

Ex. No	Experiment	No of Hours	Cos
1	Performing footprinting using Google Hacking, website information, information about an archived website, to extract contents of a website, to trace any received email to fetch DNS information	**4**	**CO1 , CO6**
2	Use port scanning. network scanning tools,IDS tool, sniffing tool and generate reports	**2**	**CO2, CO6**
3	Use Password cracking, Dictionary attack., Encrypt and decrypt passwords, DoS attack,ARP poisoning in windows, Ifconfig, ping, netstat, traceroute, Steganography tools	**4**	**CO3, CO6**
4	SQL injection for website hacking, sessionhijacking	**2**	**CO3, CO6**
5	Hacking a website by Remote File Inclusion,Disguise as Google Bot to view hidden content of a website, to use Kaspersky for Lifetime without Patch	**2**	**CO4, CO6**
6	Creating a simple keylogger in python,creating a virus, creating a trojan	**4**	**C04, CO6**
7	Cryptool to encrypt and decrypt password, implement encryption and decryption usingCeaser Cipher	**2**	**CO5, CO6**
8	Penetration Testing using Nmap and Metasploit	**4**	**CO1, CO2, CO3, CO4, CO5, CO6**
	Total	**24**	

Course Designer(s):

1. Dr.S.Ilankumaran, AP / IT siit@tce.edu
2. Mr. P. Manojkumar, AP / IT pmkit@tce.edu

22ITPE0	PRIVACY AND SECURITY IN ONLINE SOCIAL MEDIA	Category	L	T	P	Credit
		PSE	3	0	0	3

Preamble

The surge in Internet usage has led to a significant rise in online social media platforms such as Facebook, YouTube, and Twitter. Despite their widespread use, there is a notable lack of understanding regarding privacy and security issues associated with these platforms. This course aims to explore and analyze the multifaceted aspects of privacy and security concerns on online social media, encompassing computational, cultural, and psychological perspectives.

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	Understand the working of online social networks	TPS2	70	70
CO2	Articulate the nuances of collecting data from Online Social Media and assess their trust and credibility	TPS3	70	70
CO3	Analyse information on privacy disclosures, and implement fraud detection counter measures	TPS3	70	70
CO4	Examine the counter measures to control information sharing in Online social networks	TPS3	70	70
CO5	Apply knowledge of identity management in Online social networks	TPS3	70	60
CO6	Evaluate the effectiveness of various security measures and strategies to critically assess open security issues in Online Social Networks	TPS4	70	60

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		
CO2	S	M	L									L	M		
CO3	S	M	L		M							L	M		
CO4	S	M	L		M							L	M		
CO5	S	M	L		M							L	M		
CO6	S	S	M	L	M	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	1	2	3	1	2	3	4	1	2	3	4	1	2	3	4
CO1	4	16													2	5		
CO2	4	16	20			50									2	5	10	
CO3	4	16	20			50									2	10	10	
CO4							5	15	20	10					2	10	10	
CO5							5	15	20				50		2	10	10	
CO6										10				50				10

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

Syllabus

Introduction: Online Social Networks, Data collection from social networks, Challenges, Opportunities, and pitfalls in online social networks, APIs, IPC Acts for Social Media.

Social Media Trust Analysis: Collecting data from Online Social Media, Trust, credibility, and reputations in social systems.

OSM Policing, Privacy, and Fraud Detection: Online social Media and Policing, Information privacy disclosure, revelation and its effects in OSM and online social networks, Phishing in OSM & Identifying fraudulent entities in online social networks.

Access Control Models: Access Control in Online Social Networks, Relationship-Based Access Control, Privacy Settings in Commercial Online Social Networks, Existing Access Control Approaches

Identity Management: Identity Management, Digital Identity, Identity Management Models: From Identity 1.0 to Identity 2.0, Identity Management in Online Social Networks, Identity as Self-Presentation, Identity thefts, Open Security Issues in Online Social Networks

Applications: Privacy and security issues associated with various social media.

Learning Resources

1. Security and Privacy-Preserving in Social Networks, Chbeir Richard, Al Bouna, Bechara (Eds.), Spinger, 2013.
2. The Routledge Handbook of Privacy and Social Media (1st ed.), Trepte, S., & Masur, P. (Eds.), Routledge, 2023.
3. Security and Trust in Online Social Networks, Barbara Carminati, Elena Ferrari, Marco VivianiMorgan & Claypool publications.
4. Security and Privacy in Social Networks, Editors: Altshuler, Y., Elovici, Y., Cremers, A.B., Aharony, N., Pentland, A. (Eds.), Springer, 2013
5. Security and privacy preserving in social networks, Elie Raad & Richard Chbeir, Richard Chbeir& Bechara Al Bouna, 2013
6. Social Media Security: Leveraging Social Networking While Mitigating Risk, Michael Cross, 2013
7. SWAYAM - NPTEL Course, “Privacy and Security in Online Social Media”, https://onlinecourses.nptel.ac.in/noc23_cs13/preview

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours
1	**Introduction**	1
1.1	Online Social Networks	
1.2	Data collection from social networks	1
1.3	Challenges, Opportunities, and pitfalls in online social networks	2
1.4	Online social networks- APIs	1
1.5	IPC Acts for Social Media	1

2	**Social Media Trust Analysis**	
2.1	Collecting data from Online Social Media,	2
2.2	Online social network - Trust,	1
2.3	Credibility, and reputations in social systems	2
3	**OSM Policing, Privacy, and Fraud Detection**	
3.1	Online social Media and Policing	2
3.2	Information privacy disclosure revelation and its effects in OSM and online social networks	2
3.3	Phishing in OSM	2
3.4	Identifying fraudulent entities in online social networks	2
4	**Access Control Models**	
4.1	Access Control in Online Social Networks	1
4.2	Relationship-Based Access Control	1
4.3	Privacy Settings in Commercial Online Social Networks	2
4.4	Existing Access Control Approaches	1
5	**Identity Management**	
5.1	Identity Management, Digital Identity	2
5.2	Identity Management Models: From Identity 1.0 to Identity 2.0	2
5.3	Identity Management in Online Social Networks	2
5.4	Identity as Self-Presentation, Identity thefts	2
5.5	Open Security Issues in Online Social Networks	2
6	**Applications**	
6.1	Privacy and security issues associated with various social media – Case Study	2
	Total Lecture Hours	36

Course Designer(s):

1. Sujitha.S, Assistant Professor, ssiit@tce.edu, Information Technology
2. Parkavi.R, Assistant Professor, rpit@tce.edu, Information Technology

22ITPF0	DISTRIBUTED APPLICATION DEVELOPMENT	Category	L	T	P	Credit
		PSE	3	0	0	3

Preamble

This course helps the students to understand various aspects that must be considered while designing and developing a distributed application. This course also provides necessary insights into various design patterns, frameworks, tools and technologies that could be leveraged for the development of Distributed applications.

Prerequisite

- Basic knowledge in Application development

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 concepts, components and key features of microservice application architectures	TPS2	70	80
CO2	Containerize an application by creating Docker config files and build processes to produce all the necessary Docker images	TPS3	70	70
CO3	Use appropriate patterns for the design of distributed systems subject to specific design and performance constraints	TPS3	70	70
CO4	Deploy and manage containerized application with kubernetes	TPS3	70	60
CO5	Examine the challenges in co-ordinating distributed transactions using appropriate techniques and algorithms.	TPS4	70	60
CO6	Perform Serverless application development with distributed databases such as Cassandra, DynamoDB at the backend	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**		
CO2	**S**	**M**	**L**		**S**			**S**	**S**	**S**	**M**	**S**	**M**	**M**	**M**
CO3	**S**	**M**	**L**		**S**			**S**	**S**	**S**		**L**	**M**	**M**	**M**
CO4	**S**	**M**	**L**		**S**			**S**	**S**	**S**	**M**	**S**	**M**	**M**	**M**
CO5	**S**	**S**	**M**	**L**								**L**	**S**		
CO6.	**S**	**M**	**L**		**S**			**S**	**S**	**S**		**L**	**M**	**M**	**M**

S- Strong; M-Medium; L-Low

Assessment Pattern:Cognitive Domain

CO	CAT1			Assignment -I			CAT2				Assignment - II				Terminal			
TPS Scale	1	2	3	1	2	3	1	2	3	4	1	2	3	4	1	2	3	4
CO1	10	15		-	-	-	-	-	-		-	-	-		5	10		
CO2	5	15	20	5	20	25	-	-	-		-	-	-		5	5	10	
CO3	5	10	20	5	20	25	-	-	-		-	-	-		5	5	10	
CO4	-	-	-	-	-	-	5	10	20		-	-	30		-	5	10	
CO5	-	-	-	-	-	-	5	10	10	10	-	-	20	10	-	-	5	10
CO6	-	-	-	-	-	-	-	10	20		-	-	40		-	5	10	

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

Syllabus

Microservices Architecture - Characteristics – Monolith vs Microservice – Principles for modelling microservices from monolith applications- APIs – RESTful Standards – Case studies with Spring Boot and Nodejs

Containers – Containerization- Container Orchestration- Docker - Installation – Pulling and Running image using Containers – Registry - Docker files - Building custom docker images – Docker Networking-Docker Compose

Distributed Design Patterns - Single Node Patterns – Sidecar Patterns – Ambassadors - Adapters - **Serving Patterns –**Stateless services – Session tracked services – Caching layer – Sharding Services- Sharded Caching

Kuberenetes: Architecture-Key Concepts-Pods-YAML configuration-Replication Controllers and replica sets-Microservice application deployment on Kubernetes-Services and Networking in Kubernetes

Distributed Computation – Master Election –-Fault Tolerance - Fault Models –Distributed database concepts: Distributed Transactions-Handling Concurrent Data Manipulation - Commit Protocols – Voting Protocols

Serverless Computing - Serverless Platform Architecture – Characteristics – Function-as-a-Service – Backend as a service – Event driven Programming – Message queues – Serverless Databases – Key-Value Stores

Reference Books& web resources

1. Sam Newman, “Building Microservices: Designing Fine-Grained Systems”, O’Reilly, Second Edition, 2021.
2. Nigel Poulton, “Quick Start Kubernetes-Hands on”, 2023 Edition
3. Brendon Burns, “Designing Distributed Systems”, O’Reilly Publication, First Edition, 2018

4. Andrew S. Tanenbaum, Maarten Van Steen, “Distributed Systems : Principles and Paradigms”, PearsonEducation, Third Edition, 2017
5. George Coulouris, Jean Dollimore, Tim Kindberg, Gordon Blair , "Distributed Systems: Concepts and Design", Pearson Education, Fifth Edition, 2017
6. MaddieStaggler – “Beginning Serverless Computing: Developing with Amazon Web Services, Microsoft Azure and Google Cloud – Apress, 2018
7. Ben Stopford, “ Designing Event-Driven Systems”, O’Reilly Publication, May 2018

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Microservices Architecture**	
1.1	Characteristics, Monolith vs Microservice	1
1.2	Principles for modelling microservices from monolith applications	1
1.3	APIs – RESTful Standards	2
1.4	Case studies with Spring Boot and Nodejs	
2	**Containers**	
2.1	Containerization- Container Orchestration	1
2.2	Docker - Installation – Pulling and Running image using Containers	1
2.3	Docker files - Building custom docker images	1
2.4	Docker Networking-Docker Compose	2
3	**Distributed Design Patterns**	
3.1	Single Node Patterns – Sidecar Patterns	1
3.2	Ambassadors - Adapters	2
3.3	**Serving Patterns –**Stateless services – Session tracked services	1
3.4	Caching layer – Sharding Services- Sharded Caching	2
4	**Kuberenetes**	
4.1	Architecture-Key Concepts	1
4.2	Pods-YAML configuration	1
4.3	Replication Controllers and replica sets	2
4.4	Microservice application deployment on Kubernetes- Services and Networking in Kubernetes	2
5	**Distributed Computation**	

Module No.	Topic	No. of Periods
5.1	Master Election	2
5.2	Fault Tolerance - Fault Models	2
5.3	Distributed database concepts: Distributed Transactions	1
5.4	Handling Concurrent Data Manipulation	1
5.5	Commit Protocols – Voting Protocols	2
6	**Serverless Computing**	
6.1	Serverless Platform Architecture – Characteristics	1
6.2	Function-as-a-Service – Backend as a service	2
6.3	Event driven Programming – Message queues	2
6.4	Serverless Databases – Key-Value Stores	2
	Total	36

Course Designer(s):

1. Dr.S.Padmavathi, Professor, IT, spmcse@tce.edu
2. Mrs.S.Thiruchadai Pandeeswari, Assistant Professor, IT, eswarimsp@tce.edu

22ITPG0	ASSISTIVE TECHNOLOGY DESIGN	Category	L	T	P	Credit
		PSE	3	0	0	3

Preamble

This course gives the design and evaluation of Assistive Technologies with ethics, policies. It's a course to design, prototype and evaluate the assistance with new/existing devices. Bridging the gap between people and assistive devices develop the client centred projects for various disability in the society.

Prerequisite

NIL

Course Outcomes

CO1	Course Outcome Statement	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Explain the Fundamentals of disability, communicating with the disability people and their needs	TSP2	70	70
CO2	Understand the existing devices and technology used to assist the disability people	TSP2	70	70
CO3	Deploy the gap between people and devices	TSP3	70	70
CO4	Illustrate appropriate techniques to Find the issues in Human Interface Design, Product idea, physical and cognitive impairments	TSP3	70	60
CO5	Infer Client Centred Design for various disabilities	TSP4	70	70
CO6	Demonstrate Case studies for various disabilities design/modify/fabricate/devices to assist the people based on their needs	TSP4	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	L		L
CO2.	M	L										M	L		L
CO3.	S	M	L									M	M		L
CO4.	S	M	L		L							S	M	L	L
CO5.	S	S	M	L	L			L	M			S	S	L	M
CO6.	S	S	M	L	M	S	M	M	M	M		S	S	S	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	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	5	-	-	-	-
CO2	4	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	5	-	-	-	-
CO3	2	10	40	-	-	-	100	-	-	-	-	-	-	-	-	-	2	5	10	-	-	-
CO4	-	-	-	-	-	-	-	-	4	5	15	-	-	-	30	-	2	5	10	-	-	-
CO5	-	-	-	-	-	-	-	-	4	5	15	15	-	-	30	-	2	5	10	10	-	-
CO6	-	-	-	-	-	-	-	-	2	5	15	15	-	-	-	40	-	5	10	10	-	-

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

Syllabus

Introduction about Physical and Mental abilities – Sensor Disabilities – Neuro developmental Disabilities – Loco motors and Multiple Disabilities - Disability and DSM 5 Manual - **Disability Communication and Etiquette** – Communicating / Interacting with people with disability – Common practices – people-first language exceptions – Practical takeaways – other frameworks – User Centered Design

Exploring the needs– Observing low, mid, high, and newer technologies applications through reflection, observation, and application. Bridging the gap between people and rehabilitation products – Designing beyond the norm to meet the needs of people- improving home environments for aged people

Client-centered design - Intro to the Domains (augmentative/alternate communication, orthotics, prosthetics and robotics, seating and mobility, computer access) - Issues of Human Interface Design - Art, Aesthetics issues in adaptive design –Ideas to Product – Assistive technology for persons with cognitive impairments - Universal Design

Technologies for ability people– Independent Living – Software, Electronics – Mobility – Information Access- Physical,Sensory – Speech and communication– Assistive technology devices– Amplifying Devices – Alert Devices –Mobile Devices - Haptic Devices

Case Studies - Modify, customize, fabricate a range of low to medium tech assistive technology devices – Assistive devices for physical Mobility - wheelchairs for multiple disability -Visually Challenging People - Brailey and other gadgets to support for navigation and workplace - Hearing and Speech Impaired people - supporting gadgets - Mental health issues - cognitive and memory issues - Old Age People - Assistive Devices indoor and outdoor environments.

Text Book

1. Bryant, D. P. & Bryant, B. R. (2012). Assistive technology for people with disabilities.Upper Saddle River, New York:Pearson

Reference Books & web resources

1. Cook, Albert M., and Jan Miller Polgar. *Cook & Hussey's Assistive Technologies: Principles and Practice*. 3rd ed. Mosby Elsevier, 2007. ISBN: 9780323039079.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Introduction about Physical and Mental abilities**	
1.1	Sensor Disabilities	1
1.2	Neuro developmental Disabilities , Loco motors and Multiple Disabilities	2
1.3	Disability and DSM 5 Manual, Disability Communication and Etiquette	2
1.3.1	Communicating / Interacting with people with disability	1
1.3.2	Common practices , people-first language exceptions , Practical takeaways	1
1.3.3	Other frameworks – User Centred Design	1
2	**Technologies for ability people**	
2.1	Independent Living-Software, Electronics, Mobility	2
2.2	Information Access- Physical, Sensory, Speech and communication	1
2.3	Assistive technology devices, Amplifying Devices, Alert Devices, Mobile Devices , Haptic Devices	2
3	**Exploring the needs**	
3.1	Observing low, mid, high, and newer technologies applications through reflection,observation and application	1
3.2	Bridging the gap between people and rehabilitation products	2
3.3	Designing beyond the norm to meet the needs of people, improving home environments for aged people	2
4	**Client-centered design**	
4.1	Intro to the Domains (augmentative communication, orthotics, prosthetics and robotics, seating and mobility, computer access)	2
4.2	Issues of Human Interface Design, Art, Aesthetics issues in adaptive design	2
4.3	Ideas to Product	1
4.4	Assistive technology for persons with cognitive impairments	2
4.5	Universal Design	2
5	**Case Studies**	
5.1	Modify,customize,fabricate a range of low to medium tech assistive technology devices	2
5.2	Assistive devices for physical Mobility	1

Module No.	Topic	No. of Periods
5.3	wheelchairs for multiple disability -Visually Challenging People	2
5.4	Brailey and other gadgets to support for navigation and workplace	1
5.5	Hearing and Speech Impaired people - supporting gadgets	1
5.6	Mental health issues - cognitive and memory issues	1
5.7	Old Age People - Assistive Devices indoor and outdoor environments.	1
	TOTAL	**36**

Course Designer(s):

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

22ITPJ0 MOBILE COMMUNICATION

Category	L	T	P	Credit
PSE	3	0	0	3

Preamble

The course aims at exploring the concepts of mobile communications in Physical, MAC, Network and Transport layer level. It also explores the WLAN, GSM, LTE, 5G telecommunication system and Ad Hoc routing schemes. This course induces research practice through the team assignment on recent methods/protocols with simulation tools.

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	Experiment with the wireless multiplexing, modulation and spread spectrum techniques for the given scenario	TPS3	70	70
CO2	Choose the suitable wireless MAC mechanisms - SDMA, TDMA, FDMA and CDMA for solving the given problem	TPS3	70	70
CO3	Outline the working principle of Mobile IP and Mobile TCP	TPS2	70	80
CO4	Demonstrate the various functions of Wireless LAN and GSM, LTE, 5G telecommunication system	TPS2	70	80
CO5	Solve the given wireless ad hoc network routing problem with suitable routing schemes	TPS3	70	70
CO6	Apply anyone of the schemes in a given mobile communication network environment and study their performance through simulation tools such as NS3	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	PS O1	PS O2	PS O3
CO1.	S	M	L										M		
CO2.	S	M	L										M		
CO3	M	L											L		
CO4	M	L											L		
CO5	S	M	L										M		
CO6	S	S	M	L	M			S	S	S		S	M	L	M

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	CAT1			Assignment -1			CAT2			Assignment -2			Terminal		
TPS Scale	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
CO1	10	10	10		40									5	10
CO2	10	10	30		50								5	10	10
CO3		20			10								5	10	
CO4							10	20			20		5	10	
CO5							10	20	40		10		5	5	10
CO6												70			10

Syllabus

Physical Layer: Signal propagation - Multiplexing - SDM, TDM, FDM, CDM – Modulation – ASK, PSK, FSK, MSK - Spread spectrum – DSSS, FHSS

MAC Layer: CSMA/CD - SDMA, FDMA, TDMA – Aloha, Slotted Aloha, PRMA, ISMA – CDMA – MACA, Comparisons

Network and Transport Layer: Mobile IP – Packet Delivery, Agent Registration, Reply, Triangular Routing - Mobile TCP - Snooping TCP

Wireless LAN: Transmission Technologies – System Architecture - Physical Layer – IR, FHSS, DSSS - DFWMAC

Telecommunication Systems: GSM - Services – Architecture – Protocol Stack – Call Routing – Handover, LTE, 5G

Wireless Ad Hoc Networks – Routing: Challenges – Table driven, On-demand, Power aware Routing schemes, QoS

Text Book

1. Jochen.H.Schiller, “Mobile Communications”, Pearson, second edition 2008.

Reference Books& web resources

1. T.S.Rappaport, “Wireless Communications Principles and Practices”, Pearson Education, Asia, NewDelhi, second edition, 2010
2. C.Siva Ram Murthy and B.S. Manoj, “Ad Hoc Wireless Networks- Architectures and Protocols”, second Edition, 2004.
3. https://archive.nptel.ac.in/courses/106/106/106106167/

Course Content and Lecture Schedule

Module No	Topic	No. of Lecture Hours
1	**Physical Layer**	
1.1	Signal propagation	1
1.2	Multiplexing – SDM, TDM, FDM, CDM	2
1.3	Modulation – ASK, PSK, FSK, MSK	2
1.4	Spread Spectrum – DSSS, FHSS	2
2	**Medium Access Control Layer**	
2.1	CSMA/CD	1
2.2	SDMA, FDMA	1
2.3	TDMA – Aloha, Slotted Aloha	1
2.4	PRMA, ISMA	2
2.5	CDMA	1
2.6	MACA, Comparisons	1
3	**Network and Transport Layer**	
3.1	Mobile IP – Introduction	2

3.1.1	Packet Delivery	1
3.1.2	Agent Registration, Reply, Triangular Routing	2
3.2	Mobile TCP – Snooping TCP	1
3.3	Wireless LAN	1
3.3.1	Transmission Technologies, System Architecture	1
3.3.2	Physical Layer – IR, FHSS, DSSS	1
3.3.3	DFWMAC	2
4	**Telecommunication System**	
4.1	GSM – Introduction	1
4.1.1	Services, Architecture, Protocol Stack	1
4.1.2	Call Routing, Handover	1
4.2	LTE, 5G	2
5	**Wireless Ad Hoc Networks**	
5.1	Routing Challenges	1
5.2	Table Driven routing schemes	2
5.3	On-demand routing schemes	3
	Total	36

Course Designer(s):

1. Dr.S.Muthuramalingam smrit@tce.edu
2. Dr.P.Karthikeyan karthikit@tce.edu

22ITPK0	FULL STACK TECHNOLOGIES	Category	L	T	P	Credit
		PSE	3	0	0	3

Preamble

This course covers the Front-end Development Environment for handling view layer, Component Management, Life Cycle Handling, State Management of the web application. It also covers the navigation controls and emphasizes the deployment environment with a backend as a service. The concepts will be illustrated with appropriate examples and tools.

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	Understand the Full stack components and develop responsive web pages using Bootstrap 4	TSP2	70	80
CO2	Develop dynamic and responsive single-page applications using React Js and React Router	TSP3	70	70
CO3	Use scalable state management solutions for complex React applications with seamless data flow and asynchronous behavior	TSP3	70	70
CO4	Build a full-fledged backend for a web application using Express Js	TSP3	70	70
CO5	Integrate MongoDB as the storage option in Full stack development ecosystem	TSP3	70	70
CO6	Design and implement RESTful APIs to facilitate communication between frontend and backend layers of an application	TSP3	70	70

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	M	L											L		
CO2	S	M	L		S			S				S	M	M	L
CO3	S	M	L		S			S				S	M	M	L
CO4	S	M	L		S			S				S	M	M	L
CO5	S	M	L		S			S				S	M	M	L
CO6	S	M	L		S			S				S	M	M	L

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	CAT 1			Assignment 1			CAT 2			Assignment 2			Terminal		
TPS Scale	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
CO1	10	10			20								4		
CO2	10	10	20			30							4	5	15
CO3		10	30			50							4		
CO4							10	10	30			30	4	5	15
CO5								10	30			30	4	5	15
CO6							10					40		5	15

Syllabus

Introduction – Foundation Paradigms - Full Stack Development Stack and architecture – Responsive Web Design - Bootstrap4 Web UI components Basics – Grids - Themes – Bootstrap JS – jQuery selectors and events.

Front End Development with React JS – React JS Basics - React Router and Single Page Applications – Presentational and Container Components- Setting Up React Development Environment – React Forms – Components - React DOM

State Management and Redux -State and Props - Lifecycle Methods - Introduction to Redux - Controlled Forms and form Validation-Uncontrolled Components - Flux Architecture- Redux Actions- React Animation - Redux Thunk

Back End Development - Express - Routing - Request Matching - Route parameters - Route Lookup – Handler Function - Request Object - Response Object - Middleware - GraphQL - Error Handling – MongoDB - CRUD Operations

Full Stack Integration - REST API - Connecting frontend and backend using AJAX and Fetch API - Authentication and authorization- Deployment strategies and hosting options – AWS – Heroku

Learning Resources

1. ALBERT TETTEH ADJEI , “Full Stack Web Development: Building End-to-End Web Applications with Modern Technologies: A Comprehensive Guide to End-to-End Development Technologies”, TechTales Chronicles 2023.
2. David Choi and Nate “Full-Stack React, TypeScript, and Node" , Apress Publishers, Year: 2020
3. Colin Ihrig, Adam Bretz, and Markus Oberlehner, “Full Stack JavaScript Development with MEAN" , Packt Publishing, Year: 2018
4. https://reactjs.org/

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
1	**Introduction**	
1.1	Foundation Paradigms	1
1.2	Full Stack Development Stack and architecture	1
1.3	Responsive Web Design	1

1.4	Bootstrap4 Web UI components Basics	1
1.5	Grids, Themes and Bootstrap JS	1
1.6	jQuery selectors and events.	1
2	**Front End Development with React**	
2.1	React Basics	2
2.2	React Router and Single Page Applications	1
2.3	Presentational and Container Components	1
2.4	Setting Up React Development Environment	1
2.5	React Forms and Components	1
2.6	React DOM	1
3	**State Management and Redux**	
3.1	State and Props	2
3.2	Lifecycle Methods	1
3.3	Introduction to Redux	2
3.4	Controlled Forms and form Validation	1
3.5	Uncontrolled Components	1
3.6	Flux Architecture	1
3.7	Redux Actions and Thunk	1
3.8	React Animations	1
4	**Back End Development**	
4.1	Express - Routing	1
4.2	Request Matching, Route parameters	
4.3	Route Lookup , Handler Function	1
4.4	Request Object - Response Object	1
4.5	Middleware, GraphQL	1
4.6	Error Handling	1
4.7	MongoDB	1
4.8	CRUD Operations	1
5	**Full Stack Integration**	
5.1	REST API	1
5.2	Connecting frontend and backend using AJAX and Fetch API	1
5.3	Authentication and authorization	1
5.4	Deployment strategies and hosting options – AWS – Heroku	2
	Total	36

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

22ITPL0	SOFTWARE DEFINED NETWORKS	Category	L	T	P	Credit
		PSE	3	0	0	3

Preamble

This course aims to provide foundations of Software-defined Networking which includes architecture, evolution, challenges and benefits of SDN compared to traditional networking approach. This course delves into SDN's operational mechanisms, prominent controllers, OpenFlow basics and integration with virtualization and cloud technologies.

Prerequisite

Basics of Traditional Networking

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	Recognize the need for SDN in Cloud, Fog, IOT applications and modern Data Centers	TPS 2	70	70
CO2	Examine traditional and SDN based Network planes and operations	TPS 4	70	60
CO3	Configure an opensource controller and connect it with a network topology created with suitable SDN simulators such as Mininet	TPS 3	70	65
CO4	Implement Controller-Switch communication sessions using OpenFlow	TPS 3	70	65
CO5	Demonstrate the need for SDN in the context of Network Virtualization and Network Function Virtualization	TPS 3	70	65
CO6	Enhance Datacenter Networks, Campus Networks, Hospitality Networks, and Mobile Networks using SDN	TPS 3	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	S	M	L				S	S	S			S		M
CO3.	S	M	L		S			S	S	S			M	M	M
CO4.	S	M	L		S			S	S	S		L	M	M	M
CO5.	S	M	L					S	S	S			M		M
CO6.	S	M	L		M			S	S	S		L	M	M	M

S- Strong; M-Medium; L-Low

Assessment Pattern

COs	CAT 1				Assignment 1				CAT 2			Assignment 2			Terminal			
TPS Scale	1	2	3	4	1	2	3	4	1	2	3	1	2	3	1	2	3	4
CO1	10	10	-	-	-	-	-	-	-	-	-	-	-	-	5	5	-	-
CO2	5	10	20	10	-	-	-	40	-	-	-	-	-	-	5	5	10	10
CO3	5	10	20	-	-	-	60	-	-	-	-	-	-	-	-	-	10	-
CO4	-	-	-	-	-	-	-	-	5	10	20	-	-	30	-	5	10	-
CO5	-	-	-	-	-	-	-	-		20	10	-	-	10	5	5	10	-
CO6	-	-	-	-	-	-	-	-	5	10	20	-	-	60	-	5	10	-

Syllabus

SDN Evolution & Needs – Overview of Traditional Networks - Traditional Switch Architecture – Internal Structure of a Router – Technological Shifts – Motivations and Challenges of SDN – Data Center Needs - Evolution of Switches and Control planes : ForCes –4D – Ethane – Ethane – Plane Separation - Control Plane Functions – Data Plane Functions

SDN Operations and Devices – Fundamental Characteristics of SDN – Anatomy of SDN Controller – Northbound API – Southbound API – SDN Switches – Alternate SDN Methods – OpenFlow : Overview – commands – Limitations.

SDN Controllers – ONOS – Ryu – Pox – Create simple network topologies with Mininet – Capture Network flow with Wireshark – Programming with Frenetic – SDN Security

SDN and NV/NFV – Needs for SDN in Cloud – Implications of Server Virtualization – Network Function Virtualization: Overview, Requirements, Benefits, Principles, Reference Architecture – Network Service Abstraction layer – Usecases – Network Virtualization: Resources, Conceptual Architecture – SDI

SDN Applications – Datacenter Networks – Hospitality Networks – Campus Networks –5G Networks : C-RAN Architecture , Role of SDN and NFV in C-RAN – Network Administration

Text Book

1. Paul Goransson and Chuck Black – Software Defined Networks-A Comprehensive Approach – Morgan Kaufmann.- 2016 – Second Edition
2. William Stallings, “Foundations of Modern Networking: SDN, NFV, QoE, IoT and Cloud”, Pearson Education, 1st Edition, 2015

Reference Books & web resources

1. Thomas D Nadeau and ken Gray- “SDN”- O’Reilly publication- First Edition- 2014
2. Road to SDN - http://queue.acm.org/detail.cfm?id=2560327
3. Routing Control - http://www.cs.princeton.edu/~jrex/papers/rcp-nsdi.pdf
4. ONOS - https://onosproject.org/
5. Open Networking - https://www.opennetworking.org/onos/

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**SDN Evolution & Needs**	
1.1	Overview of Traditional Networks	1
1.2	Traditional Switch Architecture – Internal Structure of a Router	1
1.3	Technological Shifts – Motivations and Challenges of SDN – Data Center Needs	1
1.4	Evolution of Switches and Control planes : ForCes	1
1.5	4D - Ethane	1
1.6	Plane Separation - Control Plane Functions – Data Plane Functions	2
2	**SDN Operations and Devices**	
2.1	Fundamental Characteristics of SDN	1
2.2	Anatomy of SDN Controller – Northbound API – Southbound API – SDN Switches	2
2.3	Alternate SDN Methods	2
2.4	OpenFlow : Overview – commands – Limitations	2
3	**SDN Controllers**	
3.1	ONOS	1
3.2	Ryu – Pox	2
3.3	Create simple network topologies with Mininet	1
3.4	Capture Network flow with Wireshark	1
3.5	Programming with Frenetic	1
3.6	SDN Security	2
4	**SDN and NV/NFV**	
4.1	Needs for SDN in Cloud – Implications of Server Virtualization	1
4.2	Network Function Virtualization : Overview, Requirements, Benefits, Principles, Reference Architecture	2
4.3	Network Service Abstraction layer - Usecases	1
4.4	Network Virtualization : Resources, Conceptual Architecture	2
4.5	SDI	1
5	**SDN Applications**	
5.1	Datacenter Networks	1
5.2	Hospitality Networks - Campus Networks	3
5.3	5G Networks : C-RAN Architecture , Role of SDN and NFV in C-RAN	3
	Total	36

Course Designer(s):

1. Dr S. Padmavathi, Professor, Dept of IT spmcse@tce.edu
2. S. Thiruchadai Pandeeswari, Assistant Professor, Dept of IT eshwarimsp@tce.edu

22ITPM0	FOG COMPUTING

Category	L	T	P	Credit
PE	3	0	0	3

Preamble

This course aims at providing students with the necessary fundamental concepts and knowledge on technologies that will enable them to explore the fog computing paradigm and apply the same in their prospective projects in the domains of IoT, 5G, Industry 4.0 and Stream Analytics.

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 concepts, characteristics and architecture of Fog Computing paradigm.	TPS2	80	80
CO2	Identify the appropriate enabling technologies such as SDN, NFV and protocols for the given fog-based application	TPS3	80	70
CO3	Demonstrate the application of software definition in the networking for fog computing.	TPS3	80	70
CO4	Examine a suitable orchestration framework for a fog-based application	TPS4	80	65
CO5	Identify the suitable communication technologies and execution management functions of fog computing middleware based on the given design goal.	TPS3	80	70
CO6	Experiment with the use cases of fog computing in IoT and 5G systems	TPS3	80	65

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	PSO 3
CO1	M	L											L		
CO2	S	M	L									L	M		
CO3	S	M	L		L				L	L		L	M	L	
CO4	S	S	M	L	M	L			S	M		L	S	M	L
CO5	S	M	L		M	L	L	S	S	M	L	M	M	M	M
CO6	S	M	L		S	L	L	S	S	M	L	M	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	4	1	2	3	4	1	2	3	4
CO1	10	10													5	5		
CO2	10	10	20		10	20									5	5	5	
CO3	10	10	20		10	60										5	5	
CO4							5	10	10	10			40	10	5	5	10	10
CO5							5	10	20				10		5	5	10	
CO6								10	20				40			5	10	

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

Syllabus

Computing Paradigms: Cloud - Fog - Edge computing Concepts - Characteristics- Services - Challenges - Fog Computing Architecture - Motivations - Performance Enhancements - Enabling Technologies - Fog based applications

Networking for Fog: Fog networking requirements - Challenges - Software Definition of Networks - Plane Separation - Control Plane - Data Plane - SDN Controllers - SDN Enabled Fog Architecture - Case Study - Fog Protocol -Fog Kit - Proximity Detection Protocols- DDS/RTPS computing protocols.

Orchestration of Network Slices: Network Slicing - Resource provisioning- Mobility Management - Generic Slicing framework - Slicing Management and Orchestration - State of the art Orchestration frameworks

Middleware for Fog: Design Goals - Communication Technologies - Device Discovery - Context Monitoring - Execution Management - Containerization - Docker Container Orchestration

Fog - Use cases: Fog based real time sensor data analysis - Federated Learning - Vehicular Networks - ML for Autonomous Driving Car - IoT Applications: Smart Agriculture, Retail Analytics, Logistics and Supply Chain Management, Healthcare Monitoring, Home Automation, Smart Transportation - Industrial IoT (IIoT) - 5G systems

Learning Resources

1. Buyya, Rajkumar, and Satish Narayana Srirama, eds. Fog and edge computing: principles and paradigms. Wiley, 2019.
2. Mahmood, Zaigham, ed. Fog Computing: Concepts, Frameworks and Technologies. Springer, 2018.
3. Rahmani, Amir M., et al., eds. Fog computing in the internet of things: Intelligence at the edge. Springer, 2017.
4. Alenezi, Mamdouh, Khaled Almustafa, and Khalim Amjad Meerja. "Cloud based SDN and NFV architectures for IoT infrastructure." Egyptian Informatics Journal 20.1 (2019): 1-10.
5. Manzalini, Antonio, Cagatay Buyukkoc, Prosper Chemouil, Slawomir Kuklinski, Franco Callegati, Alex Galis, Marie-Paule Odini et al. "Towards 5g software-defined ecosystems." IEEE, Software Defined Networks Whitepaper, 2016.
6. Chiang, Mung, and Tao Zhang. "Fog and IoT: An overview of research opportunities." IEEE Internet of Things Journal 3, no. 6: 854-864,2016
7. https://www.openfogconsortium.org/resources/

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Computing Paradigms**	
1.1	Cloud - Fog - Edge computing Concepts	1
1.2	Characteristics	
1.3	Services	
1.4	Challenges	1
1.5	Fog Computing Architecture	
1.6	Motivations	1
1.7	Performance Enhancements	
1.8	Enabling Technologies	1
1.9	Fog based applications	
2	**Networking for Fog**	
2.1	Fog Networking requirements	1
2.2	Challenges	
2.3	Software Definition of Networks	1
2.4	Plane Separation	1
2.5	Control Plane	1
2.6	Data Plane	1
2.7	SDN Controllers	1
2.8	SDN Enabled Fog Architecture	1
2.9	Case Study	1
2.10	Fog Protocol - Fog Kit	1
2.11	Proximity Detection Protocols - DDS/RTPS computing protocols.	
3	**Orchestration of Network Slices**	
3.1	Network Slicing	1
3.2	Resource provisioning	1
3.3	Mobility Management	1
3.4	Generic Slicing framework	1
3.5	Slicing Management and Orchestration	2
3.6	State of the art Orchestration frameworks	1
4	**Middleware for Fog**	
4.1	Design Goals	1
4.2	Communication Technologies	1
4.3	Device Discovery	1
4.4	Context Monitoring	1
4.5	Execution Management	2
4.6	Containerization	1
4.7	Docker Container Orchestration	1
5	**Fog - Use cases**	
5.1	Fog based real time sensor data analysis	1
5.2	Federated Learning	1
5.2	Vehicular Networks	1

5.3	ML for Autonomous Driving Car	1
5.3	IoT Applications: Smart Agriculture, Retail Analytics	1
5.4	Logistics and Supply Chain Management, Healthcare Monitoring	1
5.5	Home Automation, Smart Transportation - Industrial IoT (IIoT)	2
5.6	5G systems	
	Total	**36**

Course Designers:

1. Dr.S.Padmavathi, Professor, Information Technology spmcse@tce.edu
2. Dr.K.R.Premlatha, Assistant Professor, Information Technology krplit@tce.edu

22ITPN0	INFORMATION SECURITY AUDITING AND MANAGEMENT	Category	L	T	P	Credit
		PSE	3	0	0	3

Preamble

This course aims to provide an intensive conceptual and introduction to auditing, it mainly focuses on concepts and applications related to IT audit as well as risks of information systems.

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 need of information security and auditing with general policies and procedures.	TPS2	80	85
CO2	Demonstrate the working of IT Governance and its functions in an organization.	TPS3	80	80
CO3	Conduct IT Auditing in domains like ERP implementation, Data Management etc.,	TPS3	80	80
CO4	Verify the correctness of audit objectives and audit procedures in IT auditing.	TPS4	80	70
CO5	Analyze the various forms of information security risks.	TPS4	80	70
CO6	Apply information security policies to secure Systems, Application programs, Computer operations, Communications, and Physical assets	TPS3	80	80

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					L	M	M	M		M		M
CO3	S	M	L					L	M	M	M		M		M
CO4	S	M	L					L	M	M	M		M		M
CO5	S	S	M	L	M			M	S	S	S	M	S	M	M
CO6	S	S	M	L	M			M	S	S	S	M	S	M	M

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	CAT				Assignment				CAT				Assignment				Terminal			
	1				1				2				2							
TPS Scale	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
CO1	8	20															2	5	5	
CO2	8	10	20				50										2	5	5	
CO3	4	10	20				50										2	5	5	
CO4									2	10	15	10				50	2	5	10	10
CO5									4	10	15	10				50	2	5	10	10
CO6									4	10	10							5	5	

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

Syllabus

Auditing and Internal Control: Overview of Auditing, Standards, Role of the audit committee ,Audit Risk ,The IT Audit, Internal Control, Internal Control Objectives, Principles, and Models.

IT Governance: Information Technology Governance, Structure of the information technology function, disaster recovery planning, audit implications of IT outsourcing.

Auditing IT domains: Auditing Operating Systems, Auditing Networks, Data Management Approaches, Key Elements of the Database Environment, Databases in a Distributed Environment, Controlling and Auditing Data Management Systems, Access Controls. Controlling and Auditing the SDLC, Risks Associated with ERP Implementation, Implications for Internal Control and Auditing, Auditing Tools-CAATs.

Information Risk Management: Benefits of Risk management, Elements of Risks, Quantitative Risk analysis, Qualitative risk analysis, Risk management life cycle, Risk Mitigation.

Information Security Management: Computer Architecture and system security, Application program security. Computer operations security, Communication Security, Physical security.

Text Book

1. Chris Davis and Mike Schiller, —IT Auditing: Using Controls to protect Information Assetsll, Mc-Graw Hill, Second Edition, 2011
2. James A. Hall “Information Technology Auditing,” Cengage Learning, Copyright , 4th Edition, 2016.
3. Global Technology Audit Guide (GTAG) 1: Information Technology Risk and Controls, 2nd Edition, 2012.

Reference Books& web resources

1. http://www.isaca.org/knowledge-center/itaf-is-assurance-audit-/IT-Audit-Basics/Pages/IT-Audit-Basics-Articles.aspx
2. http://intosaiitaudit.org/India_GeneralPrinciples.pdf
3. http://opentuition.com/wp-content/blogs.dir/1/files/group-documents/15/1289480671-COMPUTERASSISTEDAUDITTECHNIQUES.pdf

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours
1	**Auditing and Internal Control**	
1.1	Overview of Auditing	2
1.2	Standards	1
1.3	Role of the audit committee	1
1.4	Audit Risk	1

1.5	The IT Audit	1
1.6	Internal Control	1
1.7	Internal Control Objectives, Principles, and Models.	1
2	**IT Governance**	
2.1	Information Technology Governance	1
2.2	Structure of the information technology function	1
2.3	Disaster recovery planning	1
2.4	Audit implications of IT outsourcing	1
3	**Auditing IT domains**	
3.1	Auditing Operating Systems	1
3.2	Auditing Networks	1
3.3	Data Management Approaches	1
3.4	Key Elements of the Database Environment	1
3.5	Databases in a Distributed Environment	1
3.6	Controlling and Auditing Data Management Systems	1
3.7	Access Controls	1
3.8	Controlling and Auditing the SDLC	1
3.9	Risks Associated with ERP Implementation	1
3.10	Implications for Internal Control and Auditing	1
3.11	Auditing Tools -CAATs	2
4	**Information Risk Management**	
4.1	Benefits of Risk management	1
4.2	Elements of Risks	1
4.3	Quantitative Risk analysis	1
4.4	Qualitative risk analysis	1
4.5	Risk management life cycle	2
4.6	Risk Mitigation	1
5	**Information Security Management**	
5.1	Computer Architecture and system security	1
5.2	Application program security	1
5.3	Computer operations security	1
5.4	Communication Security	1
5.5	Physical security	1
Total Lectures		**36**

Course Designer(s):

1. Parkavi.R, Assistant Professor, rpit@tce.edu, Information Technology
2. Sujitha.S, Assistant Professor, ssiiit@tce.edu, Information Technology

22ITPP0	AUGMENTED REALITY AND VIRTUAL REALITY	Category	L	T	P	Credit
		PSE	2	0	2	3
		Exam Type: Theory				

Preamble

This course provides the basic principles about Augmented and Virtual Reality technologies, knowledge on developing AR/VR and interacting with the virtual environment through interactive devices and also facilitates the technologies involved in the development of AR/VR application.

Prerequisite

NIL

Course Outcomes

CO1	Course Outcome Statement	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Explain the basic concepts of Augmented reality, Virtual reality, Mixed reality	TSP2	70	80
CO2	Design a scene which relates to any application including light, optics etc.,	TSP3	70	70
CO3	Track the system and Interact with the application using various interactive devices	TSP3	70	60
CO4	Develop an augmented reality application using Unity3D including context and content determination	TSP3	70	70
CO5	Create a VR application, render the scenes and apply all scientific principles in it such as vision, audio, etc.,	TSP3	70	70
CO6	Investigate case studies for Medical, Gaming and other emerging fields	TSP4	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			M	M						M	L		L
CO2.	S	M	L		S	S						M	L		L
CO3.	S	M	L		S	S						M	M		L
CO4.	S	M	L		S	S		L	M	M		S	M	L	L
CO5.	S	S	M	L	S	S		L	M	M		S	S	S	M
CO6.	S	S	M	L	S	S	M	M	S	S		S	S	S	M

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	Theory								Practical					Terminal					
	CAT 1				CAT2				Test				OCR	(Theory)					
TPS Scale	1	2	3	4	1	2	3	4	1	2	3	4		1	2	3	4	5	6
CO1	4	10	-	-	-	-	-	-	-	-	-	-	-	6	5	-	-	-	-
CO2	4	10	30	-	-	-	-	-	-	-	20	-	20	2	5	10	-	-	-
CO3	2	10	30	-	-	-	-	-	-	-	20	-	20	2	5	10	-	-	-
CO4	-	-	-	-	4	-	20	-	-	-	20	-	20	2	5	10	-	-	-
CO5	-	-	-	-	4	10	20	-	-	-	20	-	20	6	-	10	-	-	-
CO6	-	-	-	-	2	10	20	10	-	-	20		20	2	-	10	10	-	-

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

Syllabus

AR VR Background: Working Principle of AR, A typical AR system, VR modern experiences, historical perspective, The Mixed Reality Continuum.

Geometry of virtual worlds: 3D transformations - Geometric modeling, Transforming rigid bodies, Light and Optics: Light propagation, Lenses and images.

Tracking and Interaction: Tracking -3D user interfaces- Interaction techniques for locomotion and manipulation

Augmented Reality: Augmented Reality- The Content - Connecting Context and Content in AR System, Various types of contents, Marker based and Marker less AR -AR Application Areas.

Virtual Reality: Software and Hardware Technology on Stereoscopic Display - Ethical and social implications, Spatial audio for immersive experience

Case studies: AR and VR Technology in Medical Field -Physical Exercises and Gaming-Film and TV Production- Architecture and Civil, Commercial and other emerging fields

Text Book

1. Steven M. LaValle, “Virtual Reality”, University of Illinios, Published by Cambridge university, 2017.
2. Virtual Reality Technology, Second Edition, Gregory C. Burdea & Philippe Coiffet, John Wiley & Sons, Inc., © 2003-2017.
3. Dieter Schmalstieg and Tobias Hollerer, “Augmented Reality: Principles & Practice”,2016

Reference Books

1. William R.Sherman, Alan Craig, “Understanding Virtual Reality, interface, Application and Design”, Elsevier(Morgan Kaufmann), 2003.
2. David H.Eberly, “3D Game Engine Design”, Elsevier, 2012.
3. John Vince, “Virtual Reality Systems”, Pearson Education, 2007.
4. Alan B. Craig; William R. Sherman; Jeffrey D. Will, “Developing Virtual Reality Applications: Foundations of Effective Design”, 2009
5. Cawood, “Augmented Reality: A Practical Guide”,2008

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**AR VR Background**	
1.1	Working Principle of AR	1
1.1.1	A typical AR system	
1.2	VR Modern experiences	1
1.2.1	Historical perspective	
1.3	The Mixed Reality Continuum	1
2	**Geometry of virtual worlds**	
2.1	3D transformations	1
2.2	Geometric modeling	1
2.3	Transforming rigid bodies	1
2.4	Light and Optics: Light propagation	1
2.4.1	Lenses and images	
3	**Tracking and Interaction**	
3.1	Tracking	1
3.2	3D user interfaces	1
3.3	Interaction techniques for Locomotion	1
3.4	Manipulation	1
4	**Augmented Reality**	
4.1	Augmented Reality- The Content	1
4.1.1	Connecting Context and Content in AR System	1
4.1.2	Various types of contents	1
4.2	Marker based and Marker less AR	2
4.3	AR Application Areas	1
5	**Virtual Reality**	
5.1	Software and Hardware Technology on Stereoscopic Display	1

Module No.	Topic	No. of Periods
5.2	Ethical and social implications	1
5.3	Spatial audio for immersive experience	1
6	**Case studies**	
6.1	AR and VR Technology in Medical Field	1
6.2	Physical Exercises and Gaming	1
6.3	Film and TV Production	1
6.4	Architecture and Civil, Commercial and other emerging fields	1
	TOTAL	**24**

List of Experiments:

The List of experiments can be applied to any domain inclusive of Industry, Medical and Gaming but not limited to

Module No.	Topic	No. of Periods
1	Study of tools like Unity3D/Unreal, Vuforia and Blender.	2
2	Install Software and Choose the Project	2
3	Develop AR enabled simple applications using Marker based trigger.	4
4	Develop AR enabled simple applications using Marker less trigger.	4
5	Create the 3D model using Blender - Apply various lighting and shading effects to the downloaded objects from asset store.	4
6	Create three dimensional virtual environment using Unity / Unreal	4
7	User Interface for the Project in AR / VR	4
	TOTAL	**24**

Course Designer(s):

1. D.Tamilselvi , Professor, dtamilselvi@tce.edu, Information Technology
2. P.Vijaya Praba, Assistant Professor, pvpit@tce.edu, Information Technology
3. M.Akila Rani, Assistant Professor, marit@tce.edu, Information Technology

22ITPQ0 C# AND .NET FRAMEWORK

Category	L	T	P	Credit
PSE	3	0	0	3

Preamble

This subject will enable students to understand the .Net Framework as a whole and technologies that constitute the framework. The student will gain programming skills in C# both in basic and advanced levels. It will help them to develop applications (web-based application and web services) using C#.

Prerequisite

- 22IT320-Object Oriented Programming

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 .Net framework components of CLR, CTS and JIT	TPS2	70	75
CO2	Implement the basic concepts of OOP and delegates, events using C# programming language	TPS3	70	70
CO3	Develop C# applications using Language Integrated Query and assembly components	TPS3	70	70
CO4	Construct different web applications, web services and able to retrieve data using ADO.Net	TPS3	70	70
CO5	Make use of Windows Communication Foundation, Windows Presentation Foundation, Windows Workflow Foundation	TPS3	70	70
CO6	Examine a simple project that incorporates all important features of .NET Framework	TPS4	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**	**L**
CO3	**S**	**M**	**L**		**M**			**M**	**M**	**M**				**L**	**L**
CO4	**S**	**M**	**L**		**M**			**M**	**M**	**M**				**L**	**L**
CO5	**S**	**M**	**L**		**M**			**M**	**M**	**M**				**L**	**L**
CO6	**S**	**S**	**M**	**L**	**M**			**M**	**M**	**M**	**L**	**L**		**L**	**L**

S- Strong; M-Medium; L-Low

Assessment Pattern

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

Attainment of course outcome 6 is evaluated through mini project which involves design and development of simple applications in .NET framework.

Some of the assignment problems include: (but not limited to)

1. Develop an online quiz application where students can take quizzes on various subjects.
2. Create an expense tracker application for students to track their expenses and manage budgets
3. Build a task management application for organizing and tracking tasks, assignments, and deadlines.
4. Build a hospital management system for managing patient records, appointments, and medical staff.
5. Create a weather forecast application that fetches weather data from an API and displays it to users.

Syllabus

The .Net framework:.Net Framework Architecture, Common Language Runtime (CLR), Common Type System (CTS), Common Language Specification (CLS), Microsoft Intermediate Language (MSIL), Just-In –Compiler, Framework Base Classes

C -Sharp Language: Language Syntax, Data Types, Identifiers, Variables, Constants, Literals, Array and Strings, Conditional Statements, Looping Structures- Delegates and Events - Generic Classes-Generic methods- Generic Interface

Other Attributes and Assembly: Implicitly Typed Local Variable- Anonymous Type- Lambda Expression- Language Integrated Query- Assemblies- Versioning- Attributes- Reflection.

Application Development on .NET: Windows based Applications - Accessing Data with ADO.NET, MVC Framework, and Entity Framework -Web applications with Web Forms- Razor application- Web Services

Overview of Advanced .Net features: Windows Communication Foundation - Windows Presentation Foundation-Windows Workflow Foundation-Case study: Synchronous and Asynchronous Programming

Text Book

1. Andrew Troelsen, —Pro C#5 and the .NET 4.5 Framework‖, AndrewTroelsen, Apress, Sixth Edition 2012
2. Herbert Schildt, —C# 4.0 The Complete Reference‖, McGraw-Hill, 2010.
3. Karli Watson, Christian Nagel, etal, Professional C# 4.0 and .NET 4, Wrox, 2010
4. John Sharp, Microsoft Visual C# Step by Step, 10th Edition 2022

Reference Book & Web resources

1. Joseph Albahari, Ben Albahari, C# 7.0 in a Nutshell, Publisher - O'Reilly Media, 2017
2. https://msdn.microsoft.com
3. https://www.telerikacademy.com/alpha/csharp
4. http://www.csharphelp.com/index.html

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**The .Net framework**	
1.1	.Net Framework Architecture	1
1.2	Common Language Runtime (CLR)	1
1.3	Common Type System (CTS), Common Language Specification (CLS)	1
1.4	Microsoft Intermediate Language (MSIL), Just-In – Compiler	2
1.5	Framework Base Classes	1
2	**C -Sharp Language**	
2.1	Language Syntax, Data Types, Identifiers, Variables, Constants, Literals, Array and Strings	3
2.2	Conditional Statements	1
2.3	Looping Structures	1
2.4	Delegates and Events	1
2.5	Generic Classes-Generic methods- Generic Interface	2
3	**Other Attributes and Assembly**	
3.1	Implicitly Typed Local Variable	1
3.2	Anonymous Type -Lambda Expression	1
3.3	Language Integrated Query	1
3.4	Assemblies- Versioning	1
3.5	Attributes-Reflection	1
4	**Application Development on .NET**	
4.1	Windows based Applications	1

Module No.	Topic	No. of Periods
4.2	Accessing Data with ADO.NET	2
4.3	MVC Framework	1
4.4	Entity Framework	1
4.5	Web applications with Web Forms	2
4.6	Razor application	1
4.7	Web Services	1
5	**Overview of Advanced .Net features**	
5.1	Windows Communication Foundation	1
5.2	Windows Presentation Foundation	1
5.3	Windows Workflow Foundation	1
5.4	Case study: Synchronous and Asynchronous Programming	1
5.5	Mini project	4
	Total	36

Course Designer(s):

1. Ms.S.Sujitha, Assistant Professor, ssiit@tce.edu, Information Technology
2. Dr.G.Vennila, Assistant Professor, gvait@tce.edu, Information Technology

22ITRA0 ADVANCED CRYPTOGRAPHY

Category	L	T	P	Credit
PEES	3	0	0	3

Preamble

The course on Advanced Cryptography aims to equip students with a profound understanding of complex cryptographic algorithms and protocols. The course enables the students to develop practical implementation skills, fostering the ability to apply cryptographic solutions to real-world scenarios that involveszero knowledge proof systems, secure two-party and multi-party computation. The course prepares individuals with the knowledge and skills on modern cryptography necessary for addressing contemporary challenges in secure communication and data protection.

Prerequisite

22IT520 Information Security

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	Appreciate the usage of number theory, probability and statistics in the development of modern crypto algorithms	TPS3	70	70
CO2	Construct privacy preserving security systems using Zero Knowledge and Oblivious transfer protocols	TPS3	70	70
CO3	Experiment fine grained access control systems using Identity Based Encryption and Attribute Based Encryption	TPS3	70	70
CO4	Illustrate cryptographic techniques for secure group communication and computation	TPS3	70	70
CO5	Explain the working principle of quantum computing and quantum cryptography	TPS2	80	75
CO6	Breakdown the recent research problems in real world applications like Digital cash, E-Voting and identify suitable cryptographic techniques to solve it	TPS4	70	65

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		L								M		
CO2	S	M	L		L			M					M		
CO3	S	M	L		L			M					M		
CO4	S	M	L		L			M					M		
CO5	M	L											M		
CO6	S	S	M	L	M	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	1	2	3	1	2	3	4	1	2	3	4	1	2	3	4
CO1	5	10	20			30											20	
CO2	5	10	20			30										5	10	
CO3		10	20			40											20	
CO4							10	10	20				40			5	10	
CO5								20								10		
CO6									20	20				60				20

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

Syllabus

Primitives of Advanced Cryptography

One way Functions (OWF)–Types, Trapdoor Functions, Hard core predicates of OWF. Pseudo Random Number Generators (PRNG), Pseudo-random Permutations (PRP), Pseudo-Random Functions (PRF).

Zero Knowledge Protocols

Chosen Ciphertext Security, Interactive proofs and zero-knowledge interactive proofs, Non-interactive zero-knowledge (NIZK) proofs, Applications in privacy and authentication.

Oblivious transfer

Oblivious transfer protocols and variations, Privacy-preserving data exchange using oblivious transfer, Differential Privacy.

Access control schemes

Identity Based Encryption (IBE), Key management in IBE systems, Benefits and challenges. Attribute-Based Encryption (ABE) – Access control and fine-grained encryption, Attribute-based access control policies, Hierarchical and lattice-based ABE.

Secret Sharing and Threshold Cryptography

Secret sharing schemes and applications - Shamir's Secret Sharing, Distributed key management and access control, Threshold encryption and decryption.

Multi Party Computation

Fundamentals of secure multiparty computation (MPC) – Homomorphic encryption, Two-party and multi-party secure computation, Yao's Millionaires' Problem and the Garbled Circuit protocol.

Quantum cryptography

Quantum computers, CRYSTALS-Kyber algorithm, Shor‘s quantum factoring algorithm, quantum key distribution and reconciliation.

Case study

Vulnerability analysis of authentication and data security in real world security based applications like e-voting and digital cash.

Reference Books& web resources

1. Jonathan Katz and Yehuda Lindell, “Introduction to Modern Cryptography: Principles and Protocols”, 3rd Edition, Chapman and Hall/CRC Press, 2020.
2. Douglas R. Stinson, “Cryptography: Theory and Practice”, 4th Edition, CRC Press, 2019.
3. Dijiang Huang, Qiuxiang Dong and Yan Zhu, “Attribute-Based Encryption and Access Control”, CRC Press, 2020
4. Ronald Cramer , Ivan Bjerre Damgård and Jesper Buus Nielsen, “Secure Multiparty Computation and Secret Sharing”, 1st Edition, Cambridge University Press, 2015
5. Simon Singh, “The Code Book, the evolution of secrecy from Mary, Queen of Scots, to quantum cryptography”, Doubleday 1999

6. Dan Boneh Presentation, NIST Computer Security Resource Center - An Overview of Identity Based Encryption

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
	Introduction to the course and course outcomes	1
1	**Primitives of Advanced Cryptography (5)**	
1.1	One way Functions(OWF) - types	1
1.2	Trapdoor Functions	1
1.3	Hard core predicates of OWF	1
1.4	Pseudo Random Number Generators (PRNG)	1
1.5	Pseudo-random Permutations (PRP), Pseudo-Random Functions (PRF)	1
2	**Zero Knowledge Protocols (5)**	
2.1	Chosen Ciphertext Security	1
2.2	Interactive proofs and zero-knowledge interactive proofs	1
2.3	Non-interactive zero-knowledge (NIZK) proofs	2
2.4	Applications in privacy and authentication	1
3	**Oblivious transfer (3)**	
3.1	Oblivious transfer protocols and variations	1
3.2	Privacy-preserving data exchange	1
3.3	Differential Privacy	1
4	**Access control schemes (6)**	
4.1	Identity Based Encryption (IBE)	1
4.2	Key management in IBE systems	1
4.3	Benefits and challenges	1
4.4	Attribute-Based Encryption (ABE)	1
4.5	Attribute-based access control policies	1
4.6	Hierarchical and lattice-based ABE	1
5	**Secret Sharing and Threshold Cryptography (5)**	
5.1	Secret sharing schemes and applications	1
5.2	Shamir's Secret Sharing	1
5.3	Distributed key management and access control	1
5.4	Threshold encryption and decryption	2
6	**Multi Party Computation(5)**	
6.1	Fundamentals of secure multiparty computation	1
6.2	Homomorphic encryption	1
6.3	Two-party and multi-party secure computation	1
6.4	Yao's Millionaires' Problem	1
6.5	Garbled Circuit protocol	1
7	**Quantum cryptography (4)**	
7.1	Quantum computers	1
7.2	CRYSTALS-Kyber algorithm	1

Module No.	Topic	No. of Periods
7.3	Shor's quantum factoring algorithm	1
7.4	Quantum key distribution and reconciliation	1
8	**Research article discussion (2)** Vulnerability analysis - authentication and data security systems	2
	Total	36

Course Designer(s):

1. Jeyamala C, Associate Professor, Dept. of IT, jeyamala@tce.edu
2. Suguna M, Associate Professor, Dept. of IT, mscse@tce.edu

		Category	L	T	P	Credit
22ITRB0	**INFORMATION RETRIEVAL**	PEES	3	0	0	3

Preamble

The course focuses on the representation, storage, organization, and access to information items using various IR algorithms and techniques. The course emphasizes the building of information retrieval systems for documents so as to retrieve relevant or useful information from them.

Prerequisite

- Nil

Course Outcomes

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

COs	Course Outcomes (CO)	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Differentiate different retrieval algorithms and evaluation techniques	TPS2	70	70
CO2	Illustrate various Information Retrieval models such as boolean, vector space and probabilistic models with its variants for the given textual data	TPS3	70	65
CO3	Examine the performance of the various IR models	TPS4	70	60
CO4	Simulate different classification and clustering algorithms for textual data using text operations	TPS3	70	65
CO5	Investigate the usage of various text search engines with web crawling and link analysis using suitable tools and techniques	TPS4	70	60
CO6	Develop simple information retrieval systems such as recommender systems, personalization, musical notes extraction using text and multimedia data	TPS3	70	65

Mapping with Programme 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										L	L		L
CO2.	S	M	L		S			S				L	M	M	L
CO3	S	S	M	L								L	S		L
CO4	S	M	L		S			S				S	M	M	L
CO5	S	S	M	L	S			S				S	S	M	L
CO6	S	M	L		S	S		S	S	S	S	S	M	S	S

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	CAT1				Assignment 1				CAT2				Assignment 2			Terminal					
TPS Scale	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	1	2	3	4	5	6
CO1	5	10														2	8				
CO2	5	10	20				50									2	6	10			
CO3	10	10	20	10			30	20								2	6	10	5		
CO4									5	10	20					2	6	10			
CO5									5	10	20	10				2	6	10	5		
CO6											20				100	2	6				

Syllabus

Retrieval Models Basic Concepts – Nature of unstructured and semi-structured text - Retrieval Process – Classic Information Retrieval Models – Boolean Model, Vector Model, Probabilistic Model, Vector Space Model, Latent Semantic Indexing model, Bayesian Networks - Retrieval Evaluation

Query Languages Key Word based Querying – Query Operations – User Relevance Feedback – Local and Global Analysis

Indexing and Searching Inverted files – Suffix trees - Boolean Queries – Sequential Searching – Pattern Matching - Structural queries – Compression

Text Operations Data Standards and Data Quality - Legal, Policy and Ethics - Preprocessing – Document Categorization – Naïve Bayes Models, Document Clustering – k-means clustering, Word embedding – Encoding, Feature Extraction, Sequential Models - RNN

Web Information Retrieval Search Engines – Web Crawling – Link analysis – Page Ranking – Semantic Search

Multimedia Information Retrieval Data types and formats – Feature Extraction - Indexing and Retrieval

IR Systems Spam Filtering – Sentiment Analysis - Recommender Systems - Personalization – Search Advertising – Chatbots – Question Answering models - Text Summarization - Multimedia IR Systems

Learning Resources

1. Ricardo Baeza-Yates, Berthier Ribeiro-Neto, Modern Information Retrieval, Pearson Education, 2nd edition, 2011.
2. C. Manning, P. Raghavan, and H. Schutze, Introduction to Information Retrieval, Cambridge University Press, 2008.
3. Stefano Ceri, Alessandro Bozzon, Web Information Retrieval, Springer, 2013.
4. Henk Blanken, Henk Ernst Blok, Ling Feng, Arjen Vries, Multimedia Retrieval, Springer, 2007.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Retrieval Models**	
1.1	Basic Concepts	1
1.2	Nature of unstructured and semi-structured text	
1.3	Retrieval Process	1
1.4	Classic Information Retrieval Models	1

1.4.1	Boolean Model	
1.4.2	Vector Model	1
1.4.3	Probabilistic Model	
1.4.4	Vector Space Model	1
1.4.5	Latent Semantic Indexing model	1
1.4.6	Bayesian Networks	1
1.5	Retrieval Evaluation	1
2	**Query Languages**	
2.1	Key Word based Querying	1
2.2	Query Operations	1
2.3	User Relevance Feedback	1
2.4	Local and Global Analysis	1
3	**Indexing and Searching**	
3.1	Inverted files	1
3.2	Suffix trees	1
3.3	Boolean Queries	1
3.4	Sequential Searching	1
3.5	Pattern Matching	1
3.6	Structural queries	1
3.7	Compression	
4	**Text Operations**	
4.1	Data Standards and Data Quality - Legal, Policy and Ethics	2
4.2	Preprocessing	
4.3	Document Categorization	2
4.3.1	Naïve Bayes Models	
4.4	Document Clustering	
4.4.1	k-means clustering	
4.5	Word Embedding	3
4.5.1	Encoding	
4.5.2	Feature Extraction	
4.5.3	Sequential Models - RNN	
5	**Web Information Retrieval**	
5.1	Search Engines	1
5.2	Web Crawling	1
5.3	Link analysis	2
5.4	Page Ranking	2
5.5	Semantic Search	1
6	**IR Systems**	
6.1	Recommender Systems	4
6.2	Personalization	
6.3	Search Advertising	
6.4	Chatbots	
6.5	Text Summarization	
6.6	Multimedia IR Systems	

Total Lecture Hours	**36**

Course Designer(s):

1. A.M.Abirami abiramiam@tce.edu
2. S.Pudumalar spmit@tce.edu
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22ITRC0	QUANTUM MACHINE LEARNING

Category	L	T	P	Credit
PEES	3	0	0	3

Preamble

This course delivers a comprehensive understanding of quantum computing basics, encompassing quantum mechanics and algorithms, prerequisites for exploring quantum machine learning. Students delve into quantum machine learning, enhancing their capacity to tackle real-world challenges effectively.

Prerequisite

Quantum Computing
22IT520 Machine Learning

Course Outcome

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

CO	Course Outcome	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Explain quantum computing basics: qubits, gates, and notation.	TPS2	70	70
CO2	Experiment various elementary quantum circuits using tools.	TPS3	70	65
CO3	Apply quantum algorithms to meet the requirements of Quantum Machine Learning (QML).	TPS3	70	65
CO4	Utilize quantum supervised and unsupervised algorithms like QSVM, QKNN, QPCA, and QKmeans.	TPS3	70	65
CO5	Implement quantum enhanced hybrid models using variational quantum circuits.	TPS3	70	65
CO6	Analyze performance of quantum machine learning techniques for various domains.	TPS4	70	60

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	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	M	M

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

CO	CAT1			Assignment -I			CAT2				Assignment - II				Terminal			
TPS Scale	1	2	3	1	2	3	1	2	3	4	1	2	3	4	1	2	3	4
CO1	10	10			10										2	5		
CO2	10	15	20			50									2	5	15	
CO3		15	20			40									2	5	15	
CO4							5	15	15				30			5	15	
CO5							5	15	15				30		2		10	
CO6							5	5		20				40	2		5	10

Syllabus

Quantum Computing Fundamentals: Math Basic, Classical vs Quantum computing, Quantum Bits (Qbits), Notation, and Representation of qubits on bloch sphere, Single and Multiple Qubit Gates.

Quantum Mechanics: Quantum States – Superposition & Entanglement, Quantum Evolution, Quantum Measurements, Bell's Inequality, Quantum Circuits, Quantum Error Correction.

Quantum Algorithms: Deutsch-Jozsa, Grover's Search Algorithm, Shor's Algorithm.

Quantum Supervised Learning: Fundamentals of QML, Data Encoding, Quantum Feature spaces and kernels, Variational Quantum Circuits, **Supervised Algorithms** - Quantum Linear Regression, Quantum SVM, Quantum KNN, Quantum Neural Network,

Quantum Unsupervised Learning: Quantum PCA, Quantum K-means, Quantum Hierarchical Clustering, Hybrid Quantum Classical Machine Learning.

Learning Resources

- Nielsen, M. A., & Chuang, I. L." Quantum computation and quantum information", Cambridge university press, 10th Edition, 2010.
- Wittek, Peter. Quantum machine learning: what quantum computing means to data mining. Academic Press, 1st Edition, 2014.
- Ganguly, Santanu. *Quantum machine learning: an applied approach*. New York: Apress, 1st Edition, 2021.
- NPTEL: https://onlinecourses.nptel.ac.in/noc21_cs103/preview - Introduction to Quantum Computing: Quantum Algorithms and Qiskit, by Prof.PrabhaMandayam, Prof.Anupama Ray, Prof.Sheshashayee Raghunathan | IIT Madras, IBM Research, IBM Systems.
- Lecture notes and coding assignments - https://github.com/gosf/qml-mooc by Quantum Machine Learning MOOC, created by Peter Wittek from the University of Toronto.
- IBM quantum documentation: https://docs.quantum.ibm.com/start.
- PENNYLANE documentation: https://docs.pennylane.ai/en/stable/

Course Contents and Lecture Schedule

Module	Topic	No.of Periods
1.	**Quantum Computing Fundamentals:**	
1.1	Math Basics	1
1.2	Classical vs Quantum computing, Quantum Bits (Qbits)	1
1.3	Notation, and Representation of qubits on bloch sphere	1
1.4	Single and Multiple Qubit Gates	1
2.	**Quantum Mechanics:**	
2.1	Quantum States – Superposition & Entanglement	2
2.2	Quantum Evolution	2
2.3	Quantum Measurements	2
2.4	Bell's Inequality	1
2.5	Quantum Circuits and Operations	2
2.6	Quantum Error Correction	2
3.	**Quantum Algorithms:**	
3.1	Deutsch-Jozsa	2
3.2	Grover's Search Algorithm	2
3.3	Shor's Algorithm	2
4.	**Quantum Supervised Learning:**	
4.1	Fundamentals of QML	1
4.2	Data Encoding	1
4.3	Quantum Feature spaces and kernels	1
4.4	Variational Quantum Circuits	2
4.5	Quantum Linear Regression	1
4.6	Quantum SVM	1
4.7	Quantum KNN	1
4.8	Quantum Neural Network	2
5.	**Quantum Unsupervised Algorithms**	
5.1	Quantum PCA	1
5.2	Quantum K-means	1
5.3	Quantum Hierarchical Clustering	1
5.4	Hybrid Quantum Classical Machine Learning	2
	TOTAL HOURS	**36**

Course Designers:

Dr.C.Deisy, Professor, IT Department, cdcse@tce.edu
T. Saranya, Assistant Professor, IT Department, tsait@tce.edu

22ITRD0	NATURAL LANGUAGE PROCESSING	Category	L	T	P	Credit
		PEES	3	0	0	3

Preamble

The course aims to provide text and speech processing by applying the most widely used and effective machine learning techniques, strategies and toolkits for natural language processing.

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 natural language processing methods and strategies	TPS2	70	85
CO2	Use suitable text representation schemes for modelling the text documents	TPS3	70	75
CO3	Experiment suitable pre-processing techniques for text documents and audio files	TPS4	70	65
CO4	Apply machine learning techniques for text and speech processing	TPS3	70	75
CO5	Examine the strength and weakness of different text processing algorithms	TPS4	70	65
CO6	Develop applications using NLP toolkits and language models	TPS3	70	75

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		
CO2.	S	M	L		S			S				S	M	M	L
CO3	S	S	M	L	S	S	S	S	S	S	S	S	S	S	S
CO4	S	M	L		S			S		S		S	M	M	M
CO5	S	S	M	L	S			S	S	S		S	S	M	M
CO6	S	M	L		S	S	S	S	S	S	S	S	M	S	S

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	Test 1				Assignment 1				Test 2				Assignment 2				Terminal			
TPS Scale	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
CO1	3	5	10														2	5	6	
CO2	3	5	10				30										2	5	8	
CO3	2	5	10	20			20	20	2	5	10	10			30		2	5	8	6
CO4	2	5	20				30		2	5	20				20		2	5	8	
CO5									3	5	5	5			10		2	5	8	6
CO6									3	5	20				40		2	5	8	

Syllabus

Introduction Computational Linguistics – NLTK Toolkit – Building Corpus - Web Scraping – Tokenization, Stemming, Lemmatization, Synsets, Hypernyms, WordNet, Edit Distance

Text Representation Word Vectors – BagOfWords – TF-IDF - N-grams - Word2Vec, CBOW, Skip-gram, TF-IDF Weighted Word2Vec, Glove

Text Processing Regular Expressions – Document Similarity Measures – Cosine and cluster measures – Spelling correction – POS Tagging – Sequential Tagging – MaxEnt, CRF

Language Modelling - Word Sense Disambiguation – Word Embeddings - Named Entity Recognition – Topic Modelling

Deep Learning for NLP Perceptron – Back Propagation – Feed Forward Neural Network - Recurrent Neural Network - LSTM – Seq2Seq Models - Attention Mechanism - Transformer – BERT Model – GPT-3 – Zero-Shot learning -

Speech Processing Word Boundary Detection – Argmax Computation – HMM – APIs – TextToSpeech, SpeechToText

Applications– Sentiment Analysis – Stylometry – Document Clustering – Text Summarization – Spam detection – Resume mining – Natural Language Understanding (NLU) – Chatbot – Neuro-Symbolic AI

Learning Resources

1. Hobson Lane, Cole Howard, Hannes Hapke, “Natural Language Processing in Action “, 2nd edition, Manning Publications, 2021
2. Sowmya Vajjala, Bodhisattwa Majumder, Anuj Gupta, Harshit Surana, “Practical Natural Language Processing: A Comprehensive Guide to Building Real-World NLP Systems”, O’Reilly, 2020
3. Christopher D. Manning and Hinrich Schutze, “Foundations of Natural Language Processing” , 6th Edition, The MIT Press Cambridge, Massachusetts London, England, 2003
4. Daniel Jurafsky and James H. Martin “Speech and Language Processing”, 3rd edition, Prentice Hall, 2009.
5. Chris Manning and HinrichSchütze, “Foundations of Statistical Natural Language Processing”, 2nd edition, MITPress Cambridge, MA, 2003
6. Charniack, Eugene, Statistical Language Learning, MIT Press, 1993.
7. https://www.fast.ai/2019/07/08/fastai-nlp/
8. https://www.coursera.org/specializations/natural-language-processing
9. https://indicnlp.org
10. NPTEL/SWAYAM Course – Applied Natural Language Processing, R Ramaseshan, Chennai Mathematical Institute, India

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours
1	**Introduction**	
1.1	Computational Linguistics	1
1.2	NLTK Toolkit	1
1.3	Building Corpus	1

1.4	Web Scraping	1
1.5	Tokenization, Stemming, Lemmatization	1
1.6	Synsets, Hypernyms	1
1.7	WordNet, Edit Distance	1
2	**Text Representation**	
2.1	Word Vectors – BagOfWords	1
2.2	TF-IDF – N-grams	1
2.3	Word2Vec	1
2.4	CBOW, Skip-gram	1
2.5	TF-IDF Weighted Word2Vec, Glove	1
3	**Text Processing**	
3.1	Regular Expressions	1
3.2	Document Similarity Measures	1
3.3	Cosine and cluster measures	1
3.4	Spelling correction	1
3.5	POS Tagging – Sequential Tagging	1
3.6	MaxEnt, CRF	1
4	**Language Modelling**	
4.1	Word Sense Disambiguation	1
4.2	Word Embedding	1
4.3	Named Entity Recognition	1
4.4	Topic Modelling	1
5	**Deep Learning for NLP**	
5.1	Perceptron – Back Propagation – Feed Forward Neural Network	1
5.2	Recurrent Neural Network	1
5.3	LSTM	
5.4	Seq2Seq Models	1
5.5	Transformer – BERT Model, GPT-3	1
5.6	Zero-Shot Learning	1
6	**Speech Processing**	
6.1	Word Boundary Detection	1
6.2	Arg max Computation	1
6.3	HMM	1
6.4	APIs	1
6.5	Text To Speech	1
6.6	Speech To Text	1
7	**Applications**	
7.1	Sentiment Analysis – Stylometry	1
7.2	Document Clustering Text Summarization – Spam detection-Resume mining	2
7.3	Natural Language Understanding (NLU) – Chatbot	
7.4	Neuro-Symbolic AI	
	Total Lecture Hours	36

Course Designer(s):

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22ITRE0	REINFORCEMENT LEARNING

Category	L	T	P	Credit
PEES	3	0	0	3

Preamble

The course on reinforcement learning provides an emphasis on Markov Decision Process (MDP), Dynamic Programming, Monte- Carlo Methods, Temporal Difference Learning (TDL) and Function Approximation Methods. It also facilitates the student by interpreting the real-world problems and gaming by examining with appropriate open-source tools.

Prerequisite

Machine Learning

Course Outcome

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

CO	Course Outcome	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Describe theory underlying Reinforcement Learning (RL).	TPS2	70	70
CO2	Apply Markov Decision Processes (MDPs) to solve real world problems.	TPS3	70	65
CO3	Illustrate Policy Iteration, Value Iteration and Policy Evaluation in Dynamic Programming.	TPS3	70	65
CO4	Experiment Monte- Carlo prediction method, Monte- Carlo control method and Temporal Difference Learning (TDL) algorithms like Q Learning, SARSA for the real-world scenario.	TPS3	70	65
CO5	Apply Function Approximation Methods to find an optimal behaviour strategy.	TPS3	70	65
CO6	Compare the performance of Markov Decision Processes, Monte-carlo methods, Temporal Difference Learning (TDL) algorithms and Policy gradients for the given real time application .	TPS4	70	60

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	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	M	M

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

CO	CAT 1			Assignment - I			CAT 2				Assignment - II				Terminal			
TPS Scale	1	2	3	1	2	3	1	2	3	4	1	2	3	4	1	2	3	4
CO1	10	10			10										2	5		
CO2	5	5	30			50									2	5	10	
CO3		10	30			40									2	5	15	
CO4							5	10	20				30			5	15	
CO5							5	10	20				30		2		10	
CO6							5	5		20				40	2	5		15

Syllabus

Reinforcement Learning (RL): Elements, Framework and applications, Challenges, Action-Value Methods, Optimistic Initial Values, Upper-Confidence-Bound (UCB) Action Selection, Gradient Bandit, probably approximately correct (PAC) Learning Framework

Markov Decision Processes (MDPs): - The Agent- Environment Interface, Rewards, Returns, The Markov Property, Modelling, Markov Decision Processes, Value Functions, Optimal Value Functions, Bellman equation, Optimality and Approximation

Dynamic Programming: Policy Evaluation, Policy Improvement, Policy Iteration, Value Iteration, Asynchronous Dynamic Programming, Banach fixed point theorem, Efficiency of Dynamic Programming.

Monte- Carlo Methods: Prediction, Estimation of action values, control without exploring starts, Incremental Approach, Off – Policy Prediction

Temporal Difference Learning (TDL): - Prediction, Optimality, Q Learning, SARSA (State-Action-Reward-State-Action) Algorithms, Gaming

Function Approximation Methods: Gradient-Descent Methods, Eligibility trace for function approximation, Control with function approximation, Least squares, Eligibility Traces for Actor Critic Methods

Learning Resources

- Richard S. Sutton and Andrew G. Barto, “Reinforcement Learning: An Introduction”, Second Edition, MIT Press, 2019.
- Csaba Szepesvari, “Algorithms for Reinforcement learning”, Morgan and ClayPool Publishers, First Edition, 2010.
- Tom M Mitchell, “Machine Learning”, McGraw-Hill, Indian Edition, 2017.
- Russell, Stuart J., and Peter Norvig. "Artificial intelligence: a modern approach."Pearson Education Limited, 2016
- https://onlinecourses.nptel.ac.in/noc19_cs55 - Reinforcement learning by Prof. Balaraman Ravindran, IIT Madras
- https://www.coursera.org/specializations/business-analytics - Business Analytics by Eric Bradlow et al, University of Pennysylvania

Course Contents and Lecture Schedule

Module No	Topic	No. of Lecture Hours
1	**Reinforcement Learning (RL)**	
1.1	Elements, Framework and applications	1
1.2	Challenges	
1.3	Action-Value Methods	1
1.4	Optimistic Initial Values	1
1.5	Upper-Confidence-Bound (UCB) Action Selection	1
1.6	Gradient Bandit	1
1.7	Probably approximately correct (PAC) Learning Framework	
2	**Markov Decision Processes (MDPs)**	
2.1	The Agent- Environment Interface	1
2.2	Rewards, Returns	1
2.3	The Markov Property	1
2.4	Modelling	1
2.5	Markov Decision Processes	1
2.6	Value Functions, Optimal Value Functions	1
2.7	Bellman equation	1
2.8	Optimality and Approximation	1
3	**Dynamic Programming**	
3.1	Policy Evaluation, Policy Improvement	2
3.2	Policy Iteration, Value Iteration	1
3.3	Asynchronous Dynamic Programming	2
3.4	Banach fixed point theorem	1
3.5	Efficiency of Dynamic Programming	1
4	**Monte- Carlo Methods**	
4.1	Prediction, Estimation of action values	1
4.2	Control without exploring starts	1
4.3	Incremental Approach	1
4.4	Off – Policy Prediction	1
5	**Temporal Difference Learning (TDL)**	
5.1	Prediction	1
5.2	Optimality, Q Learning	1
5.3	SARSA (State-Action-Reward-State-Action) Algorithms	1
5.4	Gaming	2
6	**Function Approximation Methods**	
6.1	Gradient-Descent Methods	2
6.2	Eligibility trace for function approximation	1
6.3	Control with function approximation	2
6.4	Least squares	1
6.5	Eligibility Traces for Actor Critic Methods	1
	Total Hours	**36**

Course Designers:

1. C.Deisy, Professor, IT Department cdcse@tce.edu
2. S. Sridevi, Associate Professor, IT Department sridevi@tce.edu
3. K.V.Uma, Associate Professor, IT Department kvuit@tce.edu

22ITQA0 **MACHINE LEARNING**

Category	L	T	P	Credit
EM	3	0	0	3

Preamble

The course on machine learning provides an emphasis on data dimensionality reduction techniques, supervised, unsupervised and neural network 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 neural network techniques for real life problems especially medical data set.	TPS3	70	65
CO6	Analyze the performance of various classifiers, regression models, clustering 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

Basic Concepts : Probability,Linear Algebra

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)

Supervised learning :

Bayes Optimal Classifier, Naive Bayes, Nearest Neighbour Models - Bayesian Learning - Bayesian Optimal Classier - Belief Network – SVM

Evaluation measures:

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

Unsupervised Learning:

Hierarchical Clustering, Divisive and Agglomerative, Anomaly Detection – Outlier Types, Techniques of Anomaly Detection

Neural Networks:

Basics, Early Models, Perceptron Learning, Backpropagation

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	**Basic Concepts**	
1.1	Probability	1
1.2	Linear Algebra	1
2	**Introduction to Machine Learning**	
2.1	Components of learning	1
2.2	Inductive Learning Hypotheses	1
2.3	Learning models – geometric models,	2
2.4	probabilistic models	1
2.5	logic models	1
2.6	Statistical Decision Theory	1
2.7	Bayesian Learning (ML, MAP, Bayes estimates, Conjugate priors)	2
3	**Supervised Learning**	
3.1	Bayes Optimal Classifier	1
3.2	Naive Bayes	1
3.3	Nearest Neighbour Models	1
3.4	Bayesian Learning	1
3.5	Bayesian Optimal Classier	1
3.6	Belief Network	1
3.7	SVM	1
4	**Evaluation measures**	
4.1	Ensemble Methods	1
4.2	Bagging Adaboost Gradient Boosting	2
4.3	Diagnosis and Regularization of Bias Vs Variance	2
4.4	Learning Curve	1
5	**Unsupervised Learning**	
5.1	Hierarchical Clustering	1
5.2	Divisive and Agglomerative	2
5.3	Anomaly Detection– Outlier Types	1
5.4	Techniques of Anomaly Detection	2
6	**Neural Networks**	

Module No.	Topic	No. of Periods
6.1	Basics	1
6.2	Early Models	1
6.3	Perceptron Learning	2
6.4	Backpropagation	2
	Total	36

Course Designer(s):

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

		Category	L	T	P	Credit
22ITQB0	**ARTIFICIAL INTELLIGENCE**	**EM**	**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, 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	80
CO2	Solve search problems by applying a suitable search strategy	TPS3	80	70
CO3	Find the optimal move for a given game using adversarial search	TPS3	80	70
CO4	Solve Constraint Satisfaction Problems such as Map Coloring, Job-Shop Scheduling etc using Backtracking search	TPS3	80	70
CO5	Apply different deep learning algorithms for object detection and recognition	TPS3	80	70
CO6	Examine various Search techniques , Deep learning, Computer Vision techniques for solving engineering problems in the fields of science, medicine, finance etc.	TPS4	80	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									L	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- Good Behavior: The Concept of Rationality - The Nature of Environments - The Structure of Agent, 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: tic-tac-toe, Sudoku, n queens, cryptarithmetic puzzle- Constraint Propagation: Inference in CSPs- Backtracking Search for CSPs.

Deep Learning and Computer vision: Simple Feed forward Networks- Convolutional Neural Networks – Recurrent Neural Networks- GANs- Transfer Learning, **Computer vision**: Image formation processing-Image Features, 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" , O'Reilly, 2017.
6. Mohamed Elgendy , "Deep Learning for Vision Systems", Manning,2020
7. https://nptel.ac.in/courses/106105077

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	2
1.2	Intelligent Agents - Agents and Environments	1
1.3	Good Behavior: The Concept of Rationality - The Nature of Environments -The Structure of Agent	2
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	2
2.3	Hill-climbing search- Simulated annealing -Local beam search	1
3.	**Adversarial Search and Games**	
3.1	Game Theory- Optimal Decisions in Games	2
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 and Computer Vision**	
5.1	Simple Feed forward Networks	2
5.2	Convolutional Neural Networks –Recurrent Neural Networks	3
5.3	GANs-Transfer Learning	2
	Computer Vision:	
5.4	Image Processing- Features Extraction	2
5.5	Classifying Images	2
5.6	Object Detection and Recognition	3
	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

22ITQC0	SOCIAL NETWORK ANALYSIS

Category	L	T	P	Credit
EM	3	0	0	3

Preamble

The course introduces concepts and methods of social network analysis. It aims to provide students with essential knowledge on network analysis applicable to real world data. Students will learn to extract, manage and visualize data about its structure and dynamics.

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	Illustrate network data visualization using social network analysis packages	TPS3	70	70
CO2	Apply social network measures for the web graph	TPS3	70	70
CO3	Demonstrate graph mining and cascading effect using different algorithms for social networks	TPS3	70	70
CO4	Investigate social network behaviour using network properties	TPS3	70	70
CO5	Use social network theory and software packages for building social network models	TPS4	70	70
CO6	Determine the type of network suitable for modelling the real networked data	TPS4	70	70

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	S	M	L		S			S		L		L	M	M	L
CO2	S	M	L		S			S		L		L	M	M	L
CO3	S	M	L		S			S		L		L	M	M	L
CO4	S	M	L		S			S		L		L	M	M	L
CO5	S	S	M	L	S	S	S	S	S	S	S	S	S	S	S
CO6	S	S	M	L	S	S	S	S	S	S	S	S	S	S	S

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

CO	CAT 1			Assignment I				CAT 2			Assignment II				Terminal					
TPS Scale	1	2	3	1	2	3	4	1	2	3	1	2	3	4	1	2	3	4	5	6
CO1	5	10				10									2	5	5			
CO2	5	10	20			20									2	5	5			
CO3	10	10	20			20				10			10		2	5	10			
CO4								10	10	20			20		2	5	10			
CO5								10	10	20			20		2	5	10	5		
CO6			10			30	20			10			20	20		5	10	5		

Syllabus

Introduction: Motivation, Web Graph, Types of Social Networks, Social Network Datasets and formats, Social Network Data Visualization Tools - Networkx, Gephi, Pajek

Properties: Connectedness, Clustering Coefficient, Distance Measures, Connected Components, Network Robustness, Degree and Closeness Centrality, Betweenness Centrality, Subgroups, Cliques, Neighbourhood overlap, Bipartite graph, Homophily, Closure, Social Influence, Positive Negative Relationships

Mining Graphs: Community and Cluster detection, Link Analysis - Random Walk, Page Rank algorithms, Hubs and Authorities

Cascading Networks: Diffusion in networks, Power law, Preferential Attachment Models, Small World Network.

Social Network Models – Granovetter Model, Schelling Model, Balance Theorem

Applications: Link Prediction, Social media data analysis, Behavioural Analysis

Learning Resources

1. Ian A. McCulloh, Helen L. Armstrong, Anthony N. Johnson, “Social Network Analysis with Applications”, Wiley, 2013, First Edition
2. Charles Kadushin, “Understanding Social Networks: Theories, Concepts and Findings”, Oxford University Press, 2011, First Edition
3. SWAYAM - NPTEL Course, “Social Networks”, https://onlinecourses.nptel.ac.in/noc19_cs66/preview
4. Coursera - “Applied Social Network Analysis in Python”, https://www.coursera.org/learn/python-social-network-analysis
5. Xiaoming Fu, JarDer Luo, Margarete Boos, “Social Network Analysis Interdisciplinary Approaches and Case Studies”, CRC Press, 2017, First Edition
6. P.M. Krishna Raj, Ankith Mohan, K.G. Srinivasa, “Practical Social Network Analysis with Python”, Springer, 2018, First Edition
7. Stanley Wasserman, Katherine Faust, “Social Network analysis: methods and Applications”, Cambridge University Press, 1994 (Reprinted 1999), First Edition.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours
1	**Introduction**	
1.1	Motivation	1
1.2	Web Graph	
1.3	Types of Social Network	1
1.4	Datasets and Formats	
1.5	SN Data Visualization Tools	2
2	**Properties**	
2.1	Connectedness	1
2.2	Clustering Coefficient, Distance Measures	1
2.3	Connected Components	1
2.4	Network Robustness	1
2.5	Degree, Closeness Centrality, Betweeness	1

2.6	Subgroups, Cliques	1
2.7	Neighbourhood overlap	1
2.8	Bipartite Graph	1
2.9	Homophily, Closure, Social Influence	1
2.10	Positive Negative Relationships	1
3	**Mining Graphs**	
3.1	Community and Cluster Detection	3
3.2	Link Analysis	
3.2.1	Random Walk Algorithm	2
3.2.2	Page Rank Algorithm	2
3.3	Hubs and Authorities	3
4	**Cascading Networks**	
4.1	Diffusion in Networks	2
4.2	Power Law	1
4.3	Preferential Attachment Models	1
4.4	Small World Network	2
5	**Social Network Models**	
5.1	Granovetter Model	1
5.2	Schelling Model	1
5.3	Balance Theorem	1
6	**Applications**	
6.1	Link Prediction	1
6.2	Social media data Analysis	1
6.3	Behavioural Analysis	1
	Total Lecture Hours	36

Course Designers:

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3. A.M. Abirami abiramiam@tce.edu
4. K.V. Uma kvuit@tce.edu
5. R.Parkavi rpit@tce.edu

		Category	L	T	P	Credit
22ITQD0	**Applied Data Science with Visualization**	EM	3	0	0	3

Preamble

The course introduces concepts, methods, and real time applications of data science with visualization. It provides an emphasis on data processing techniques, rule mining, classification, and clustering techniques. It also facilitates the student by interpreting the real-world problems by examining with appropriate tools.

Prerequisite

Nil

Course Outcome

On 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	Demonstrate various Python constructs for data science	TPS3	70	65
CO2	Apply appropriate data preprocessing techniques for the given dataset	TPS3	70	65
CO3	Use Python libraries for data analysis and visualization	TPS3	70	65
CO4	Apply association rule mining algorithms to identify the association rules for the given dataset	TPS3	70	65
CO5	Apply supervised and unsupervised learning algorithms and demonstrate its performance	TPS3	70	65
CO6	Discuss information visualisation principles for dashboard design	TPS2	70	70

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	S	M	L		S							S	M	M	L
CO2	S	M	L		S							S	M	M	L
CO3	S	M	L		S							S	M	M	L
CO4	S	M	L		S							S	M	M	L
CO5	S	M	L		S							S	M	M	L
CO6	M	L			S							S	L	M	L

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

CO	CAT1			Assignment -I			CAT2			Assignment - II			Terminal Theory		
TPS Scale	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
CO1	5	5	10			20							2	5	10
CO2	5		20			30							2		15
CO3	5	5	20			30						20	2	5	10
CO4	5		20			20							2		15
CO5							5	10	60			80		5	15
CO6							10	15					2	10	

Syllabus

Introduction to Python Data Structures
Data Science - Need, Applications, Difference between data analysis and data analytics. Python- Variables, data types, control structures, Operators, Simple operations, Array and its operations, Numpy operations, Matrix and its operations

Data preparation and pre-processing
Dealing missing values, Normalization, Transformation, statistical description about the data, Accessing the data, Summary of the data, Relationship between the data

Data Visualization:
Basic plotting Line plot, Bar plot, Pie Chart, Scatter Plot, Histogram, Stacked Bar Charts, Sub Plots, **Python libraries** Matplotlib, Seaborn, Plotly **Applied Visualization:** Box plot, Area Chart, Density plot, Heat map, Tree map

Association Rule Mining:
Frequent Itemset Mining Methods- Apriori, Frequent Pattern (FP) Tree - Mining Various Kinds of Association rules

Supervised Learning Algorithms
Decision Tree: ID3 Classifier, C4.5, CART, K-Nearest Neighbour, Performance Metrics

Unsupervised Learning Algorithms
Distance Functions, Dissimilarity between the mixed types of data, K-Means Algorithm, K-Medoids Algorithm

Information Visualization
Visual Perception and Cognition - Gestalt's Principles - Tufte's Principles - Applications of Principles of Information Visualization - Dashboard Design

Learning Resources

1. Jiawei Han, Jian Pei, Hanghang Tong “Data Mining: Concepts and Techniques”, Morgan Kaufman, Fourth Edition, 2022.
2. Ian H.Witten, Eibe Frank, Mark.A. Hall, “Data Mining Practical Machine Learning Tools and Techniques”, Elsevier, Fourth Edition, 2016.
3. AdelchiAzzalini, Bruno Scarpa, “Data Analysis and Data Mining: An Introduction”, Oxford University Press, Third Edition, 2012.
4. G. K. Gupta, “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall India Learning Private Limited, Second edition, 2011.
5. https://nptel.ac.in/courses/106/105/106105174/ - Data Mining by Prof. Pabitra Mitra, IIT Kharagpur
6. William McKinney , “Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython”, Second Edition, O'Reilly Media, 2017.

Course Contents and Lecture Schedule

Module No	Topic	No. of Lecture Hours
1	**Introduction to Python Data Structures**	
1.1	Data Science - Need, Applications, Difference between data analysis and data analytics.	1
1.2	Python- Variables, data types, control structures	1
1.3	Operators, Simple operations, Array and its operations	1
1.4	NumPy operations, Matrix and its operations	2
2	**Data preparation and pre-processing**	
2.1	Dealing missing values, Normalization, Transformation	1
2.2	statistical description about the data, Accessing the data	1
2.3	Summary of the data, Relationship between the data	1
3	**Data Visualization:**	
3.1	Basic plotting Line plot, Bar plot, Pie Chart, Scatter Plot, Histogram, Stacked Bar Charts, Subplots	2
3.2	Python libraries: Matplotlib, Seaborn, Plotly	1
3.3	Applied Visualization**:** Box plot, Area Chart, Density plot, Heat map, Tree map	1
4	**Association Rule Mining:**	
4.1	Frequent Itemset Mining Methods- Apriori	2
4.2	Frequent Pattern (FP) Tree	2
4.3	Mining Various Kinds of Association rules	2
5	**Supervised Learning Algorithms**	
5.1	Decision Tree: ID3 Classifier	2
5.2	C4.5, CART	2
5.3	K-Nearest Neighbour	2
5.4	Performance Metrics	1
6	**Unsupervised Learning Algorithms**	
6.1	Distance Functions,	1
6.2	Dissimilarity between the mixed types of data	2
6.3	K-Means Algorithm	2

6.4	K- Medoids Algorithm	1
7	**Information Visualization**	
7.1	Visual Perception and Cognition	1
7.2	Gestalt's Principles	2
7.3	Tufte's Principles	
7.4	Applications of Principles of Information Visualization	1
7.5	Dashboard Design	1
	Total	**36**

Course Designers:

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Dr.A.M. Abirami, , Associate Professor, IT Department abiramiam@tce.edu
Mrs.S.Pudumalar ,Assistant Professor, IT Department spmit@tce.edu

		Category	L	T	P	Credit
22ITQE0	**Business Analytics**	EM	3	0	0	3

Preamble

The course aims to provide the detailed knowledge in Business Analytics for decision-making process. The course enables the learners to enhance their management and decision-making skills with selecting suitable data modelling and analytics tools and techniques.

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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 fundamental concepts of Business Analytics.	TPS2	70	70
CO2	Apply Excel Functions, queries, and Visualization in solving the business-related problems.	TPS3	70	65
CO3	Use descriptive analytics to summarize and interpret the data.	TPS3	70	65
CO4	Demonstrate the performance of various predictive analytics techniques.	TPS3	70	65
CO5	Demonstrate the practical applications of social media analytics in marketing, brand management and social media strategy etc.	TPS3	70	65
CO6	Analyze the data using statistical and data analytic techniques for the real time business problems.	TPS4	70	60

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	M	L										L	L		L
CO2	S	M	L		S							M	M	M	L
CO3	S	M	L		M							M	M	M	L
CO4	S	M	L		S							S	M	M	L
CO5	S	M	L	L	S							S	M	M	L
CO6	S	S	M	L	S							S	S	M	L

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

CO	CAT1			Assignment -I				CAT2			Assignment - II				Terminal Theory					
TPS Scale	1	2	3	1	2	3	4	1	2	3	1	2	3	4	1	2	3	4	5	6
CO1	10	10			10										2	5				
CO2	5	5	30			50									2		15			
CO3		10	30			40									2		15			
CO4								5	5	30			30		2	5	15			
CO5								5	5	20			30		2	5	10			
CO6								5	5	20			20	20		5	15			

Syllabus

Fundamentals of Business Analytics: Scope, Framework, Types of Data, Classification of Business Analytics, Trends of Business Analytics, and applications of Business Analytics

Analytics on Spreadsheets: Excel Formulas, Excel Functions, Data Queries, Spread Sheet – Add -Ins for Business Analytics, Data Visualization

Descriptive Analytics: Populations and samples, Statistical notations, Measures of Dispersion, and Measures of Association, Statistical measures for summarizing the data

Predictive Analytics: Decision tree Classifier, Random Forest, Moving average, Exponential smoothing, Trend, Cyclical and seasonality components, ARIMA (autoregressive integrated moving average), Seasonal Autoregressive Integrated Moving Average (SARIMA), Vector Autoregression (VAR), Forecasting using Prophet

Social Media Analytics: Need, Key Performance Indicators - Digital Marketing: 7Ps of Marketing, Methods of Digital Marketing - SMA tools : Case Study with Google Analytics Tool

Learning Resources

U.Dinesh Kumar , “Business Analytics: The Science of Data - Driven Decision Making”, Wiley, First Edition, 2017.

Galit Shmueli, Nitin R Patel, Peter C Bruce, “Data Mining for Business Intelligence: Concepts, Techniques and Applications in Microsoft Office Excel with XLMiner” Wiley, First Edition, 2008.

Foster Provost and Tom Fawcet, "Data Science for Business”, O’Reilly Media, First Edition, 2013.

James R Evans, “Business Analytics – Methods, Models and Decisions,” Pearson, Second Edition, 2017.

https://onlinecourses.nptel.ac.in/noc23_mg54/preview - Business Analytics For Management Decision By Prof. Rudra P Pradhan, IIT Kharagpur.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Fundamentals of Business Analytics**	
1.1	Scope, Framework, Types of Data	2
1.2	Classification of Business Analytics	1
1.3	Trends of Business Analytics and applications of Business Analytics	2
2	**Analytics on Spreadsheets**	
2.1	Excel Formulas, Excel Functions	2
2.2	Data Queries, Spread Sheet – Add -Ins for Business Analytics	2
2.3	Data Visualization	2
3	**Descriptive Analytics**	
3.1	Populations and samples	2
3.2	Statistical notations	1
3.3	Measures of Dispersion and Measures of Association	2
3.4	Statistical measures for summarizing the data	2
4	**Predictive Analytics**	
4.1	Decision tree Classifier	2
4.2	Random Forest	1
4.3	Moving average	1
4.4	Exponential smoothing, Trend, Cyclical and seasonality components	2
4.5	ARIMA (autoregressive integrated moving average)	1
4.6	Seasonal Autoregressive Integrated Moving Average (SARIMA), Vector Autoregression (VAR)	2
4.7	Forecasting using Prophet	2
5	**Social Media Analytics**	
5.1	Need, Key Performance Indicators	1
5.2	Digital Marketing: 7Ps of Marketing	1
5.3	Methods of Digital Marketing	1
5.4	SMA tools	2
5.5	Case Study with Google Analytics Tool	2
	Total Hours	**36**

Course Designers:

1. Dr.S.Sridevi,Associte Professor,IT Department sridevi@tce.edu
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3. Dr.S.Karthiga, Assiatant Professor,IT Department skait@tce.edu

22ITQF0	STATISTICAL ANALYSIS AND COMPUTING	Category	L	T	P	Credit
		EM	3	0	0	3

Preamble

The course helps you make sense of data by identifying patterns, relationships, and trends within it for making informed decisions in various fields, from science and engineering to business and finance.

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	Perform data analysis using different probability distribution methods	TPS3	70	70
CO2	Perform statistical testing techniques and make inferences for the given dataset	TPS3	70	70
CO3	Use suitable regression techniques for any given dataset	TPS3	70	70
CO4	Apply different feature selection techniques for real datasets	TPS3	70	70
CO5	Demonstrate a fundamental understanding of the various Python constructs for data science	TPS2	70	80
CO6	Develop real-time applications using mathematical and statistical models	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		L
CO2	S	M	L									S	M		L
CO3	S	M	L									S	M		L
CO4	S	M	L									S	M		L
CO5	M	L			S							S	L	M	L
CO6	S	M	L		S							S	M	M	L

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	CAT 1			Assignment 1			CAT 2			Assignment 2			Terminal Theory					
TPS Scale	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	4	5	6
CO1	10	10	10			20							2	5	10			
CO2	10	10	20			40							2	10	15			
CO3	10	10	10			40		10	10				2	5	10			
CO4							10	10	25			10	2	5	10			
CO5							10	10			10		2	10				
CO6							5	5	5			80		5	5			

CO6 COVERED THROUGH MINI PROJECT

Syllabus

Data Analysis and Probability Distributions Introduction to Data Analysis - Types of Data – Types of Variables - Central Tendency and Dispersion - Probability Distributions - Random variable, Variance, Covariance, Correlation Coefficient - Discrete Probability Distributions - Binomial, Poisson - Continuous Probability Distributions - Uniform, Exponential, Normal - Python functions for Distributions

Statistical Testing Sampling and Sampling distributions - Confidence Interval Estimation - Hypothesis Testing - Null and Alternative Hypothesis - Type 1 and Type 2 errors - One sample test, Two sample test - Analysis of Variance - 1 way ANOVA - 2 way ANOVA - F test - Turkey test, ANOVA for Randomized Design - Python functions for Statistical testing

Regression Analysis Linear Regression - Least Square Method, Coefficient of Determination, Significance Test - Estimation and Prediction - Residual Analysis - Multiple Linear Regression - Python functions for Regression Analysis - Maximum Likelihood Estimation (MLE) - MLE and Distributions - Logistic Regression - Confusion Matrix - ROC Curve - Regression Analysis Model Building - Linear vs Logistic Regression

Feature Selection Chi-square test - Fisher's score - Information Gain - Factor Analysis - Principal Component Analysis - Linear Discriminant Analysis - Python functions for feature selection

Text Book

1. Douglas Montgomery and George C. Runger, "Applied Statistics and Probability for Engineers" 6th edition, Wiley, 2017

Reference Books& web resources

1. William McKinney , "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython", 2 nd Edition, O'Reilly Media, 2017

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours
1.	**Data Analytics and Probability Distributions**	
1.1	Introduction to Data Analysis - Types of Data – Types of Variables	1
1.2	Central Tendency and Dispersion	1
1.3	Probability Distributions - Random variable, Variance, Covariance, Correlation Coefficient	1
1.4	Discrete Probability Distributions - Binomial, Poisson	2

1.5	Continuous Probability Distributions - Uniform, Exponential, Normal	2
1.6	Python functions for Distributions	1
2	**Statistical Testing**	
2.1	Sampling and Sampling distributions	1
2.2	Confidence Interval Estimation	1
2.3	Hypothesis Testing - Null and Alternative Hypothesis Type 1 and Type 2 errors	2
2.4	One sample test, Two sample test	1
2.5	Analysis of Variance - 1 way ANOVA - 2 way ANOVA- F test - Turkey test	3
2.6	ANOVA for Randomized Design	1
2.7	Python functions for Statistical testing	1
3	**Regression Analysis**	
3.1	Linear Regression- Least Square Method	1
3.2	Coefficient of Determination, Significance Test - Estimation and Prediction - Residual Analysis	2
3.3	Multiple Linear Regression - Python functions for Regression Analysis	2
3.4	Maximum Likelihood Estimation (MLE) - MLE and Distributions	2
3.5	Logistic Regression	1
3.6	Confusion Matrix - ROC Curve - Regression Analysis Model Building	1
3.7	Linear vs Logistic Regression	1
4.	**Feature Selection**	
4.1	Chi-square test- Fisher's score	1
4.2	Information Gain	1
4.3	Factor Analysis	2
4.4	Principal Component Analysis	2
4.5	Linear Discriminant Analysis	1
4.6	Python functions for feature selection	1
	Total Lectures	**36**

Course Designer(s):

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2. S.Karthiga , Assistant Professor, skit@tce.edu,Information Technology
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B. TECH INFORMATION TECHNOLOGY
DEGREE PROGRAMME

INDUSTRY SUPPORTED COURSES
AND INTERDISCIPLINARY ELECTIVE COURSES

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2022

THIAGARAJAR COLLEGE OF ENGINEERING
(A Government Aided Autonomous Institution affiliated to Anna University)
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		Category	L	T	P	Credit
22IT1A0	**MLOPS**	PEES	1	0	0	1

Preamble

This course provides foundational knowledge and practical skills required for effective deployment of ML solutions. It deals with the key components of MLOps, traditional ML deployment methodologies, infrastructure considerations, version control strategies, CI/CD pipelines, and real-world case studies

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 the fundamental concepts of MLops including lifecycle, objectives and key components	TPS 2	70	70
CO2	Appraise the suitability of cloud versus on-premises infrastructure for ML Ops	TPS 4	70	70
CO3	Use Version control and collaboration techniques effectively on platforms such as Git, Git lab.	TPS 3	70	70
CO4	Design CI/CD pipelines for ML projects, integrating them with version control systems	TPS 3	70	70
CO5	Deploy ML models using suitable cloud-based tools	TPS 3	70	70
CO6	Integrate ML models with necessary storage and monitoring tools such as S3, CloudWatch	TPS 3	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		
CO2	S	S	M	L		L	L	L	M	M	L	L	S	L	M
CO3	S	M	L		M	L	L	L	M	M	L	L	M	M	M
CO4	S	M	L		M	L						L	M	M	
CO5	S	M	L		M	L	L	L	M	M	L	L	M	M	M
CO6	S	M	L		M	L	L	L	M	M	L	L	M	M	M

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	Internal (Miniproject)						Terminal					
TPS Scale	1	2	3	4	5	6	1	2	3	4	5	6
CO1	-	-	-	-	-	-	5	5	-	-	-	-
CO2	-	-	10	20	-	-	-	5	10	10	-	-
CO3	-	-	10	-	-	-	5	5	10	-	-	-
CO4	-	-	20	-	-	-	-	5	10	-	-	-
CO5	-	-	20	-	-	-	-	5	10	-	-	-
CO6	-	-	20	-	-	-	-	5	10	-	-	-

Syllabus

MLOps Basics: ML Lifecycle Overview – MLOps: Definition, Objectives, Key Components – Traditional ML Deployment – Challenges – MLOps Workflow

Infrastructure for MLOps: Cloud vs. On-premises infrastructure for ML Ops - Storage options: Object storage, file storage, and databases - Containerization and orchestration for ML deployment – AutoML services

Version Control and Collaboration: Git – Git Workflow for ML Projects – Best practices for collaborating on ML Projects

CI/CD pipelines for ML: Design – Integration with Version control systems - Jenkins, GitLab: Overview, Setup – Configuring Automated Tests

Case Study: AWS Sagemaker – Overview – Components – Pre-built models – Integration with Storage, Serverless functions – Monitoring.

Learning Resources

1. Treveil M, Omont N, Stenac C, Lefevre K, Phan D, Zentici J, Lavoillotte A, Miyazaki M, Heidmann L. Introducing MLOps. O'Reilly Media; 2020 Nov 30.
2. MLOps Guide - https://huyenchip.com/mlops/

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**MLOps Basics**	
1.1	ML Lifecycle Overview – MLOps: Definition, Objectives, Key Components	1
1.2	Traditional ML Deployment – Challenges	1
1.3	MLOps Workflow	1
2	**Infrastructure for MLOps**	
2.1	Cloud vs. On-premises infrastructure for ML Ops	1
2.2	Storage options: Object storage, file storage, and databases	1
2.3	Containerization and orchestration for ML deployment	1
3	**Version Control and Collaboration**	
3.1	Git – Git Workflow for ML Projects	1

Module No.	Topic	No. of Periods
3.2	Best practices for collaborating on ML Projects	1
4	**CI/CD pipelines for ML**	
4.1	Design – Integration with Version control systems	1
4.2	Jenkins, GitLab: Overview	1
4.3	Setup – Configuring Automated Tests	1
5	**Case Study**	
5.1	AWS Sagemaker – Overview – Components	1
5.2	Pre-built models	1
5.3	Integration with Storage, Serverless functions – Monitoring	1
	Total	**14**

Course Designer(s):

1. Mr.T.Sasikumar, tmsasikumar@gmail.com, Senior Technical Consultant, Thoughtworks, Chennai
2. Dr.S.Padmavathi, spmcse@tce.edu, Professor, IT,TCE
3. Mrs.S.Thiruchadai Pandeeswari, eshwarimsp@tce.edu, APIT,TCE
4. Dr..K.R.Premalatha, krplit@tce.edu, APIT, TCE

Industry Expert Profile

Mr. T. Sasikumar is a full stack developer with **14+ years** of experience in leading multiple development teams building high performance enterprise platforms. Proficient in eXtreme Programming (XP) practices and Agile methodologies. Of late He is also playing the role of a data engineer building streaming platforms using Apache Kafka eco system.

		Category	L	T	P	Credit
22IT1B0	**DATA PROCESSING AND VISUALIZATION USING BIG DATA TOOLS**	PEES	1	0	0	1

Preamble

The term "big data" has become increasingly common in discussions about IoT, machine learning, and artificial intelligence, largely due to the immense volume of data these technologies generate. This flood of data enables algorithms and tools to uncover patterns and insights, transforming raw data into decision support models. This course is designed to offer hands-on experience in big data techniques and technologies, specifically focusing on their application to various forms of real-time data.

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 use of big data platforms for big data management	TPS2	70	85
CO2	Set up big data analytical environment for big data processing and management	TPS2	70	85
CO3	Apply Spark platform for big data applications like energy exploration, financial market analysis, fraud detection, medical records and image analysis	TPS3	70	75
CO4	Use Airflow platform for large scale data processing	TPS3	70	75
CO5	Use data visualization and interactive tools for exploratory data analysis and data insights	TPS4	70	65
CO6	Use big data platforms, machine learning algorithms and visualizations for real time applications	TPS4	70	65

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			S			S				M	L	M	L
CO2.	M	L			S			S				M	L	M	L
CO3	S	M	L		S			S				M	M	M	L
CO4	S	M	L		S			S				M	M	M	L
CO5	S	S	M	L	S			S				S	S	M	L
CO6	S	S	M	L	S	M	M	S	M	M	L	S	S	M	L

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	Continuous Assessment Test						Terminal					
TPS Scale	1	2	3	4	5	6	1	2	3	4	5	6
CO1	2	3					2	6				
CO2	2	3					2	6	10			
CO3			10				2	6	10			
CO4			10				2	6	10			
CO5			10	10			2	6	10	6		
CO6	5	5	30	10			2	6		6		

Syllabus

Introduction to Big Data Types - Characteristics - Big Data Analytics – Big Insights and Big Sheets

Big Data Processing Distributed Datasets – Data Integration – Data Processing – Inference – Dashboard – Data aware to Data Driven Organization – AI powered search and analytics

Big data Analytics Platforms
Spark - Features - Architecture – Workers, Cluster Managers, Driver Programs, Executors, Tasks - Environment Set up and Installation - Use cases - Data Analysis - PySpark, Spark SQL

Airflow - Features – Architecture - Big data orchestration - Environment Set up and Installation - Use cases – Integration with Big Data Platforms - Advantages and Disadvantages

Interactive Data Visualization and Tools Tableau **Applications** Geo spatial analytics, Multimodal data analytics

Learning Resources

1. Raj Kamal, Preeti Saxena, “Big Data Analytic:: Introduction to Hadoop, Spark and Machine Learning”, McGraw Hill, 2019.
2. Jules S Damji, Brooke Wenig, Tathagata Das, “Learning Spark: Lightning-Fast Data Analytics”, O’Reilly, 2nd Edition, 2020
3. Bas P Harenslak, Julian Rutger de Ruiter, “Data Pipelines with Apache Airflow”, Manning, 2021.
4. Hayden Van Der “Dashboard Playbook: Data Viz to Data Wiz: Tableau & Power BI”, Reactive Publishing, 2023
5. https://onlinemaps.surveyofindia.gov.in/PricingPolicy.aspx
6. https://tn.data.gov.in/dataset-group-name/gis
7. https://data.world/
8. https://www.kaggle.com/

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Introduction to Big**	
1.1	Types	1
1.2	Characteristics	
1.3	Big Data Analytics	

Module No.	Topic	No. of Periods
1.4	Big Insights and Big Sheets	
2	**Big Data Processing**	
2.1	Distributed Datasets	1
2.2	Data Integration	
2.3	Data Processing	
2.4	Inference	
2.5	Dashboard	1
2.6	Data aware to Data Driven Organization	
2.7	AI powered search and analytics	
3	**Big data Analytics Platforms** – Spark	
3.1	Features	2
3.2	Architecture - Workers, Cluster Managers, Driver Programs, Executors, Tasks	
3.3	Environment Set up and Installation	3
3.4	Use cases	
3.5	Data Analysis - PySpark, Spark SQL	
4	**Big data Analytics Platforms** - Apace Airflow	
4.1	Features	2
4.2	Architecture	
4.3	Big data orchestration	2
4.4	Environment Set up and Installation	
4.5	Use cases	
4.6	Integration with Big Data Platforms	2
4.7	Advantages and Disadvantages	
5	**Interactive Data Visualization and Tools**	
5.1	Tableau	1
5.2	Applications – Geo spatial, multimodal data analytics	1
	Total Lecture Hours	**16**

Course Designer(s):

1. K Vijay Kumar, Scientist – E, Joint Director CDAC Chennai — vijayk@cdac.in
2. A M Abirami — abiramiam@tce.edu
3. K V Uma — kvuit@tce.edu

22IT1C0 WEB APPLICATION SECURITY

Category	L	T	P	Credit
PEES	1	0	0	1

Preamble

The primary goal of application security is to fortify an application with robust and efficient security measures. These measures aim to reduce the likelihood of attackers being able to manipulate applications and gain unauthorized access to, steal, alter, or delete sensitive 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	Understand the recent security breaches' impact on businesses and the role of security frameworks in ensuring web application security.	TPS2	70	75
CO2	Apply SSL/HTTP protocols and security response headers to secure web communication and address common vulnerabilities.	TPS3	70	70
CO3	Analyze OWASP Top 10 risks by identifying vulnerabilities like Broken Access Control, Injection, etc.	TPS4	70	65
CO4	Implement secure coding and prevention strategies to mitigate Server-Side Forgery and prevent AWS Buckets Takeovers.	TPS3	70	70
CO5	Evaluate the implemented security measures' effectiveness in mitigating web application risks using practical scenarios.	TPS4	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			S							S	L	M	L
CO2.	S	M	L		S			S				S	M	M	M
CO3.	S	S	M	L	S	S		S	M	M	M	S	S	S	M
CO4.	S	M	L		S			S				S	M	M	M
CO5.	S	S	M	L	S	S		S			M	S	S	S	M

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	Internal (Mini-project)						Terminal					
TPS Scale	1	2	3	4	5	6	1	2	3	4	5	6
CO1		10						10				
CO2			20					5	15			
CO3			10	10				10		15		
CO4			20					5	15			
CO5			20	10				10		15		

Syllabus

Introduction to Web Application Security: Overview - Security breaches - Security frameworks – Need for robust web application security.

Common Protocols and Security Response Headers: ESSL/HTTP protocols - Security response headers - Implementation.

OWASP Top 10 Overview: (Practical sessions) OWASP web application security risks – Broken Access Control, Crypto Failures, Injection, Insecure Design, Misconfigurations, Vulnerable & Outdated Components, Identification & Authentication Failures, Software & Data Integrity Failures, Log Failures

Secure Coding and Prevention Strategies: Mitigation Strategies: Server-Side Forgery Requests, Secure coding approaches, AWS Buckets Takeovers prevention, and Server Takeovers prevention - Shift Left security approach - Threat modelling in development lifecycle.

Text Book

1. Andrew Hoffman, “Web Application Security: Exploitation and Countermeasures for Modern Web Applications”, O'Reilly Media, First Edition, 2023

Reference Books& web resources

1. Dafydd Stuttard, Marcus Pinto, “The Web Application Hacker's Handbook: Discovering and Exploiting Security Flaws,” 2nd Edition,Wiley,2011,ISBN:1118026470/978-1118026472.
2. Stuart McClure, Joel Scambray, Kurtz,” Hacking Exposed 7:Network Security Secrets & Solutions”, 7thEdition, McGraw-Hill Prof Med/Tech, 2012, ISBN13:9780071780285
3. Andrew S. Tanenbaum and David J. Wether all, “Computer Networks”, 5th Edition, Pretice Hall,2011,IB-13:9780132126953
4. OWASP Security Testing Guide

   (https://www.owasp.org/index.php/File:OWASP_Testing_Guide_v2_pdf.zip)
5. OWASP: http://www.owasp.org
6. WASC: http://www.webappsec.org/
7. SANS: http://www.sans.org

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Introduction to Web Application Security**	
1.1	Overview - Security breaches	1
1.2	Security frameworks – Need for robust web application security	1
2	**Common Protocols and Security Response Headers**	
2.1	ESSL/HTTP protocols	1
2.2	Security response headers - Implementation	1
3	**OWASP Top 10 Overview**	
3.1	OWASP web application security risks – Broken Access Control, Crypto Failures, Injection, Insecure Design, Misconfigurations	2
3.2	Vulnerable & Outdated Components, Identification & Authentication Failures	2
3.3	Software & Data Integrity Failures, Log Failures	1
4	**Secure Coding and Prevention Strategies**	
4.1	Mitigation Strategies: Server-Side Forgery Requests, Secure coding approaches	2
4.2	AWS Buckets Takeovers prevention, and Server Takeovers prevention	1
4.3	Shift Left security approach	1
4.4	Threat modelling in development lifecycle	1
	Total	14

Course Designer(s):

1. Prateek Tiwari, Security head, Zomato pt@zomato.com
2. M.Suguna mscse@tce.edu
3. R Parkavi rpit@tce.edu

22ITGA0	DATABASE MANAGEMENT SYSTEMS	Category	L	T	P	Credit
		IE	3	0	0	3

Preamble

This course is intended for enabling students to understand the various functionalities of Database management system and develop solutions for the real-world problem. It emphasizes the need for design of database systems and provides an in-depth coverage of various principles of database systems.

Prerequisite

- None

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 structured, unstructured data and Data Base Management Systems.	TPS2	70	80
CO2	Implement Java Database connectivity by executing DDL and DML commands for the given application.	TPS3	70	70
CO3	Illustrate the use of complex query languages to populate, update and retrieve the data from database.	TPS3	70	70
CO4	Use PL/SQL to perform various Query operations for a given database.	TPS3	70	70
CO5	Apply normalization techniques to design a database for a given application.	TPS3	70	70
CO6	Explain transaction, concurrency control mechanism.	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											L		
CO2	S	M	L		S			S	S	M		L	M	M	M
CO3	S	M	L		S			S	S	M		L	M	M	M
CO4	S	M	L		S			S	S	M		L	M	M	M
CO5	S	M	L										M		
CO6	M	L											L		

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	CAT 1			Assignment 1			CAT 2			Assignment 2			Terminal		
TPS Scale	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
CO1	10	10											5	10	
CO2	5	5	30			50							5		10
CO3	5	5	30			50							5		15
CO4							5		35			50	5	5	15
CO5								15	25			50		5	10
CO6							5	15						10	

Syllabus

Database Systems Concepts: Structured data, unstructured data and Information, Databases and Database Users. Data models and its Types, Schemas and Instances, Three Schema Architecture, Classification of DBMS.

Data Modeling: Entity Relationship (ER) Model .

NOSQL database- NOSQL Key-Value Stores- Column-Based or Wide Column NOSQL Systems.

Database query language: Basic SQL- Data types –Types of Constraints, Views, Simple and Complex Queries-Single row and Multi-row Subquery, Date and String functions. Database Connectivity-JDBC

Programming Language Extension to SQL (PL/SQL)– Fundamentals, Control Structures, PL/SQL –Cursor, Trigger, Function , Procedure ,Package and Exception.

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

Transaction: Properties of Transaction**. Concurrency Control** –Two Phase Locking

Text Book

1. Ramez Elmasri, Shamkant B. Navathe, ”Fundamentals of Database Systems”, Pearson, Seventh Edition, 2016

Reference Books & web resources

1. Nilesh Shah, “Database Systems using Oracle”, 2nd edition, Prentice Hall of India Pvt Ltd, 2007
2. C.J Date, A.Kannan, S.Swamynathan , “An Introduction to database systems”,Pearson Education, Eighth Edition, 2006.

3. Abraham Silberschatz, Henry F.Korth and Sudarshan, “Database System Concepts”, Tata Mcgraw-Hill, Sixth edition, 2010
4. Raghu Ramakrishnan, Johannes Gehrke, —Database Management Systems‖, McGraw Hill ,Fourth Edition, 2010
5. Pramod J. Sadalage,Martin Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence,Pearson,2013
6. Web Reference :http://nptel.ac.in/courses/106106093/ Course Name:Database Design.

Course Contents and Lecture Schedule

Module No	Topic	No. of Periods
1	**Database Systems Concepts and Data Modelling**	
1.1	Structured data, unstructured data and Information	1
1.2	Databases and Database Users	
1.3	Data models and its Types, Schemas and Instances	1
1.4	Three Schema Architecture	1
1.5	Classification of DBMS	1
1.6	Entity Relationship (ER) Model	1
2	**NOSQL Database**	
2.1	NOSQL Key-Value Stores- Column-Based or Wide Column NOSQL Systems.	2
3	**Database query language**	
3.1	Basic SQL- Data types	2
3.2	Types of Constraints	1
3.3	Views	1
3.4	Simple Queries	3
3.5	Complex Queries- Single row and Multi-row Subquery	3
3.6	Date and String functions	2
3.7	Database Connectivity-JDBC	2
4	**Programming Language Extension to SQL (PL/SQL)**	
4.1	Control Structures	2

4.2	PL/SQL - Cursor	2
4.3	Trigger, Function	2
4.4	Procedure	1
4.5	Exception, Package	1
5	**Database Design Theory and Normalization**	
5.1	Functional Dependencies	1
5.2	Normal forms based on Primary keys, 2NF	1
5.3	3NF, Boyce Codd Normal form	1
5.4	Multivalued dependence and Fourth Normal form	1
5.5	Join dependencies and Fifth Normal Form	1
6	**Transaction, Concurrency Control, and Enterprise Architecture**	
6.1	Properties of Transaction	1
6.2	Two Phase Locking	1
	Total Lectures	**36**

Course Designer(s):

1. Dr.S.Sridevi ,Associate Professor sridevi@tce.edu
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		Category	L	T	P	Credit
22ITGB0	**KOTLIN PROGRAMMING**	IE	3	0	0	3

Preamble

The objective of the course is to provide a detailed description of Kotlin, open source programming language. The course focuses on basic concepts of Kotlin along with the object-oriented programming constructs using Kotlin.

Prerequisite

- None

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 fundamentals of the Kotlin Programming language	TPS3	70	70
CO2	Make use of Functions and Lambdas expressions to solve a problem using Kotlin	TPS3	70	70
CO3	Apply OOP concepts using Kotlin for the given application	TPS3	70	70
CO4	Use Collections and Annotations to the given application	TPS3	70	70
CO5	Illustrate interoperability between Kotlin and Java and apply the regular expressions for the given application	TPS3	70	70
CO6	Develop professional applications using Kotlin language for any real time problem.	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**	**PSO1**	**PSO2**	**PSO3**
CO1.	S	M	L		M								S	M	
CO2.	S	M	L		M								S	M	
CO3.	S	M	L		M								S	M	
CO4.	S	M	L		S								S	S	
CO5.	S	M	L		S								S	S	
CO6.	S	M	L		S			S	S	S		M	S	S	M

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	TEST 1			Assignment 1			TEST 2			Assignment 2			Terminal		
TPS Scale	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
CO1	5	5	10										2	5	10
CO2	10	10	30			50							2	5	10
CO3			30			50			10				2	5	15
CO4							10	10	30			20	2	5	15
CO5							10	10	20			30	2	5	10
CO6												50			5

Syllabus

Introduction - History of Kotlin – Features – Variables and Datatypes – Environment Set up – Type casting – Operators – Input/Output - Comments

Kotlin Functions - Control Flows – Functions – Recursion Function – Kotlin Lamdas – Higher order function – Inline Functions - Arrays-Mutable Array

Kotlin OOPs - Class and Object - Nested and Inner Class - Kotlin Constructor - Visibility Modifier - Kotlin Inheritance - Abstract Class - Kotlin Interface - Data Class - Sealed Class - Extension Function - Kotlin Generics - Exception Handling

Collections & Annotation - Kotlin Collections - List: listOf() - mutableListOf() - Kotlin ArrayList - arrayListOf() - Map: mapOf() - Kotlin HashMap - hashMapOf() - mutableMapOf() - Set: setOf() - mutableSetOf() - hashSetOf() – Reflection - Annotations

Java Interoperability & Regex - Calling Java code from Kotlin - Calling Kotlin code from Java - Regular Expressions - Regex patterns

Text Book

1. Peter Späth, “Pro Android with Kotlin: Developing Modern Mobile Apps with Kotlin and Jetpack”, 2nd edition,2022

Reference Books & web resources

1. Tim Lavers, “Learn to Program with Kotlin”,Apress, 2021
2. David Griffiths and Dawn Griffiths, “Head First Kotlin: A Brain-Friendly Guide”, O’reilly; 1st edition, 2019
3. Stephen Samuel, Stefan Bocutiu,“Learn Kotlin Programming: A Comprehensive Guide to OOP, Functions, Concurrency, and Coroutines in Kotlin”,Packt, 2nd edition,2019.
4. https://developer.android.com/kotlin/campaign/learn

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
1	**Introduction**	
1.1	History of Kotlin	1
1.2	Features	1
1.3	Variables and Datatypes	1

1.4	Environment Set up	1
1.5	Type casting	1
1.6	Operators, Input/Output - Comments	1
2	**Kotlin Functions**	
2.1	Control Flows	1
2.2	Functions – Recursion Function	1
2.3	Kotlin Lamdas	2
2.4	Higher order function – Inline Functions	1
2.5	Arrays,Mutable Array	2
3	**Kotlin OOPs**	
3.1	Class and Object, Nested and Inner Class	
3.2	Kotlin Constructor,Visibility Modifier	2
3.3	Kotlin Inheritance, Abstract Class,Kotlin Interface	2
3.4	Data Class - Sealed Class	2
3.5	Extension Function, Generics	2
3.6	Exception Handling	2
4	**Collections & Annotation**	
4.1	Kotlin Collections	1
4.2	List: listOf() , mutableListOf()	2
4.3	Kotlin ArrayList ,arrayListOf()	2
4.4	Map: mapOf() , Kotlin HashMap ,hashMapOf() ,mutableMapOf()	2
4.5	Set: setOf() ,mutableSetOf() , hashSetOf()	1
4.6	Reflection - Annotations	1
5	**Java Interoperability & Regex**	
5.1	Calling Java code from Kotlin	1
5.2	Calling Kotlin code from Java	1
5.3	Regular Expressions	1
5.4	Regex Patterns	1
	Total Lectures	**36**

Course Designer(s):

1. Dr.S.Karthiga, Assistant Professor, IT skait@tce.edu
2. Ms.C.V.Nisha Angeline, Assistant Professor, IT cvnait@tce.edu

22ITGC0	OBJECT ORIENTED PROGRAMMING WITH JAVA	Category	L	T	P	Credit
		IE	3	0	0	3

Preamble

This course aims to provide students with broad theoretical and practical skills in object oriented programming. This course focuses on various OOP concepts such as Encapsulation, Inheritance and Polymorphism. It also focuses on various libraries for programming an interactive real world application.

Prerequisite

- None

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 programming constructs like data types, operators, condition and looping control structures, arrays for the given problem	TPS3	70	70
CO2	Apply the object-oriented concepts such as encapsulation, inheritance and polymorphism for the given problem	TPS3	70	70
CO3	Apply JAR, package, and exception handling mechanism for the given problem.	TPS3	70	70
CO4	Use various libraries like String, I/O, Collection classes for the given problem.	TPS3	70	70
CO5	Develop interactive, user friendly applications through Event Handling for the given problem.	TPS3	70	70
CO6	Develop an application in Java through OOP concepts and its libraries for a real-time problem	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	PS O1	PS O2	PS O3
CO1.	S	M	L		M								S	M	
CO2.	S	M	L		M								S	M	
CO3.	S	M	L		M								S	M	
CO4.	S	M	L		S								S	S	
CO5.	S	M	L		S								S	S	
CO6.	S	M	L		S			S	S	S		M	S	S	M

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	TEST 1			Assignment 1			TEST 2			Assignment 2			Terminal		
TPS Scale	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
CO1	5	5	10										2	5	10
CO2	10	10	30			50							2	5	10
CO3			30			50			10				2	5	15
CO4							10	10	30			20	2	5	15
CO5							10	10	20			30	2	5	10
CO6												50			5

Syllabus

Programming Constructs: Data types, Operators, Condition and Looping Control structures, Arrays

Object Oriented Programming Concepts: Encapsulation - Object and Class, Methods, Constructors, Inheritance, Polymorphism, Abstract class and Interfaces

Packages and Exception Handling: JAR Operations, Create and import packages, Exception handling, Exception hierarchy, Built-in exceptions and User defined exceptions

Libraries: String Class and its methods, File I/O, Collection Framework - ArrayList, LinkedList, Iterator, ListIterator, StringTokenizer

Event Handling: AWT Components, Events, Listeners. Layouts

Text Book

1. Herbert Schildt, “Java : The Complete Reference”, McGraw-Hill. Twelfth Edition, 2022.

Reference Books & web resources

1. Paul Deitel and Harvey Deitel, “Java How to Program (Early Objects)”, Pearson, Eleventh Edition, 2018.
2. E.Balagurusamy, “Programming with Java” , McGraw-Hill, Fifth Edition, 2014.
3. Kathy Sierra, “Head First Java”, Shroff publications, Second edition, 2005.
4. https://docs.oracle.com/javase/tutorial/index.html

Course Contents and Lecture Schedule

Module No	Topic	No. of Lecture Hours
1	**Programming Constructs**	
1.1	Data types, Operators	1
1.2	Conditional and Looping Control structures	2
1.3	Arrays	1
2	**Object Oriented Programming Concepts**	
2.1	Encapsulation - Object and Class	2

2.2	Methods and Constructors	2
2.3	Inheritance	2
2.4	Polymorphism	2
2.5	Abstract class and Interfaces	2
3	**Packages and Exception Handling**	
3.1	JAR Operations	2
3.2	Create and import packages	2
3.3	Exception handling	2
3.4	Exception hierarchy	1
3.5	Built in exceptions and User defined exceptions	2
4	**Libraries**	
4.1	String Class and its methods	1
4.2	File I/O	1
4.3	Collection Framework	1
4.4	ArrayList,LinkedList	2
4.5	Iterator, ListIterator	1
4.6	StringTokenizer	1
5	**Event Handling**	
5.1	AWT Components	2
5.2	Events	2
5.3	Listeners, Layouts	2
	Total Lectures	**36**

Course Designer(s):

1. Dr.P.Karthikeyan, Associate Professor, IT karthikit@tce.edu
2. Ms.C.V.Nisha Angeline, Assistant Professor, IT cvnait@tce.edu

22ITGD0 SOFTWARE ENGINEERING

Category	L	T	P	Credit
IE	3	0	0	3

Preamble

The course highlights the application of systematic, disciplined, quantifiable approach to the development, operation and maintenance of software. Aims to impart knowledge on the basic principles, concepts and standard practices of software lifecycle process. The course also enables the students to acquire team building and managerial skills through team project activities 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 various software process models and Devops practices.	TPS2	70	80
CO2	Identify functional and non-functional requirements for any given problem and document it systematically.	TPS3	70	70
CO3	Prepare design documents with standards for any given user requirements.	TPS3	70	70
CO4	Build optimal test cases using appropriate testing techniques.	TPS3	70	70
CO5	Illustrate the benefits upon usage of version controlling and tracking mechanisms in software development	TPS2	70	80
CO6	Develop an application using software engineering best practices and standards.	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	L	M
CO2	S	M	L		M								M	L	M
CO3	S	M	L		S								M	L	
CO4	S	M	L										M		
CO5	M	L			S								L	M	
CO6	S	M	L		S				S	S	S	M	M	M	S

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	CAT			Assignment			CAT			Assignment			Terminal					
	1			1			2			2								
TPS Scale	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	4	5	6
CO1	8	20											3	10				
CO2	8	10	20			50							3	5	20			
CO3	4	10	20			50			10			10	3	5	20			
CO4							8	10	25			30	3	5	10			
CO5							8	20					3	5				
CO6							4	10	5			60			5			

CO6 COVERED THROUGH MINI PROJECT

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

Syllabus

Software Process: Traditional Process Models Vs Agile Methodologies, Software Quality Attributes, Roles and responsibilities of software project manager, Devops-lifecycle process, principles and practices.

Software Requirements Analysis: Requirement Gathering techniques – User story map - Functional Requirements - Non-functional Requirements, Use Cases –SRS Documentation.

Software Design: Design concepts, Design notations, Design techniques-UML diagrams, Data Flow Diagrams,Microservices architecture-Design guidelines, Design Tools, Documentation.

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

Software Testing: Testing process, Testing levels- Black box testing, White box testing, Unit testing, Integration testing, System testing, Test case generation.

Software Configuration and maintenance Management: Tasks- version control- tracking- VC tools- Git, CVS, Monotone, Bazaar- software release and maintenance, reverse engineering and reengineering.

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 (09/2020) .

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. Orit Hazzan, Yael Dubinsky, “Agile software engineering Ⅱ”, Springer,2014
5. Agile Project Management: Creating Innovative Products (2nd Edition) 2nd Edition by Jim Highsmith.
6. P. Bourque and R.E. Fairley, eds., Guide to the Software Engineering Body of Knowledge, Version 3.0, IEEE Computer Society, 2014; www.swebok.org.
6. https://www.edx.org/learn/software-engineering/
7. https://cloudacademy.com/blog/introduction-to-devops/

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours
1.	**Software Process**	
1.1	Traditional Process Models Vs Agile Methodologies	2
1.2	Software Quality Attributes	1
1.3	Roles and responsibilities of software project manager	

1.4	Devops-lifecycle process	2
1.5	Devops principles and practices	1
2	**Software Requirements Analysis**	
2.1	Requirement Gathering techniques	1
2.2	User story map	1
2.3	Functional Requirements	1
2.4	Non-functional Requirements	1
2.5	Use Cases	1
2.6	Documentation	1
3	**Software Design**	
3.1	Design concepts	1
3.2	Design notations	1
3.3	Design techniques	4
3.4	Design guidelines	1
3.5	Microservices architecture	1
3.6	Design Tools	1
3.7	Documentation	1
4.	**Software Development**	
4.1	Coding standards	1
4.2	code inspection ,reviews and walkthroughs	1
5.	**Software Testing**	
5.1	Testing process	1
5.2	Testing levels	
5.3	Black box testing	1
5.4	White box testing	1
5.5	Unit testing	1
5.6	Integration testing	1
5.7	System testing	1
5.8	Test Case generation	2
6	**Software Configuration and maintenance management**	
6.1	Tasks	1
6.2	version control	
6.3	tracking ,tracking tools	1
6.4	Software release and maintenance	1
6.5	Reverse engineering and reengineering.	1
	Total Lectures	**36**

Course Designer(s):

1. Pudumalar.S, Assistant Professor, spmit@tce.edu, Information Technology
2. Ilankumaran.S, Assistant Professor, siit@tce.edu, Information Technology

B. TECH INFORMATION TECHNOLOGY
DEGREE PROGRAMME

INDUSTRY SUPPORTED COURSES
AND INTERDISCIPLINARY ELECTIVE COURSES

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2022

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

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		Category	L	T	P	Credit
22IT1A0	**MLOPS**	PEES	1	0	0	1

Preamble

This course provides foundational knowledge and practical skills required for effective deployment of ML solutions. It deals with the key components of MLOps, traditional ML deployment methodologies, infrastructure considerations, version control strategies, CI/CD pipelines, and real-world case studies

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 the fundamental concepts of MLops including lifecycle, objectives and key components	TPS 2	70	70
CO2	Appraise the suitability of cloud versus on-premises infrastructure for ML Ops	TPS 4	70	70
CO3	Use Version control and collaboration techniques effectively on platforms such as Git, Git lab.	TPS 3	70	70
CO4	Design CI/CD pipelines for ML projects, integrating them with version control systems	TPS 3	70	70
CO5	Deploy ML models using suitable cloud-based tools	TPS 3	70	70
CO6	Integrate ML models with necessary storage and monitoring tools such as S3, CloudWatch	TPS 3	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		
CO2	S	S	M	L		L	L	L	M	M	L	L	S	L	M
CO3	S	M	L		M	L	L	L	M	M	L	L	M	M	M
CO4	S	M	L		M	L						L	M	M	
CO5	S	M	L		M	L	L	L	M	M	L	L	M	M	M
CO6	S	M	L		M	L	L	L	M	M	L	L	M	M	M

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	Internal (Miniproject)						Terminal					
TPS Scale	1	2	3	4	5	6	1	2	3	4	5	6
CO1	-	-	-	-	-	-	5	5	-	-	-	-
CO2	-	-	10	20	-	-	-	5	10	10	-	-
CO3	-	-	10	-	-	-	5	5	10	-	-	-
CO4	-	-	20	-	-	-	-	5	10	-	-	-
CO5	-	-	20	-	-	-	-	5	10	-	-	-
CO6	-	-	20	-	-	-	-	5	10	-	-	-

Syllabus

MLOps Basics: ML Lifecycle Overview – MLOps: Definition, Objectives, Key Components – Traditional ML Deployment – Challenges – MLOps Workflow

Infrastructure for MLOps: Cloud vs. On-premises infrastructure for ML Ops - Storage options: Object storage, file storage, and databases - Containerization and orchestration for ML deployment – AutoML services

Version Control and Collaboration: Git – Git Workflow for ML Projects – Best practices for collaborating on ML Projects

CI/CD pipelines for ML: Design – Integration with Version control systems - Jenkins, GitLab: Overview, Setup – Configuring Automated Tests

Case Study: AWS Sagemaker – Overview – Components – Pre-built models – Integration with Storage, Serverless functions – Monitoring.

Learning Resources

1. Treveil M, Omont N, Stenac C, Lefevre K, Phan D, Zentici J, Lavoillotte A, Miyazaki M, Heidmann L. Introducing MLOps. O'Reilly Media; 2020 Nov 30.
2. MLOps Guide - https://huyenchip.com/mlops/

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**MLOps Basics**	
1.1	ML Lifecycle Overview – MLOps: Definition, Objectives, Key Components	1
1.2	Traditional ML Deployment – Challenges	1
1.3	MLOps Workflow	1
2	**Infrastructure for MLOps**	
2.1	Cloud vs. On-premises infrastructure for ML Ops	1
2.2	Storage options: Object storage, file storage, and databases	1
2.3	Containerization and orchestration for ML deployment	1
3	**Version Control and Collaboration**	
3.1	Git – Git Workflow for ML Projects	1

Module No.	Topic	No. of Periods
3.2	Best practices for collaborating on ML Projects	1
4	**CI/CD pipelines for ML**	
4.1	Design – Integration with Version control systems	1
4.2	Jenkins, GitLab: Overview	1
4.3	Setup – Configuring Automated Tests	1
5	**Case Study**	
5.1	AWS Sagemaker – Overview – Components	1
5.2	Pre-built models	1
5.3	Integration with Storage, Serverless functions – Monitoring	1
	Total	**14**

Course Designer(s):

1. Mr.T.Sasikumar, tmsasikumar@gmail.com, Senior Technical Consultant, Thoughtworks, Chennai
2. Dr.S.Padmavathi, spmcse@tce.edu, Professor, IT,TCE
3. Mrs.S.Thiruchadai Pandeeswari, eshwarimsp@tce.edu, APIT,TCE
4. Dr..K.R.Premalatha, krplit@tce.edu, APIT, TCE

Industry Expert Profile

Mr. T. Sasikumar is a full stack developer with **14+ years** of experience in leading multiple development teams building high performance enterprise platforms. Proficient in eXtreme Programming (XP) practices and Agile methodologies. Of late He is also playing the role of a data engineer building streaming platforms using Apache Kafka eco system.

		Category	L	T	P	Credit
22IT1B0	**DATA PROCESSING AND VISUALIZATION USING BIG DATA TOOLS**	PEES	1	0	0	1

Preamble

The term "big data" has become increasingly common in discussions about IoT, machine learning, and artificial intelligence, largely due to the immense volume of data these technologies generate. This flood of data enables algorithms and tools to uncover patterns and insights, transforming raw data into decision support models. This course is designed to offer hands-on experience in big data techniques and technologies, specifically focusing on their application to various forms of real-time data.

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 use of big data platforms for big data management	TPS2	70	85
CO2	Set up big data analytical environment for big data processing and management	TPS2	70	85
CO3	Apply Spark platform for big data applications like energy exploration, financial market analysis, fraud detection, medical records and image analysis	TPS3	70	75
CO4	Use Airflow platform for large scale data processing	TPS3	70	75
CO5	Use data visualization and interactive tools for exploratory data analysis and data insights	TPS4	70	65
CO6	Use big data platforms, machine learning algorithms and visualizations for real time applications	TPS4	70	65

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			S			S				M	L	M	L
CO2.	M	L			S			S				M	L	M	L
CO3	S	M	L		S			S				M	M	M	L
CO4	S	M	L		S			S				M	M	M	L
CO5	S	S	M	L	S			S				S	S	M	L
CO6	S	S	M	L	S	M	M	S	M	M	L	S	S	M	L

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	Continuous Assessment Test						Terminal					
TPS Scale	1	2	3	4	5	6	1	2	3	4	5	6
CO1	2	3					2	6				
CO2	2	3					2	6	10			
CO3			10				2	6	10			
CO4			10				2	6	10			
CO5			10	10			2	6	10	6		
CO6	5	5	30	10			2	6		6		

Syllabus

Introduction to Big Data Types - Characteristics - Big Data Analytics – Big Insights and Big Sheets

Big Data Processing Distributed Datasets – Data Integration – Data Processing – Inference – Dashboard – Data aware to Data Driven Organization – AI powered search and analytics

Big data Analytics Platforms
Spark - Features - Architecture – Workers, Cluster Managers, Driver Programs, Executors, Tasks - Environment Set up and Installation - Use cases - Data Analysis - PySpark, Spark SQL

Airflow - Features – Architecture - Big data orchestration - Environment Set up and Installation - Use cases – Integration with Big Data Platforms - Advantages and Disadvantages

Interactive Data Visualization and Tools Tableau **Applications** Geo spatial analytics, Multimodal data analytics

Learning Resources

1. Raj Kamal, Preeti Saxena, “Big Data Analytic:: Introduction to Hadoop, Spark and Machine Learning”, McGraw Hill, 2019.
2. Jules S Damji, Brooke Wenig, Tathagata Das, “Learning Spark: Lightning-Fast Data Analytics”, O’Reilly, 2nd Edition, 2020
3. Bas P Harenslak, Julian Rutger de Ruiter, “Data Pipelines with Apache Airflow”, Manning, 2021.
4. Hayden Van Der “Dashboard Playbook: Data Viz to Data Wiz: Tableau & Power BI”, Reactive Publishing, 2023
5. https://onlinemaps.surveyofindia.gov.in/PricingPolicy.aspx
6. https://tn.data.gov.in/dataset-group-name/gis
7. https://data.world/
8. https://www.kaggle.com/

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Introduction to Big**	
1.1	Types	1
1.2	Characteristics	
1.3	Big Data Analytics	

Module No.	Topic	No. of Periods
1.4	Big Insights and Big Sheets	
2	**Big Data Processing**	
2.1	Distributed Datasets	1
2.2	Data Integration	
2.3	Data Processing	
2.4	Inference	
2.5	Dashboard	1
2.6	Data aware to Data Driven Organization	
2.7	AI powered search and analytics	
3	**Big data Analytics Platforms** – Spark	
3.1	Features	2
3.2	Architecture - Workers, Cluster Managers, Driver Programs, Executors, Tasks	
3.3	Environment Set up and Installation	3
3.4	Use cases	
3.5	Data Analysis - PySpark, Spark SQL	
4	**Big data Analytics Platforms** - Apace Airflow	
4.1	Features	2
4.2	Architecture	
4.3	Big data orchestration	2
4.4	Environment Set up and Installation	
4.5	Use cases	
4.6	Integration with Big Data Platforms	2
4.7	Advantages and Disadvantages	
5	**Interactive Data Visualization and Tools**	
5.1	Tableau	1
5.2	Applications – Geo spatial, multimodal data analytics	1
	Total Lecture Hours	**16**

Course Designer(s):

1. K Vijay Kumar, Scientist – E, Joint Director CDAC Chennai — vijayk@cdac.in
2. A M Abirami — abiramiam@tce.edu
3. K V Uma — kvuit@tce.edu

22IT1C0 WEB APPLICATION SECURITY

Category	L	T	P	Credit
PEES	1	0	0	1

Preamble

The primary goal of application security is to fortify an application with robust and efficient security measures. These measures aim to reduce the likelihood of attackers being able to manipulate applications and gain unauthorized access to, steal, alter, or delete sensitive 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	Understand the recent security breaches' impact on businesses and the role of security frameworks in ensuring web application security.	TPS2	70	75
CO2	Apply SSL/HTTP protocols and security response headers to secure web communication and address common vulnerabilities.	TPS3	70	70
CO3	Analyze OWASP Top 10 risks by identifying vulnerabilities like Broken Access Control, Injection, etc.	TPS4	70	65
CO4	Implement secure coding and prevention strategies to mitigate Server-Side Forgery and prevent AWS Buckets Takeovers.	TPS3	70	70
CO5	Evaluate the implemented security measures' effectiveness in mitigating web application risks using practical scenarios.	TPS4	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			S							S	L	M	L
CO2.	S	M	L		S			S				S	M	M	M
CO3.	S	S	M	L	S	S		S	M	M	M	S	S	S	M
CO4.	S	M	L		S			S				S	M	M	M
CO5.	S	S	M	L	S	S		S			M	S	S	S	M

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	Internal (Mini-project)						Terminal					
TPS Scale	1	2	3	4	5	6	1	2	3	4	5	6
CO1		10						10				
CO2			20					5	15			
CO3			10	10				10		15		
CO4			20					5	15			
CO5			20	10				10		15		

Syllabus

Introduction to Web Application Security: Overview - Security breaches - Security frameworks – Need for robust web application security.

Common Protocols and Security Response Headers: ESSL/HTTP protocols - Security response headers - Implementation.

OWASP Top 10 Overview: (Practical sessions) OWASP web application security risks – Broken Access Control, Crypto Failures, Injection, Insecure Design, Misconfigurations, Vulnerable & Outdated Components, Identification & Authentication Failures, Software & Data Integrity Failures, Log Failures

Secure Coding and Prevention Strategies: Mitigation Strategies: Server-Side Forgery Requests, Secure coding approaches, AWS Buckets Takeovers prevention, and Server Takeovers prevention - Shift Left security approach - Threat modelling in development lifecycle.

Text Book

1. Andrew Hoffman, “Web Application Security: Exploitation and Countermeasures for Modern Web Applications”, O'Reilly Media, First Edition, 2023

Reference Books& web resources

1. Dafydd Stuttard, Marcus Pinto, “The Web Application Hacker's Handbook: Discovering and Exploiting Security Flaws,” 2nd Edition,Wiley,2011,ISBN:1118026470/978-1118026472.
2. Stuart McClure, Joel Scambray, Kurtz,” Hacking Exposed 7:Network Security Secrets & Solutions”, 7thEdition, McGraw-Hill Prof Med/Tech, 2012, ISBN13:9780071780285
3. Andrew S. Tanenbaum and David J. Wether all, “Computer Networks”, 5th Edition, Pretice Hall,2011,IB-13:9780132126953
4. OWASP Security Testing Guide

   (https://www.owasp.org/index.php/File:OWASP_Testing_Guide_v2_pdf.zip)
5. OWASP: http://www.owasp.org
6. WASC: http://www.webappsec.org/
7. SANS: http://www.sans.org

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Introduction to Web Application Security**	
1.1	Overview - Security breaches	1
1.2	Security frameworks – Need for robust web application security	1
2	**Common Protocols and Security Response Headers**	
2.1	ESSL/HTTP protocols	1
2.2	Security response headers - Implementation	1
3	**OWASP Top 10 Overview**	
3.1	OWASP web application security risks – Broken Access Control, Crypto Failures, Injection, Insecure Design, Misconfigurations	2
3.2	Vulnerable & Outdated Components, Identification & Authentication Failures	2
3.3	Software & Data Integrity Failures, Log Failures	1
4	**Secure Coding and Prevention Strategies**	
4.1	Mitigation Strategies: Server-Side Forgery Requests, Secure coding approaches	2
4.2	AWS Buckets Takeovers prevention, and Server Takeovers prevention	1
4.3	Shift Left security approach	1
4.4	Threat modelling in development lifecycle	1
	Total	14

Course Designer(s):

1. Prateek Tiwari, Security head, Zomato pt@zomato.com
2. M.Suguna mscse@tce.edu
3. R Parkavi rpit@tce.edu

22ITGA0	DATABASE MANAGEMENT SYSTEMS	Category	L	T	P	Credit
		IE	3	0	0	3

Preamble

This course is intended for enabling students to understand the various functionalities of Database management system and develop solutions for the real-world problem. It emphasizes the need for design of database systems and provides an in-depth coverage of various principles of database systems.

Prerequisite

- None

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 structured, unstructured data and Data Base Management Systems.	TPS2	70	80
CO2	Implement Java Database connectivity by executing DDL and DML commands for the given application.	TPS3	70	70
CO3	Illustrate the use of complex query languages to populate, update and retrieve the data from database.	TPS3	70	70
CO4	Use PL/SQL to perform various Query operations for a given database.	TPS3	70	70
CO5	Apply normalization techniques to design a database for a given application.	TPS3	70	70
CO6	Explain transaction, concurrency control mechanism.	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											L		
CO2	S	M	L		S			S	S	M		L	M	M	M
CO3	S	M	L		S			S	S	M		L	M	M	M
CO4	S	M	L		S			S	S	M		L	M	M	M
CO5	S	M	L										M		
CO6	M	L											L		

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	CAT 1			Assignment 1			CAT 2			Assignment 2			Terminal		
TPS Scale	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
CO1	10	10											5	10	
CO2	5	5	30			50							5		10
CO3	5	5	30			50							5		15
CO4							5		35			50	5	5	15
CO5								15	25			50		5	10
CO6							5	15						10	

Syllabus

Database Systems Concepts: Structured data, unstructured data and Information, Databases and Database Users. Data models and its Types, Schemas and Instances, Three Schema Architecture, Classification of DBMS.

Data Modeling: Entity Relationship (ER) Model .

NOSQL database- NOSQL Key-Value Stores- Column-Based or Wide Column NOSQL Systems.

Database query language: Basic SQL- Data types –Types of Constraints, Views, Simple and Complex Queries-Single row and Multi-row Subquery, Date and String functions. Database Connectivity-JDBC

Programming Language Extension to SQL (PL/SQL)– Fundamentals, Control Structures, PL/SQL –Cursor, Trigger, Function , Procedure ,Package and Exception.

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

Transaction: Properties of Transaction**. Concurrency Control** –Two Phase Locking

Text Book

1. Ramez Elmasri, Shamkant B. Navathe, ”Fundamentals of Database Systems”, Pearson, Seventh Edition, 2016

Reference Books & web resources

1. Nilesh Shah, “Database Systems using Oracle”, 2nd edition, Prentice Hall of India Pvt Ltd, 2007
2. C.J Date, A.Kannan, S.Swamynathan , “An Introduction to database systems”,Pearson Education, Eighth Edition, 2006.

3. Abraham Silberschatz, Henry F.Korth and Sudarshan, “Database System Concepts”, Tata Mcgraw-Hill, Sixth edition, 2010
4. Raghu Ramakrishnan, Johannes Gehrke, —Database Management Systems‖, McGraw Hill ,Fourth Edition, 2010
5. Pramod J. Sadalage,Martin Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence,Pearson,2013
6. Web Reference :http://nptel.ac.in/courses/106106093/ Course Name:Database Design.

Course Contents and Lecture Schedule

Module No	Topic	No. of Periods
1	**Database Systems Concepts and Data Modelling**	
1.1	Structured data, unstructured data and Information	1
1.2	Databases and Database Users	
1.3	Data models and its Types, Schemas and Instances	1
1.4	Three Schema Architecture	1
1.5	Classification of DBMS	1
1.6	Entity Relationship (ER) Model	1
2	**NOSQL Database**	
2.1	NOSQL Key-Value Stores- Column-Based or Wide Column NOSQL Systems.	2
3	**Database query language**	
3.1	Basic SQL- Data types	2
3.2	Types of Constraints	1
3.3	Views	1
3.4	Simple Queries	3
3.5	Complex Queries- Single row and Multi-row Subquery	3
3.6	Date and String functions	2
3.7	Database Connectivity-JDBC	2
4	**Programming Language Extension to SQL (PL/SQL)**	
4.1	Control Structures	2

4.2	PL/SQL - Cursor	2
4.3	Trigger, Function	2
4.4	Procedure	1
4.5	Exception, Package	1
5	**Database Design Theory and Normalization**	
5.1	Functional Dependencies	1
5.2	Normal forms based on Primary keys, 2NF	1
5.3	3NF, Boyce Codd Normal form	1
5.4	Multivalued dependence and Fourth Normal form	1
5.5	Join dependencies and Fifth Normal Form	1
6	**Transaction, Concurrency Control, and Enterprise Architecture**	
6.1	Properties of Transaction	1
6.2	Two Phase Locking	1
	Total Lectures	**36**

Course Designer(s):

1. Dr.S.Sridevi ,Associate Professor sridevi@tce.edu
2. Dr.K.V.Uma, Associate Professor kvuit@tce.edu
3. Ms.S.Pudumalar , Assistant Professor spmit@tce.edu

		Category	L	T	P	Credit
22ITGB0	**KOTLIN PROGRAMMING**	IE	3	0	0	3

Preamble

The objective of the course is to provide a detailed description of Kotlin, open source programming language. The course focuses on basic concepts of Kotlin along with the object-oriented programming constructs using Kotlin.

Prerequisite

- None

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 fundamentals of the Kotlin Programming language	TPS3	70	70
CO2	Make use of Functions and Lambdas expressions to solve a problem using Kotlin	TPS3	70	70
CO3	Apply OOP concepts using Kotlin for the given application	TPS3	70	70
CO4	Use Collections and Annotations to the given application	TPS3	70	70
CO5	Illustrate interoperability between Kotlin and Java and apply the regular expressions for the given application	TPS3	70	70
CO6	Develop professional applications using Kotlin language for any real time problem.	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**	**PSO1**	**PSO2**	**PSO3**
CO1.	S	M	L		M								S	M	
CO2.	S	M	L		M								S	M	
CO3.	S	M	L		M								S	M	
CO4.	S	M	L		S								S	S	
CO5.	S	M	L		S								S	S	
CO6.	S	M	L		S			S	S	S		M	S	S	M

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	TEST 1			Assignment 1			TEST 2			Assignment 2			Terminal		
TPS Scale	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
CO1	5	5	10										2	5	10
CO2	10	10	30			50							2	5	10
CO3			30			50			10				2	5	15
CO4							10	10	30			20	2	5	15
CO5							10	10	20			30	2	5	10
CO6												50			5

Syllabus

Introduction - History of Kotlin – Features – Variables and Datatypes – Environment Set up – Type casting – Operators – Input/Output - Comments

Kotlin Functions - Control Flows – Functions – Recursion Function – Kotlin Lamdas – Higher order function – Inline Functions - Arrays-Mutable Array

Kotlin OOPs - Class and Object - Nested and Inner Class - Kotlin Constructor - Visibility Modifier - Kotlin Inheritance - Abstract Class - Kotlin Interface - Data Class - Sealed Class - Extension Function - Kotlin Generics - Exception Handling

Collections & Annotation - Kotlin Collections - List: listOf() - mutableListOf() - Kotlin ArrayList - arrayListOf() - Map: mapOf() - Kotlin HashMap - hashMapOf() - mutableMapOf() - Set: setOf() - mutableSetOf() - hashSetOf() – Reflection - Annotations

Java Interoperability & Regex - Calling Java code from Kotlin - Calling Kotlin code from Java - Regular Expressions - Regex patterns

Text Book

1. Peter Späth, “Pro Android with Kotlin: Developing Modern Mobile Apps with Kotlin and Jetpack”, 2nd edition,2022

Reference Books & web resources

1. Tim Lavers, “Learn to Program with Kotlin”,Apress, 2021
2. David Griffiths and Dawn Griffiths, “Head First Kotlin: A Brain-Friendly Guide”, O’reilly; 1st edition, 2019
3. Stephen Samuel, Stefan Bocutiu,“Learn Kotlin Programming: A Comprehensive Guide to OOP, Functions, Concurrency, and Coroutines in Kotlin”,Packt, 2nd edition,2019.
4. https://developer.android.com/kotlin/campaign/learn

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures
1	**Introduction**	
1.1	History of Kotlin	1
1.2	Features	1
1.3	Variables and Datatypes	1

1.4	Environment Set up	1
1.5	Type casting	1
1.6	Operators, Input/Output - Comments	1
2	**Kotlin Functions**	
2.1	Control Flows	1
2.2	Functions – Recursion Function	1
2.3	Kotlin Lamdas	2
2.4	Higher order function – Inline Functions	1
2.5	Arrays,Mutable Array	2
3	**Kotlin OOPs**	
3.1	Class and Object, Nested and Inner Class	
3.2	Kotlin Constructor,Visibility Modifier	2
3.3	Kotlin Inheritance, Abstract Class,Kotlin Interface	2
3.4	Data Class - Sealed Class	2
3.5	Extension Function, Generics	2
3.6	Exception Handling	2
4	**Collections & Annotation**	
4.1	Kotlin Collections	1
4.2	List: listOf() , mutableListOf()	2
4.3	Kotlin ArrayList ,arrayListOf()	2
4.4	Map: mapOf() , Kotlin HashMap ,hashMapOf() ,mutableMapOf()	2
4.5	Set: setOf() ,mutableSetOf() , hashSetOf()	1
4.6	Reflection - Annotations	1
5	**Java Interoperability & Regex**	
5.1	Calling Java code from Kotlin	1
5.2	Calling Kotlin code from Java	1
5.3	Regular Expressions	1
5.4	Regex Patterns	1
	Total Lectures	**36**

Course Designer(s):

1. Dr.S.Karthiga, Assistant Professor, IT skait@tce.edu
2. Ms.C.V.Nisha Angeline, Assistant Professor, IT cvnait@tce.edu

22ITGC0	OBJECT ORIENTED PROGRAMMING WITH JAVA	Category	L	T	P	Credit
		IE	3	0	0	3

Preamble

This course aims to provide students with broad theoretical and practical skills in object oriented programming. This course focuses on various OOP concepts such as Encapsulation, Inheritance and Polymorphism. It also focuses on various libraries for programming an interactive real world application.

Prerequisite

- None

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 programming constructs like data types, operators, condition and looping control structures, arrays for the given problem	TPS3	70	70
CO2	Apply the object-oriented concepts such as encapsulation, inheritance and polymorphism for the given problem	TPS3	70	70
CO3	Apply JAR, package, and exception handling mechanism for the given problem.	TPS3	70	70
CO4	Use various libraries like String, I/O, Collection classes for the given problem.	TPS3	70	70
CO5	Develop interactive, user friendly applications through Event Handling for the given problem.	TPS3	70	70
CO6	Develop an application in Java through OOP concepts and its libraries for a real-time problem	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	PS O1	PS O2	PS O3
CO1.	S	M	L		M								S	M	
CO2.	S	M	L		M								S	M	
CO3.	S	M	L		M								S	M	
CO4.	S	M	L		S								S	S	
CO5.	S	M	L		S								S	S	
CO6.	S	M	L		S			S	S	S		M	S	S	M

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	TEST 1			Assignment 1			TEST 2			Assignment 2			Terminal		
TPS Scale	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
CO1	5	5	10										2	5	10
CO2	10	10	30			50							2	5	10
CO3			30			50			10				2	5	15
CO4							10	10	30			20	2	5	15
CO5							10	10	20			30	2	5	10
CO6												50			5

Syllabus

Programming Constructs: Data types, Operators, Condition and Looping Control structures, Arrays

Object Oriented Programming Concepts: Encapsulation - Object and Class, Methods, Constructors, Inheritance, Polymorphism, Abstract class and Interfaces

Packages and Exception Handling: JAR Operations, Create and import packages, Exception handling, Exception hierarchy, Built-in exceptions and User defined exceptions

Libraries: String Class and its methods, File I/O, Collection Framework - ArrayList, LinkedList, Iterator, ListIterator, StringTokenizer

Event Handling: AWT Components, Events, Listeners. Layouts

Text Book

1. Herbert Schildt, “Java : The Complete Reference”, McGraw-Hill. Twelfth Edition, 2022.

Reference Books & web resources

1. Paul Deitel and Harvey Deitel, “Java How to Program (Early Objects)”, Pearson, Eleventh Edition, 2018.
2. E.Balagurusamy, “Programming with Java” , McGraw-Hill, Fifth Edition, 2014.
3. Kathy Sierra, “Head First Java”, Shroff publications, Second edition, 2005.
4. https://docs.oracle.com/javase/tutorial/index.html

Course Contents and Lecture Schedule

Module No	Topic	No. of Lecture Hours
1	**Programming Constructs**	
1.1	Data types, Operators	1
1.2	Conditional and Looping Control structures	2
1.3	Arrays	1
2	**Object Oriented Programming Concepts**	
2.1	Encapsulation - Object and Class	2

2.2	Methods and Constructors	2
2.3	Inheritance	2
2.4	Polymorphism	2
2.5	Abstract class and Interfaces	2
3	**Packages and Exception Handling**	
3.1	JAR Operations	2
3.2	Create and import packages	2
3.3	Exception handling	2
3.4	Exception hierarchy	1
3.5	Built in exceptions and User defined exceptions	2
4	**Libraries**	
4.1	String Class and its methods	1
4.2	File I/O	1
4.3	Collection Framework	1
4.4	ArrayList,LinkedList	2
4.5	Iterator, ListIterator	1
4.6	StringTokenizer	1
5	**Event Handling**	
5.1	AWT Components	2
5.2	Events	2
5.3	Listeners, Layouts	2
	Total Lectures	**36**

Course Designer(s):

1. Dr.P.Karthikeyan, Associate Professor, IT karthikit@tce.edu
2. Ms.C.V.Nisha Angeline, Assistant Professor, IT cvnait@tce.edu

22ITGD0 SOFTWARE ENGINEERING

Category	L	T	P	Credit
IE	3	0	0	3

Preamble

The course highlights the application of systematic, disciplined, quantifiable approach to the development, operation and maintenance of software. Aims to impart knowledge on the basic principles, concepts and standard practices of software lifecycle process. The course also enables the students to acquire team building and managerial skills through team project activities 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 various software process models and Devops practices.	TPS2	70	80
CO2	Identify functional and non-functional requirements for any given problem and document it systematically.	TPS3	70	70
CO3	Prepare design documents with standards for any given user requirements.	TPS3	70	70
CO4	Build optimal test cases using appropriate testing techniques.	TPS3	70	70
CO5	Illustrate the benefits upon usage of version controlling and tracking mechanisms in software development	TPS2	70	80
CO6	Develop an application using software engineering best practices and standards.	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	L	M
CO2	S	M	L		M								M	L	M
CO3	S	M	L		S								M	L	
CO4	S	M	L										M		
CO5	M	L			S								L	M	
CO6	S	M	L		S				S	S	S	M	M	M	S

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	CAT			Assignment			CAT			Assignment			Terminal					
	1			1			2			2								
TPS Scale	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	4	5	6
CO1	8	20											3	10				
CO2	8	10	20			50							3	5	20			
CO3	4	10	20			50			10			10	3	5	20			
CO4							8	10	25			30	3	5	10			
CO5							8	20					3	5				
CO6							4	10	5			60			5			

CO6 COVERED THROUGH MINI PROJECT

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

Syllabus

Software Process: Traditional Process Models Vs Agile Methodologies, Software Quality Attributes, Roles and responsibilities of software project manager, Devops-lifecycle process, principles and practices.

Software Requirements Analysis: Requirement Gathering techniques – User story map - Functional Requirements - Non-functional Requirements, Use Cases –SRS Documentation.

Software Design: Design concepts, Design notations, Design techniques-UML diagrams, Data Flow Diagrams,Microservices architecture-Design guidelines, Design Tools, Documentation.

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

Software Testing: Testing process, Testing levels- Black box testing, White box testing, Unit testing, Integration testing, System testing, Test case generation.

Software Configuration and maintenance Management: Tasks- version control- tracking- VC tools- Git, CVS, Monotone, Bazaar- software release and maintenance, reverse engineering and reengineering.

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 (09/2020) .

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. Orit Hazzan, Yael Dubinsky, “Agile software engineering Ⅱ”, Springer,2014
5. Agile Project Management: Creating Innovative Products (2nd Edition) 2nd Edition by Jim Highsmith.
6. P. Bourque and R.E. Fairley, eds., Guide to the Software Engineering Body of Knowledge, Version 3.0, IEEE Computer Society, 2014; www.swebok.org.
6. https://www.edx.org/learn/software-engineering/
7. https://cloudacademy.com/blog/introduction-to-devops/

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours
1.	**Software Process**	
1.1	Traditional Process Models Vs Agile Methodologies	2
1.2	Software Quality Attributes	1
1.3	Roles and responsibilities of software project manager	

1.4	Devops-lifecycle process	2
1.5	Devops principles and practices	1
2	**Software Requirements Analysis**	
2.1	Requirement Gathering techniques	1
2.2	User story map	1
2.3	Functional Requirements	1
2.4	Non-functional Requirements	1
2.5	Use Cases	1
2.6	Documentation	1
3	**Software Design**	
3.1	Design concepts	1
3.2	Design notations	1
3.3	Design techniques	4
3.4	Design guidelines	1
3.5	Microservices architecture	1
3.6	Design Tools	1
3.7	Documentation	1
4.	**Software Development**	
4.1	Coding standards	1
4.2	code inspection ,reviews and walkthroughs	1
5.	**Software Testing**	
5.1	Testing process	1
5.2	Testing levels	
5.3	Black box testing	1
5.4	White box testing	1
5.5	Unit testing	1
5.6	Integration testing	1
5.7	System testing	1
5.8	Test Case generation	2
6	**Software Configuration and maintenance management**	
6.1	Tasks	1
6.2	version control	
6.3	tracking ,tracking tools	1
6.4	Software release and maintenance	1
6.5	Reverse engineering and reengineering.	1
	Total Lectures	**36**

Course Designer(s):

1. Pudumalar.S, Assistant Professor, spmit@tce.edu, Information Technology
2. Ilankumaran.S, Assistant Professor, siit@tce.edu, Information Technology

22MA111	CALCULUS FOR ENGINEERS

Category	L	T	P	Credit
BSC	3	1	0	4

Preamble

This course aims to provide technical competence of modeling engineering problems using calculus. In this course, the calculus concepts are taught geometrically, numerically, algebraically and verbally. Students will apply the main tools for analyzing and describing the behavior of functions of single and multi-variables: limits, derivatives, integrals of single and multi-variables to model and solve complex engineering problems using analytical methods and MATLAB.

Prerequisite

NIL

Course Outcomes

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

CO's	Course Outcomes	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Cognize the concept of functions, limits and continuity	TPS2	75	70
CO2	Compute derivatives and apply them in solving engineering problems	TPS3	70	65
CO3	Employ partial derivatives to find maxima minima of functions of multi variables	TPS3	70	65
CO4	Demonstrate the techniques of integration to find the surface area of revolution of a curve.	TPS3	70	65
CO5	Utilize double integrals to evaluate area enclosed between two curves.	TPS3	70	65
CO6	Apply triple integrals to find volume enclosed between surfaces	TPS3	70	65

Mapping with Programme Outcomes

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

S - Strong; M - Medium; L - Low

Assessment Pattern

Assessment	CAT 1 (%)			Assignment 1 (%)			CAT 2 (%)			Assignment 2 (%)			Terminal Exam (%)		
TPS / COs	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
CO1	3	10	-	-	-	-	-	-	-	-	-	-	-	5	-
CO2	-	10	30	-	-	25	-	-	-	-	-	-	-	5	14
CO3	3	-	30	-	-	25	-	-	-	-	-	-	-	5	12
CO4	4	10	-	-	-	-	4	-	20	-	-	18	-	5	16
CO5	-	-	-	-	-	-	6	10	20	-	-	14	-	5	12
CO6	-	-	-	-	-	-	-	20	20	-	-	18	-	5	16
MATLAB				50						50					
Total	10	30	60	-	-	100	10	30	60	-	-	100	-	30	70

* Assignment 1: (i) Application Problems in CO2 and CO3(50%).
(ii) MATLAB Onramp& Introduction to symbolic Math with MATLAB (50%).
**Assignment 2: (i) Application Problems in CO4, CO5 and CO6 (50%).
(ii) Application problems using MATLAB. (50%).
***Terminal examination should cover all Course Outcomes in the appropriate TPS level.

Syllabus

DIFFERENTIAL CALCULUS

Functions - New functions from old functions - Limit of a function - Continuity - Limits at infinity - Derivative as a function - Maxima and Minima of functions of single variable – Mean value theorem - Effect of derivatives on the shape of a graph - Application problems in engineering using MATLAB.

FUNCTIONS OF SEVERAL VARIABLES

Partial derivatives – Chain rule - Maxima and minima of functions of two variables – Method of Lagrange's Multipliers - Application problems in engineering using MATLAB.

INTEGRAL CALCULUS

Fundamental theorem of Calculus – Indefinite integrals and the Net Change Theorem – Improper integrals – Area of surface of revolution -Application problems in engineering using MATLAB.

MULTIPLE INTEGRALS

Iterated integrals and Fubini's theorem -Double integrals over general regions -Double integrals in polar coordinates -Applications of double integrals (density, mass, moments & moments of inertia problems only)-triple integrals- triple integrals in cylindrical coordinates- triple integrals in spherical coordinates- change of variables in multiple integrals - Application problems in engineering using MATLAB.

Text Book

1) James Stewart, Daniel Clegg and Saleem Watson, "Calculus Early Transcendentals", 9e, Cengage Learning, New Delhi, 2019.

Reference Books& web resources

1) George B. Thomas, "Thomas Calculus: Early Transcendentals", 14th Edition, Pearson Publishers, New Delhi, 2018.
2) Howard Anton, IrlBivens and Stephen Davis, "Calculus: Early Transcendentals", 12thedition, John Wiley & Sons, 2021.
3) Kuldeep Singh, "Engineering Mathematics Through Applications",2ndedition, Blooms berry publishing, 2019,
4) Kuldip S. Rattan, Nathan W. Klingbeil, Craig M. Baudendistel, "Introductory Mathematics for Engineering Applications", 2nd edition, John Wiley& Sons, 2021.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**DIFFERENTIAL CALCULUS**	
1.1	Functions and New functions from old functions	1
1.2	Limit of a function and Continuity of a function	1
1.3	Limits at infinity	1
	Tutorial	1
1.4	Derivative as a function	1
1.5	Maxima and Minima of functions of single variable	1
	Tutorial	1
1.6	The Mean value theorem	1
1.7	Effect of derivatives on the shape of a graph of a function	2
	Tutorial	1
1.8	Application problems in engineering using MATLAB	1
2	**FUNCTIONS OF SEVERAL VARIABLES**	
2.1	Partial derivatives – Chain rule	2
2.2	Maxima and minima of functions of two variables	1
	Tutorial	1
2.3	Method of Lagrange's Multipliers	2
2.4	Application problems in engineering using MATLAB	1
	Tutorial	1
3	**INTEGRAL CALCULUS**	
3.1	Fundamental theorem of Calculus	2
3.2	Indefinite integrals and the Net Change Theorem	1
	Tutorial	1
3.3	Improper integrals	2
3.4	Area of surface of revolution	2
	Tutorial	1
3.5.	Application problems in engineering using MATLAB	1
4	**MULTIPLE INTEGRALS**	
4.1	Iterated integrals and Fubini's theorem	1
4.2	Double integrals over general regions	2
	Tutorial	1
4.3	Double integrals in polar coordinates	1
4.4	Applications of double integrals (density, mass, moments & moments of inertia problems only)	2
	Tutorial	1
4.5	Triple integrals	1
4.6	Triple integrals in cylindrical coordinates	1
	Tutorial	1
4.7	Triple integrals in spherical coordinates	2
	Tutorial	1
4.8	Change of variables in multiple integrals	2
4.9	Application problems in engineering using MATLAB	1
	Tutorial	1
	Total	**48**

Course Designer(s):

1. Dr.B.Vellaikannan, Professor, Mathematics, bvkmat@tce.edu
2. Dr.C.S.Senthilkumar, Assistant Professor, Mathematics, kumarstays@tce.edu
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5. Dr.M.Sundar, Assistant Professor, Mathematics, msrmat@tce.edu

22CHAA0	ENVIRONMENTAL SCIENCE

Category	L	T	P	Credit
BS	1		1	0

(Common to all branches)

Preamble

The objective of this course is to make the students learn the basic concepts of environment, ecology, and to create awareness on current environmental issues, and develop
a sustainable environment by participating in various activities on conserving natural resources and protecting the environment.

Prerequisite

Nil

Course Outcomes

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

CO	Course Outcome	TCE Proficiency Scale	Expected Proficiency	Expected Attainment Level %
CO1	Describe the importance and progression of ecological system	TPS2	A	80
CO2	Explain the significance of natural resources	TPS2	A	80
CO3	Examine the effects of pollution on environment and human beings	TPS3	A	80
CO4	Practice the suitable solid waste management for segregation and reuse of waste	TPS3	A	80
CO5	Explain renewable energy resources for sustainable environment	TPS2	A	80
CO6	Perform Environment oriented group activities	TPS4	A	80

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	CAT						Assignment#						Terminal***					
TPS Scale	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
CO1		20					NA						Presentation on case study report					
CO2		20																
CO3			20															
CO4			20															
CO5		20																
CO6																		

Assignment: Marks will be given for the review I &II of case study presentation.

*** Case study presentation and evaluation

- Each group comprise of maximum three students
- Students will submit the case study report similar to final year project report
- Evaluation of case study presentation is based on the approved rubrics

Method of Evaluation

a)Internal assessment

S.No	Description	Max.marks	Final conversion
1	CAT	60	30
2	Assignment marks (from Review I&II)	2×20 =40	20
Total			50

b) End semester examination – Case study presentation

Performance Index	Marks per Individual
Originalityof the work	20
Data collected	20
Suggestion to overcomefor the identified issues	20
FinalPresentation	40
Total	100

Model Titles for Case Study:

1. Environmental impacts of rubber industry in Virudhunagar district
2. Solid waste and waste water management in TCE hostel.
3. Status of workers in fireworks industry in Sivakasi region
4. A study on impacts of tanneries on ground water and soil quality in Dindigul district.
5. Effect of pharmaceutical industry on groundwater quality in poikaraipatty village, AlagarKovil.
6. Environmental impacts of quarry industries in MelurTaluk.
7. Environmental effect of Kudankulam atomic power plant.
8. Effect on ground water and soil quality by dyeing industries in Tiruppur.
9. Effect of textile wastes in Karur District.
10. Segregation of waste and its recycling by Madurai Municipality at Vellakkal

Syllabus

Environment and Ecosystem - Multidisciplinary nature of environment- Ecosystem-Structure and Functions, Energy flow in ecosystem-Ecological succession- Natural resources -Over exploitation, Conservation. **Environmental pollution and control -** Environmental pollution – Types (Air, Water, Soil)and Effects–Control measures, Solid waste management, Environmental Impact Assessment.**Sustainable Environment–**Carbon footprint, Carbon and water neutrality, Sustainable development goals, Renewable energy resources (Solar, Wind, Tidal, Biomass), Atom economy,Carbon vs Hydrogen economy, Linear economy vs Circular economy, Environmental ethics – issues, solution

Awareness and activities:

- ✓ Lectures by Environmentalist
- ✓ Group meeting on water management
- ✓ Awareness on modern pollution control measures
- ✓ Drive on e-waste segregation and disposal
- ✓ Field visit to treatment systems
- ✓ Preparation of seed ball and plantation
- ✓ Slogan, Poster, Essay writing, Role play events

Text Book

1. Kaushik, A &Kaushik, C.P, Environmental Science and Engineering, 6thEdition, New Age International, 2018.
2. ErachBharucha, Text book of Environmental studies for Undergraduate courses, 2ndEdtion, UGC, 2013.

Reference Books& web resources

1. O.P. Gupta, Elements of Environmental Pollution Control, Khanna Publishing House, New Delhi
2. Metcalf & Eddy, Waste Water Engineering, Mc-Graw Hill, New York, 2013, ISBN: 077441206.
3. Aldo Vieira, Da Rosa, Fundamentals of renewable energy processes, Academic Press Oxford, UK; 2013. ISBN: 9780123978257.
4. www.indiaenvironmentportal.org.in
5. www.teriin.org
6. www.cpcp.nic.in
7. www.sustainabledevelopment.un.org
8. www.conserve-energy-future.com

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Environment and Ecosystem**	
1.1	Multidisciplinary nature of environment	1
1.2	Structure and Function of Ecosystem. Energy flow in ecosystem – Universal energy flow model	2
1.3	Ecological succession	1
1.4	Natural resources - Over exploitation, Conservation	1

Module No.	Topic	No. of Periods
2	**Environmental pollution and control**	
2.1	Environmental pollution – Types(Air, Water, Soil) and Effects	2
2.2	Control measures: Air pollution (Bag filter, Cyclone separator, Electrostatic Precipitator)	1
2.3	Industrial waste water treatment – Primary, Secondary, Tertiary	1
2.4	Solid waste management	1
2.5	Environmental Impact Assessment – Components, Processes and methods	1
3	**Sustainable Environment**	
3.1	Concept of carbon credit and carbon foot print, Carbon and water neutrality	1
3.2	Sustainable development goals – An overview	1
3.3	Renewable energy resources – Solar, Wind, Tidal, Biomass	2
3.4	Sustainable environment: Atom economy, Carbon vs Hydrogen economy, Linear economy vs Circular economy,	1
3.5	Environmental ethics: Issues and solution	1
4	**Awareness and activities**	
4.1	Lectures by environmentalist	1
4.2	Awareness on modern pollution control measures	1
4.3	Group activity on waste management	1
4.4	Drive on e-waste segregation and disposal	1
4.5	Field visit to treatment systems	1
4.6	Plantation using seed ball	1
4.7	Slogan, Poster, Essay writing, Role play events	1
	Total	24

Course Designer(s):

1. Dr.M.Kottaisamy hodchem@tce.edu
2. Dr. V. Velkannan velkannan@tce.edu
3. Dr. M. Velayudham mvchem@tce.edu

22CHAB0	CONSTITUTION OF INDIA

Category	L	T	P	Credit
AC	2	0	0	0

Preamble

On the successful completion of the course, the students will be able to explain the basic features and fundamental principles of Constitution of India. The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the "basic structure" of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of "Constitutionalism" – a modern and progressive concept historically developed by the thinkers of "liberalism" – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of "constitutionalism" in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America.

The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India's legacy of "diversity". It has been said that Indian constitution reflects ideals of its freedom movement; however, few critics have argued that it does not truly incorporate our own AICTE Model Curriculum for Mandatory Courses & Activities (Non-Credit) for Undergraduate Degree in Engineering & Technology ancient legal heritage and cultural values. No law can be "static" and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it "as one of the strongest court in the world"

Course Outcome:

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

CO1	Explain the meaning of the constitution law and constitutionalism and Historical perspective of the Constitution of India	Understand
CO2	Explain the salient features and characteristics of the Constitution of India, scheme of the fundamental rights and the scheme of the Fundamental Duties and its legal status	Understand
CO3	Explain the Directive Principles of State Policy, Federal structure and distribution of legislative and financial powers between the Union and the States, and Parliamentary Form of Government in India	Understand
CO4	Explain the amendment of the Constitutional Powers and Procedure, the historical perspectives of the constitutional amendments in India, and Emergency Provisions.	Understand
CO5	Explain the Local Self Government – Constitutional Scheme in India, Scheme of the Fundamental Right to Equality,	Understand
CO6	Explain the scheme of the Fundamental Right to certain Freedom under Article 19, and Scope of the Right to Life and Personal Liberty under Article 21	Understand

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
11. Emergency Provisions : National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21

Assessment Pattern

Bloom's category	Continuous Assessment Tests		Seminar
	1	2	-
Remember	40	40	0
Understand	60	60	100
Apply	0	0	0
Analyze	0	0	0
Evaluate	0	0	0
Create	0	0	0

References

1. Durga Das Basu, 'Introduction to The Constitution of India', LexisNexis Butterworths Wadhwa, 20th Edition, Reprint 2011.
2. Constitution of India, National Portal of India, Web link: https://www.india.gov.in/my-government/constitution-india

Course Designers:

1. Adapted from AICTE Model Curriculum for Undergraduate Degree Courses in Engineering & Technology, Volume-II, January 2018.

22CHAC0	ESSENCE OF INDIAN KNOWLEDGE

Category	L	T	P	Credit
AC	2	0	0	0

Preamble

On the successful completion of the course, the students will be able to explain the concept of Indian Traditional Knowledge along with Indian Modern Knowledge. Traditional Knowledge Systems or Indigenous Knowledge Systems are a body of knowledge, which is very ancient and deep rooted. They have their origins in the remote past. Their systematisation and canonisation gave rise to the elite (the Greater Tradition) science. The nature of Traditional Knowledge System is diverse. It covers, among other things, literary, artistic and scientific works; songs, dances, medical treatments and practices; manufacturing and industry; and agricultural technologies and techniques. There is a dramatically growing national and international interest in incorporating Traditional Knowledge Systems, including Traditional Ecological Knowledge, into truly participatory approaches to development.

Course Outcome:

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

CO1	Explain the concept of Traditional Knowledge and Modern knowledge of India.	Understand
CO2	Explain the need and importance of protecting Traditional Knowledge, Knowledge sharing, and Intellectual property rights over Traditional Knowledge.	Understand
CO3	Explain about the use of Traditional Knowledge to meet the basic needs of human being.	Understand
CO4	Explain the rich biodiversity materials and knowledge preserved for practicing traditional lifestyle.	Understand
CO5	Explain the use of Traditional Knowledge in Manufacturing and Industry.	Understand
CO6	Explain about the cultural expression and modern applications of Traditional Knowledge	Understand

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

Traditional and Modern Knowledge: Two Worlds of Knowledge - Phase of Explorers, Sir Arthur Cotton and Irrigation, Smallpox Vaccination, Late Nineteenth Century, Voelcker, Howard and Agriculture, Havell and Indian Art; Indians at the Encounter - Gaekwad of Baroda and Technical Education, Science Education and Modern Industries, Hakim Ajmal Khan and Ayurveda, R. N. Chopra and Indigenous Drugs, Gauhar Jaan and Indian Classical Music; Linking Science and the Rural - Tagore's Sriniketan Experiment, Marthandam, the YMCA Model, Gandhi's Thoughts on Development, Nehru's View of Growth; Post-Independence Era - Modernization and Traditional Knowledge, Social Roots of Traditional Knowledge Activism, Global Recognition for Traditional Knowledge. **Global Mechanisms of Protection and Sharing:** For Recognition and Protection - United Nations Educational, Scientific and Cultural Organization (UNESCO), World Health Organization (WHO), International Labour Organization (ILO), UN Working Group on Indigenous Populations, Evolution of Other Organizations; Norms of Sharing - United Nations Environment Programme (UNEP), World Intellectual Property Organization (WIPO), World Trade

Organization (WTO); IPR and Traditional Knowledge - Theoretical Background, Positive Protections of TK, Defensive Strategies, IPR Facilitation for TK. **Traditional Knowledge for Basic Needs:** Indian Midwifery Tradition—The Dai System, Surface Flow Irrigation Tanks, Housing - A Human Right, Changing Priorities—Niyamgiri. **Biodiversity and Genetic Resources:** Jeevani - The Wonder Herb of Kanis, A Holistic Approach - FRLHT, Basmati - In the New Millennium, AYUSH-Based Cosmetics. **Traditional Knowledge in Manufacturing and Industry:** Drug Discovery, A Sweetener of Bengal, The Sacred Ring of Payyanur, Channapatna Toys. **Traditional Cultural Expressions:** Banarasi Saree, Music, Built and Tangible Heritage, Modern Yoga, Sanskrit and Artificial Intelligence, Climate Change and Traditional Knowledge.

Assessment Pattern

Bloom's category	Continuous Assessment Tests		Seminar (Internal Exam)
	1	2	-
Remember	40	40	0
Understand	60	60	100
Apply	0	0	0
Analyze	0	0	0
Evaluate	0	0	0
Create	0	0	0

This course assessment is fully internal. There is no terminal examination.

Learning Resources:

1. Nirmal Sengupta "Traditional Knowledge in Modern India Preservation, Promotion, Ethical Access and Benefit Sharing Mechanisms" Springer, 2019.
2. Amit Jha," Traditional Knowledge System in India", Atlantic Publishers and Distributors Pvt Ltd, 2009.
3. Basanta Kumar Mohanta, Vipin Kumar Singh "Traditional Knowledge System and Technology in India", Pratibha Prakashan, 2012.
4. Kapil Kapoor, Michel Danino "Knowledge Traditions and Practices of India", Central Board of Secondary Education, 2012.
5. NPTEL video lecture on "Ayurvedic Inheritance of India", Video link: https://nptel.ac.in/courses/121/106/121106003/#.
6. Youtube video on "Introduction to Indian Knowledge Systems", Video link: https://www.youtube.com/watch?v=LZP1StpYEPM.
7. Youtube video on "12 Great achievements of Indian Civilization", Video link: https://www.youtube.com/watch?v=xmogKGCmclE.

Course Designers:

- Dr.S.J.Thiruvengadam sjtece@tce.edu
- Dr.V.R.Venkatasubramani venthiru@tce.edu

22ES150	ENGINEERING EXPLORATION

Category	L	T	P	Credit
ES	1	1	-	2

Preamble

The course Engineering Exploration provides an introduction to the engineering field. It is designed to help the student to learn about engineering and how it affects our everyday lives. On the successful completion of the course, students will be to explain how engineering is different from science and technology and how science, mathematics and technology are an integral part of engineering design.

Prerequisite

NIL

Course Outcomes

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

CO	Course Outcome	TCE Proficiency Scale	Expected Proficiency	Expected Attainment
CO1	Explain technological & engineering development, change and impacts of engineering	TPS2	70	70
CO2	Draw a product in enough detail that others can accurately build it and write specification sheet for a given product	TPS3	70	70
CO3	Complete initial steps (Define a problem, list criteria and constraints, brainstorm potential solutions and document the ideas) in engineering design process	TPS3	70	70
CO4	Draw sketches to a design problem and provide a trade-off matrix	TPS3	70	70
CO5	Communicate possible solutions through drawings and prepare project report	TPS3	70	70
CO6	Apply the concept of engineering fundamentals in Civil and Mechanical, Engineering	TPS3	70	70

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	M	L	-	-	-	-	-	-	-	-	-	-
C02	S	M	L	-	-	-	-	-	-	-	-	-
C03	S	M	L	-	-	-	-	-	-	-	-	-
C04	S	M	L	-	-	-	-	-	-	-	-	-
C05	S	M	L	-	-	-	-	-	-	-	-	-
C06	S	M	L	-	-	-	-	-	-	-	-	-

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	Worksheet-1			Worksheet-2			CAT			Terminal (Theory)		
TPS Scale	1	2	3	1	2	3	1	2	3	1	2	3
CO1	5	20						5			20	
CO2		5	20						5			20
CO3					5	20			10			20
CO4					5	20			10			20
CO5									10			10
CO6									10			10

Syllabus

What is Engineering: Engineering Requirement, Knowledge within Engineering disciplines, Engineering advancements **Engineering Design:** Problem definition, idea generation through brainstorming and researching, solution creation through evaluating and communicating, text/analysis, final solution and design improvement. **Defining problems and Brainstorming:** Researching design, sketching problem solving **Communicating solution**: Dimensioning orthographic drawing, perspective drawing **Modeling and Testing final output:** Product evaluation, reverse engineering, final project report. **Civil Engineering:** Structural forces structural analysis, bridge design components, structural design **Mechanical Engineering:** Types of motion, mechanical power system, mechanical power formula, mechanical design.

Reference Books

1. Ryan A.Brown, Joshua W.Brown and Michael Berkihiser: “Engineering Fundamentals: Design, Principles, and Careers”, Goodheart-Willcox Publisher, Second Edition, 2014.
2. Saeed Moaveni ,“Engineering Fundamentals: An Introduction to Engineering”, Cengage learning, Fourth Edition, 2011.

Course Contents and Lecture Schedule

No.	Topic	No. of Periods
1.	**What is Engineering**	
1.1	Engineering Requirement	1
1.2	Knowledge within Engineering disciplines,	1
1.3	Engineering advancements	1
2	**Engineering Design**	
2.1	Problem definition,	1
2.2	idea generation through brainstorming and researching	1
2.3	solution creation through evaluating and communicating,	1
2.4	text/analysis	1
2.5	final solution and design improvement	1
3	**Defining problems and Brainstorming:**	
3.1	Researching design	1
3.2	sketching problem solving	2
4	**Communicating solution**	
4.1	Dimensioning orthographic drawing	1
4.2	perspective drawing	1
5	**Modeling and Testing final output**	
5.1	Product evaluation	1
5.2	reverse engineering	1
5.3	final project report	1
6	**Civil Engineering**	
6.1	Structural forces structural analysis	1
6.2	bridge design components	2
6.3	structural design	1
7	**Mechanical Engineering**	

No.	Topic	No. of Periods
7.1	Types of motion	1
7.2	mechanical power system	1
7.3	mechanical power formula	1
7.4	mechanical design	1
	Total	24

Course Designers:

1. Dr.S.J. Thiruvengadam sjtece@tce.edu
2. Dr. V.R.Venkatasubramani venthiru@tce.edu

22ES390	DESIGN THINKING

Category	L	T	P	Credit
ESC	1	-	4	3

Preamble

Design has been defined as a "systematic, intelligent process in which designers generate, evaluate, and specify concepts for devices, systems, or processes whose form and function achieve clients' objectives or users' needs while satisfying a specified set of constraints". Human-centered design is defined as a process and a set of techniques used to create new solutions for the world. Solutions include products, services, environments, organizations, and modes of interaction. The reason this process is called "human-centered" is because it starts with the people we are designing for. This course facilitates the development of students' professional skills through their team engagement in developing conceptual design for a local community problem.

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	Identify a specific social need to be addressed	TPS 3	70	80
CO2	Identify stakeholder's requirements for the societal project	TPS 3	70	80
CO3	Develop measurable criteria in which design concepts can be evaluated	TPS 3	70	80
CO4	Develop prototypes of multiple concepts using user's feedback	TPS 3	70	80
CO5	Select the best design solution among the potential solutions with its functional decomposition	TPS 5	70	80

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Phases	Deliverables	Marks	Course Outcomes
Continuous Assessment			
Review 1 – Problem Identification	Technical Report	10	CO1 and CO2
Review 2 – Specification Development	Technical Report	20	CO3
Review 3 -Conceptual Design	Technical Report	20	CO4 and CO5
End-Semester Examination			
Demonstration	Prototype	60	CO1, CO2, CO3, CO4 and CO5
Poster Presentation	Poster	40	

- Reports are to be submitted at each review. The report and presentation will be evaluated based on Rubrics

- Demonstration and Poster presentation will be evaluated by two faculty members nominated by their respective Head of the Department.

Syllabus

1.0 Project Identification: Needs Assessment, Stakeholder Identification, Stakeholder Requirement Project Time Constraint.
2.0 Specification Development: Description Problem Environment, Creation of Stakeholder's Profiles Development of Low-cost Prototypes, Development of Task-Analysis, Comparison with Benchmark Products, Development of Customer Specification, Development of Evaluation Criteria,
3.0 Conceptual Design: Conduct of Functional Decomposition, Brainstroming of possible solutions, Creation of Prototypes for Multiple Concepts, Refinement of Design Specification on users' feedback, Evaluation of Potential Solutions, Selection of best design

Learning Resources

1. Learning Material prepared by TCE faculty members
2. https://www.ideo.com/
3. https://engineering.purdue.edu/EPICS

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours		Course Outcome
		In-Class	Hands-on	
1.	**Project Identification**: Introduction to Human-Centered Design	1	-	CO1
1.1	Needs Assessment	1	2	CO1
1.2	Identification of Stakeholders	1	2	CO2
1.3	Identification of Stakeholder Requirements		2	CO2
1.4	Project Time Constraint	1	2	CO2
2.	**Specification Development**			
2.1	Description Problem Environment	1	2	CO3
2.2	Creation of Stakeholder's Profiles		2	CO3
2.3	Development of Low-cost Prototypes	1	2	CO3
2.4	Development of Task-Analysis	1	2	CO3
2.5	Comparison with Benchmark Products	1	2	CO3
2.6	Development of Customer Specification		2	CO3
2.7	Development of Evaluation Criteria	1	2	CO3
3.	**Conceptual Design**			
3.1	Conduct of Functional Decomposition	1	2	CO4
3.2	Brainstroming of possible solutions	1	2	CO4
3.3	Creation of Prototypes for Multiple Concepts	1	2	CO4
3.4	Refinement of design Specification on users' feedback		2	CO4
3.5	Evaluation of Potential Solutions	1	2	CO5
3.6	Selection of best design		2	CO5
	Total	12	34	

Course Designers:

1. Dr.S.J.Thiruvengadam sjtece@tce.edu

GUIDELINES FOR PROJECT COURSES

Project I, Project II, Project III and Project IV

B.E. / B.Tech. DEGREE PROGRAMME

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2022-23 ONWARDS

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
THIAGARAJAR COLLEGE OF ENGINEERING
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Passed in BoS Meeting 27.04.2024 Approved in Academic Council Meeting 25.05.2024

THIAGARAJAR COLLEGE OF ENGINEERING, MADURAI 625015

GUIDELINES FOR PROJECT COURSES

In the curriculum of 2022 B.E./B.Tech. Programmes, 12 credits have been assigned for **Project work in the specific discipline**. The curriculum was designed based on around 4 focus/broad areas. This has been split into **4 project courses** namely Project I, Project II, Project III and Project IV in semesters 5,6, 7 and 8 respectively.

Choice of Focus Areas: HoDs are requested to provide choice for the students to choose one of the broad/focus areas to carry out project work in 5, 6, 7 and 8th semesters. The number of students in each broad/focus areas shall be based on the faculty and infrastructure availability.

Project Continuity and Switching: The students shall be given a big project in the chosen broad/focus area so that it can be spread over all four semesters with specific outcomes at each semester. In case, a student wants to switch from one focus area to other area. It has to be approved by the Head of the Department and project coordinator.

Internal Marks: Three reviews shall be conducted in each semester to monitor the progress of the project. Review 1; 10 Marks, Review 2: 15 Marks, Review 3: 15 Marks. Total = 40 Marks.

Viva Voce Examinations: For external examinations, HoD shall appoint two examiners in each focus/broad area to conduct the Viva Voce examination in semesters 5. 6 and 7. Project guides are also one of the examiners, along with the two examiners appointed by the HoD. External exam will be conducted for 60 Marks.

Final Viva Voce Examination: In 8th Semester, Viva Voce will be conducted by an external examiner, HoD / HoD Nominee as internal examiner and Project Guides. External exam will be conducted for 60 Marks.

This structured approach ensures that students engage in a comprehensive project experience throughout their undergraduate studies, with regular monitoring of progress and formal evaluation through viva voce examinations. It also allows for flexibility by permitting students to switch focus areas with appropriate approvals.

22TAAA0 **தமிழர் மரபு** L T P C
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அலகு I: **மொழி மற்றும் இலக்கியம்:** **3**
இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் –சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் – பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு II: **மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை:** **3**
நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள்– பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் – தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரிமுனையில் திருவள்ளுவர் சிலை – இசைக் கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு III: **நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்:** **3**
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு IV: **தமிழர்களின் திணைக் கோட்பாடுகள்:** **3**
தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்ககால நகரங்களும் துறை முகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு V: **இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு:** **3**
இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப்படிகள் – தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

TOTAL : **15** PERIODS

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department ofArchaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book

and Educational Services Corporation, Tamil Nadu)

12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

22TAAA0 HERITAGE OF TAMILS

1. Language and Literature: Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

2. Heritage - Rock art paintings to modern art - Sculpture: Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

3. Folk and Martial arts - Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

4. Thinai concept of Tamils – Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

5. Contribution of Tamils to Indian National Movement and Indian Culture: Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
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(Publishedby: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

22TAAB0 **தமிழரும் தொழில்நுட்பமும்** L T P C
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அலகு I: **நெசவு மற்றும் பானைத் தொழில்நுட்பம்:** 3
சங்க காலத்தில் நெசவுத் தொழில் – பானைத் தொழில்நுட்பம் – கருப்பு சிவப்பு பாண்டங்கள் – பாண்டங்களில் கீறல் குறியீடுகள்.

அலகு II: **வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்:** 3
சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு– சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் – மாமல்லபுரச் சிற்பங்களும், கோவில்களும் – சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் – நாயக்கர் காலக் கோயில்கள் – மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாட்டு வீடுகள் – பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ–சாரோசெனிக் கட்டிடக் கலை.

அலகு III: **உற்பத்தித் தொழில் நுட்பம்:** 3
கப்பல் கட்டும் கலை – உலோகவியல் – இரும்புத் தொழிற்சாலை – இரும்பை உருக்குதல், எஃகு – வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் – நாணயங்கள் அச்சடித்தல் – மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள், கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங்கு மணிகள் – எலும்புத்துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

அலகு IV: **வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்:** 3
அணை, ஏரி, குளங்கள், மதகு – சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார் சமூகம்.

அலகு V: **அறிவியல் தமிழ் மற்றும் கணித்தமிழ்:** 3
அறிவியல் தமிழின் வளர்ச்சி –கணித்தமிழ் வளர்ச்சி – தமிழ் நூல்களை மின்பதிப்பு செய்தல் – தமிழ் மென்பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக்கழகம் – தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

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2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
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9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department ofArchaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)

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12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

PAPER – 2
22TAAB0 TAMILS AND TECHNOLOGY

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

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

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

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

5. **Scientific Tamil & Tamil Computing**: Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services

Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

GUIDELINES FOR PROJECT COURSES

Project I, Project II, Project III and Project IV

B.E. / B.Tech. DEGREE PROGRAMME

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2022-23 ONWARDS

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
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 BoS Meeting 27.04.2024 Approved in Academic Council Meeting 25.05.2024

THIAGARAJAR COLLEGE OF ENGINEERING, MADURAI 625015

GUIDELINES FOR PROJECT COURSES

In the curriculum of 2022 B.E./B.Tech. Programmes, 12 credits have been assigned for **Project work in the specific discipline**. The curriculum was designed based on around 4 focus/broad areas. This has been split into **4 project courses** namely Project I, Project II, Project III and Project IV in semesters 5,6, 7 and 8 respectively.

Choice of Focus Areas: HoDs are requested to provide choice for the students to choose one of the broad/focus areas to carry out project work in 5, 6, 7 and 8th semesters. The number of students in each broad/focus areas shall be based on the faculty and infrastructure availability.

Project Continuity and Switching: The students shall be given a big project in the chosen broad/focus area so that it can be spread over all four semesters with specific outcomes at each semester. In case, a student wants to switch from one focus area to other area. It has to be approved by the Head of the Department and project coordinator.

Internal Marks: Three reviews shall be conducted in each semester to monitor the progress of the project. Review 1; 10 Marks, Review 2: 15 Marks, Review 3: 15 Marks. Total = 40 Marks.

Viva Voce Examinations: For external examinations, HoD shall appoint two examiners in each focus/broad area to conduct the Viva Voce examination in semesters 5. 6 and 7. Project guides are also one of the examiners, along with the two examiners appointed by the HoD. External exam will be conducted for 60 Marks.

Final Viva Voce Examination: In 8th Semester, Viva Voce will be conducted by an external examiner, HoD / HoD Nominee as internal examiner and Project Guides. External exam will be conducted for 60 Marks.

This structured approach ensures that students engage in a comprehensive project experience throughout their undergraduate studies, with regular monitoring of progress and formal evaluation through viva voce examinations. It also allows for flexibility by permitting students to switch focus areas with appropriate approvals.

CURRICULUM AND DETAILED SYLLABI

FOR

B.Tech. INFORMATION TECHNOLOGY DEGREE PROGRAMME

PROGRAMME ELECTIVE

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2022-23 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING
(A Government Aided ISO 9001:2008 certified Autonomous Institution affiliated to Anna University)
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22ITRF0	SPATIO – TEMPORAL DATA MINING

Category	L	T	P	Credit
PEES	3	0	0	3

Preamble

The objective of the course is to equip students with foundational knowledge and advanced techniques for analyzing and extracting valuable insights from data that varies across both spatial and temporal dimensions. It also emphasis spatio-temporal classification, clustering, and data management to develop efficient algorithms that accurately analyse, group, and manage large-scale datasets involving both spatial and temporal dimensions.

Prerequisite

Machine Learning

Course Outcome

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

CO	Course Outcome	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Describe theory underlying Spatio Temporal data mining (RL).	TPS2	70	70
CO2	Apply various Spatio-Temporal data processing techniques to solve real world problems.	TPS3	70	65
CO3	Illustrate various Spatio-Temporal Data Management and Query Processing.	TPS3	70	65
CO4	Experiment various Spatio- Temporal supervised and unsupervised learning algorithms for the real-world scenario.	TPS3	70	65
CO5	Apply pattern detection algorithms to find the outlier and change detection.	TPS3	70	65
CO6	Compare the performance of various spatio – temporal preprocessing techniques, classification, and clustering algorithms for the given real time application.	TPS4	70	60

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	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	M	M

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

CO	CAT 1			Assignment - I			CAT 2				Assignment - II				Terminal			
TPS Scale	1	2	3	1	2	3	1	2	3	4	1	2	3	4	1	2	3	4
CO1	10	10			10										2	5		
CO2	5	5	30			50									2	5	10	
CO3		10	30			40									2	5	15	
CO4							5	10	20				30			5	15	
CO5							5	10	20				30		2		10	
CO6							5	5		20				40	2	5	15	

Syllabus

Spatio-Temporal Data Mining: Need, importance, Differences between traditional data mining and spatio-temporal data mining, data types - Spatial Data, Temporal data, non- spatio temporal data, Moving Object Data, sensor data, GIS, Models for capturing spatio-temporal data - Object-based models, Field-based models, Network models, Issues and Challenges, applications

Spatio - Temporal Data preprocessing techniques: Data Cleaning, Noise Reduction, Spatial and Temporal Aggregation, Coordinate Transformation and Standardization, Data Reduction Techniques, Auto-correlation Estimations, Feature Engineering for Spatio-Temporal Data, Encoding Temporal and Spatial Sequences – Fourier transform and wavelet transform, Case study

Spatial and Temporal Data Management: Spatial indexing method -quadtree, kd tree, Temporal indexing method- R Tree, T Tree**,** Spatial Query Processing, Temporal Query Languages for real time data

Supervised and Unsupervised Learning Algorithms: Long Short-Term Memory (LSTM) Networks, Spatio-Temporal Graph Neural Networks, Spatio-Temporal Self-Organizing Maps (ST-SOM), Fuzzy clustering, t-SNE (t-Distributed Stochastic Neighbour Embedding), case study

Pattern Detection: Need, Dynamic Time Warping (DTW), Temporal Event Detection using Graphs, meta learning, spatio – temporal transformers

Learning Resources

Roger S. Bivand, Edzer J. Pebesma, and Virgilio Gómez-Rubio, “Applied Spatial Data Analysis with R [ASDAR]”, 2nd Edition, Springer, 2013.

Burrough P.A. and McDonnel R.A., “Principles of Geographical Information Systems”, 3rd Edition, Oxford University Press, New York, 2007.

Chatfield C. “The Analysis of Time Series: An Introduction”, 6th edition, Chapman and Hall, London, 2003.

Longley P. and Batty M., “Spatial Analysis: Modelling in a GIS Environment”, 1st Edition, Wiley Publisher, 1997.

Wikle, C.K., Zammit-Mangion, A., and Cressie, N. “Spatio-Temporal Statistics with R”, 1st Edition, Chapman & Hall/CRC, Boca Raton, FL, 2019.

Waller, Lance A., 1965-; Gotway, Carol A., “Applied spatial statistics for public health data”, 1st Edition, Wiley Publisher, 2004

NPTEL Course on “Spatial Informatics “by Dr. SOUMYA KANTI GHOSH, IIT Kharagpur, https://archive.nptel.ac.in/courses/106/105/106105219/

Course Contents and Lecture Schedule

Module No	Topic	No. of Lecture Hours
1	**Spatio-Temporal Data Mining**	
1.1	Need, importance, Differences between traditional data mining and spatio-temporal data mining	1
1.2	data types - Spatial Data, Temporal data, non- spatio temporal data, Moving Object Data, sensor data, GIS	2
1.3	Models for capturing spatio-temporal data - Object-based models, Field-based models, Network models	2
1.4	Issues and Challenges, applications	1
2	**Spatio - Temporal Data preprocessing techniques**	
2.1	Data Cleaning, Noise Reduction, Spatial and Temporal Aggregation	2
2.2	Coordinate Transformation and Standardization, Data Reduction Techniques	1
2.3	Auto-correlation Estimations	1
2.4	Feature Engineering for Spatio-Temporal Data	1
2.5	Encoding Temporal and Spatial Sequences – Fourier transform and wavelet transform,	2
2.6	Case study	1
3	**Spatial and Temporal Data Management**	
3.1	Spatial indexing method -quadtree, kd tree	2
3.2	Temporal indexing method- R Tree, T Tree	2
3.3	Spatial Query Processing,	3
3.4	Temporal Query Languages for real time data	3
4	**Supervised and Unsupervised Learning Algorithms**	
4.1	Long Short-Term Memory (LSTM) Networks	1
4.2	Spatio-Temporal Graph Neural Networks	1
4.3	Spatio-Temporal Self-Organizing Maps (ST-SOM)	1
4.4	Fuzzy clustering	2
4.5	t-SNE (t-Distributed Stochastic Neighbour Embedding),	1
5	**Pattern Detection**	
5.1	Need, Dynamic Time Warping (DTW)	1
5.2	Temporal Event Detection using Graphs	2
5.3	meta learning	1
5.4	spatio – temporal transformers	1
5.5	Case Study	1
	Total Hours	**36**

Course Designers:

1. Dr.S. Sridevi, Associate Professor, IT Department sridevi@tce.edu
2. Mrs.T.Saranya, Assistant Professor, IT Department tsait@tce.edu

22ITRG0	VIRTUALIZATION TECHNOLOGIES

Category	L	T	P	Credit
PEES	3	0	0	3

Preamble

This course aims to provide foundational knowledge and skills required to design, implement, and manage virtualized environments effectively. Also, necessary concepts and technologies to implement and manage virtualized and containerized solutions are covered.

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	Review virtualization techniques and its significance in modern IT infrastructures	TPS 2	70	75
CO2	Perform VM management activities such as image creation, building , image conversion and resizing	TPS 3	70	70
CO3	Utilize necessary security measures for protecting host and Virtual machine	TPS 3	70	70
CO4	Deploy and manage containerized applications using Kubernetes	TPS 3	70	70
CO5	Examine networking concepts in virtualized environments, including VLANs and SDN	TPS 4	70	70
CO6	Make use of virtualization and containerization-based solutions for the given scenario	TPS 3	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		S			L	L	L			M	M	L
CO3.	S	M	L										M		
CO4.	S	M	L		S			L	L	L		M	M	M	L
CO5.	S	S	M	L	M								S	L	
CO6.	S	M	L		S			L	L	L		M	M	M	L

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	CAT 1			CAT 2				ASSIGNMENT 1			ASSIGNMENT 2				TERMINAL			
TPS Scale	1	2	3	1	2	3	4	1	2	3	1	2	3	4	1	2	3	4
CO1	5	15	-	-	-	-	-	-	10	-	-	-	-	-	2	5	-	-
CO2	5	15	30	-	-	-	-	-	-	80	-	-	-	-	2	5	10	-
CO3	5	15	10	-	-	-	-	-	-	10	-	-	-	-	2	5	10	-
CO4	-	-	-	5	10	-	-	-	-	-	-	-	60	-	2	5	10	-
CO5	-	-	-	5	10	30	15	-	-	-	-	-	-	20	2	5	10	10
CO6	-	-	-	5	10	10	-	-	-	-	-	-	20	-	-	5	10	-

Syllabus

Virtualization Basics : Techniques to design virtual machine monitors - Virtualization Techniques : CPU, Memory, I/O, Storage – Case studies : Xen, KVM/QEMU - Amazon:EC2-VM Creation, Accessing & Working, :AWS-S3 Storage Creation and Accessing, ISO to Image Creation -Image building - Image conversion - Image resizing.

Virtual Machine Management: Datacenter : Provision, monitoring and management – VM Live Migration – VM Checkpointing and Cloning – VM forking - High Availability Techniques – CaseStudy : Snowflock

VM Security: User Accounting Server authentication- SSL certificates - Host system Protection - Virtual machine security architecture-Security Parameters-Accounting Techniques.

Containerization : Overview - Comparison with virtual machines - Docker: Basics and commands- Key challenges in managing containers at scale – Kubernetes: Overview, architecture Deploying applications with Kubernetes
Network Virtualization: Virtual LANs (VLANs), virtual switches - Software-defined networking (SDN) Security in Virtualized and Containerized Environments - Isolation and security measures - Best practices for securing virtual machines and containers

Emerging Technologies: Virtualization at the edge - Implications for IoT and edge computing - Serverless architecture and its relationship with containers - Emerging trends in container technologies - Case study: NVIDIA NGC

Text Book

1. Matthew Portnoy, “Virtualization essentials” ,John Wiley & Sons, 2023
2. Le, Dac-Nhuong, Raghvendra Kumar, Gia Nhu Nguyen, and Jyotir Moy Chatterjee. Cloud computing and virtualization. John Wiley & Sons, 2018.

Reference Books & web resources

1. James Strong, Vallery Lancey, Networking and Kubernetes: A Layered approach, O’Reilly, 2021
2. Docker Foundations: https://docs.docker.com/get-started/#foundations-of-docker
3. Kubernetes Basics: https://kubernetes.io/docs/tutorials/kubernetes-basics/

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Virtualization Basics**	
1.1	Techniques to design virtual machine monitors	2
1.2	Virtualization Techniques : CPU, Memory, I/O, Storage	1
1.3	Case studies : Xen, KVM/QEMU	2
1.4	AWS EC2-VM Creation, Accessing & Working, :AWS-S3 Storage	1
1.5	ISO to Image Creation -Image building - Image conversion - Image resizing.	2
2	**Virtual Machine Management**	
2.1	Datacenter : Provision, monitoring and management	1
2.2	VM Live Migration – VM Checkpointing and Cloning	1
2.3	VM forking - High Availability Techniques	1
2.4	CaseStudy: Snowflock	1
3	**VM Security**	
3.1	User Accounting Server authentication- SSL certificates	1
3.2	Host system Protection	1
3.3	Virtual machine security architecture	1
3.4	Security Parameters-Accounting Techniques.	1
4	**Containerization**	
4.1	Overview - Comparison with virtual machines	1
4.2	Docker basics and commands	2
4.3	Key challenges in managing containers at scale – Kubernetes: Overview, architecture	3
4.4	Deploying applications with Kubernetes	3
5	**Network Virtualization:**	
5.1	Virtual LANs (VLANs), virtual switches	1
5.2	Software-defined networking (SDN)	3
5.3	Security in Virtualized and Containerized Environments -	1

Module No.	Topic	No. of Periods
5.4	Isolation and security measures - Best practices for securing virtual machines and containers	1
6	**Emerging Technologies**	
6.1	Virtualization at the edge	1
6.2	Implications for IoT and edge computing	1
6.3	Serverless architecture and its relationship with containers - Emerging trends in container technologies – Case study	3
	Total	36

Course Designer(s):

1. Dr S. Padmavathi, Professor, Department of Information Technology spmcse@tce.edu
2. S.Thiruchadai Pandeeswari, Assistant Professor, Department of Information Technology eshwarimsp@tce.edu

22ITPR0	SOFTWARE TESTING

Category	L	T	P	Credit
PSE	3	0	0	3

Preamble

The course covers software testing concepts, principles, methods and tools. The purpose of this course is to build necessary skills to design and perform testing at the unit and application level of software

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 traditional testing activities like test cases design & authoring and defect management	TPS3	70	80
CO2	Implement BDD principles in agile testing projects	TPS3	70	80
CO3	Use automation frameworks like Junit and Selenium to perform unit testing and functional testing	TPS3	70	80
CO4	Design and execute API test cases using tools like Postman	TPS3	70	80
CO5	Perform performance testing, mobile app testing using appropriate tools	TPS3	70	80
CO6	Employ AI driven testing tools to perform tasks like automating test cases/scripts generation, test data synthesis and test optimization	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			S	S	S		S	M	M	M
CO3	S	M	L		S			S	S	S		S	M	M	M
CO4	S	M	L		S			S	S	S		S	M	M	M
CO5	S	M	L		S			S	S	S		S	M	M	M
CO6	S	M	L		S			S	S	S		S	M	M	M

S- Strong; M-Medium; L-Low

Assessment Pattern

	CAT 1				CAT 2			Assignment 1				Assignment 2			Terminal			
TPS Scale	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**1**	**2**	**3**	**4**
CO1	10	20	-	-	-	-	-	-	-	20	-	-	-	-	10	10	-	-
CO2	5	10	20	-	-	-	-	-	10	30	-	-	-	-	5	5	10	-
CO3	5	10	20	-	-	-	-	-	-	40		-	-	-		10	10	
CO4	-	-	-	-	5	10	20	-	-	-	-	-	15	20	-	5	10	-
CO5	-	-	-	-	5	10	20	-	-	-	-	-	15	20	-	5	10	-
CO6	-	-	-	-	10	10	10	-	-	-	-	-	30	-	5		5	-

Syllabus

Software Development and Testing: Testing in Traditional Models: Waterfall, V-Model, Spiral – STLC – Test Process – Test Design techniques – Test Cases Authoring – Bug Life cycle – Defect Management – Test Metrics – Test Standards : ISO 25000

Agile Testing: Principles – Test quadrants – Behaviour-driven development – User story testing – Generating examples, parameterizing examples, building parameter table – CI/CD - Cucumber

Test Automation Frameworks: Unit Testing: Assertions, Annotations – TestNG, Junit/Pyunit – Functional Testing : Selenium IDE, Selenium Webdriver, Mocha – Performance Testing : Jmeter – Mobile Testing : Appium – Test scripts generation for simple workflows

API Testing: API Test cases **–** HTTP messages – Request/ response headers – Status Codes – Postman: Overview, Variables, Query Parameters – Read/Write JSON – Integration of API testing with CI/CD pipeline

Testing AIapps: Goals – Key aspects – Lifecycle of AI Apps – Metamorphic Testing – Model back testing – Coverage guided fuzzing.

Testing and AI: Self-healing tests **–** Low code /No code Test automation platforms – Test data synthesis – Test Optimization – Ethics

Text Book

1. Dorothy Graham, Rex Black, Erik Van, “Foundations of Software Testing”, Cengage Learning EMEA; 4th edition edition (August 9, 2019)
2. 2. Lisa Crispin, Janet Gregory, “Agile Testing: A Practical Guide for Testers”, AddisonWesley Professional, 2009
3. 3. Srinivasan Desikan ,Gopalasamy Ramesh, ”Software Testing – principles and practices”, Pearson Education , First Edition, 2009
4. Krishna Rungta, “Selenium Learn in one day”, published on Amazon digital services, 2017
5. Testing AI/ML based systems - https://www.wipro.com/holmes/testing-of-ai-ml-based-systems/

Reference Books & web resources

1. Junit 5 - https://junit.org/junit5/docs/current/user-guide/
2. Mocha - https://mochajs.org/#getting-started
3. Appium - https://appium.io/docs/en/2.1/quickstart/test-js/
4. Jmeter - https://jmeter.apache.org/usermanual/index.html

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Software Development and Testing**	
1.1	Testing in Traditional Models: Waterfall, V-Model, Spiral	2
1.2	STLC – Test Process – Test Design techniques – Test Cases Authoring	2
1.3	Bug Life cycle – Defect Management – Test Metrics – Test Standards	2
2	**Agile Testing**	
2.1	Principles – Test quadrants	1
2.2	Behaviour-driven development – User story testing	2
2.3	Generating examples	1
2.4	Parameterizing examples	1
2.5	Building parameter table	1
2.6	CI/CD	1
2.7	Cucumber	1
2.8	Defect Management - Root cause Analysis	1
3	**Test Automation Frameworks**	
3.1	Unit Testing: Assertions, Annotations TestNG, Junit/Pyunit	2
3.2	Functional Testing : Selenium IDE, Selenium Webdriver, Mocha	2
3.3	Performance Testing : Jmeter	2
3.4	Mobile Testing : Appium – Test scripts generation for simple workflows	2
4	**API Testing**	
4.1	API Test cases – HTTP messages – Request/ response headers – Status Codes	2
4.2	Postman: Overview, Variables, Query Parameters – Read/Write JSON	2
4.3	Integration of API testing with CI/CD pipeline	2
5	**Testing AI apps**	
5.1	Goals – Key aspects – Lifecycle of AI Apps – Metamorphic Testing	2
5.2	Model back testing – Coverage guided fuzzing.	2
6	**Testing and AI**	

Module No.	Topic	No. of Periods
6.1	Self-healing tests – Low code /No code Test automation platforms	1
6.2	Test data synthesis	1
6.3	Test Optimization— Ethics	1
	Total	36

Course Designer(s):

1. Ms.S.Thiruchadai Pandeeswari,AP,IT,eshwarimsp@tce.edu
2. Ms.S.Pudumalar, AP,IT,spmit@tce.edu

CURRICULUM AND DETAILED SYLLABI

FOR

B.Tech. INFORMATION TECHNOLOGY DEGREE PROGRAMME

INDUSTRY SUPPORTED COURSES

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2022-23 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING
(A Government Aided ISO 9001:2008 certified Autonomous Institution affiliated to Anna University)
MADURAI – 625 015, TAMILNADU

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

Passed in Board of Studies Meeting 15.11.2024 Approved in Academic Council Meeting on 21.12.2024

22IT2A0	Generative AI

Category	L	T	P	Credit
PEES	2	0	0	2

Preamble

This course provides an in-depth exploration of generative artificial intelligence techniques, focusing on algorithms and models that can create data similar to input data. Students will learn about various generative models, their applications, and practical implementation through programming assignments and projects.

Prerequisite

22IT160 – Problem Solving using Computers
22IT520 – Machine Learning

Course Outcomes

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

CO Number	Course Outcomes	TCE Proficiency Scale	Expected Level of Proficiency in %	Expected Attainment Level %
CO1	Explain the fundamental principles and applications of generative models	TPS 2	70	70
CO2	Apply GAN architectures, adversarial training, and variants like DCGANs, WGANs, and CGANs to generate synthetic data	TPS 3	70	65
CO3	Demonstrate the use of generative models in domains like image generation, text generation, and music composition	TPS 3	70	65
CO4	Implement generative models using popular frameworks like TensorFlow or PyTorch.	TPS 3	70	65
CO5	Apply knowledge of generative AI's limitations and demonstrate ethical considerations for its responsible use	TPS 3	70	65
CO6	Develop critical thinking skills for evaluating and improving generative models.	TPS 4	70	60

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	M	L											L		
CO2	S	M	L									M	M		
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									M	M		
CO6	S	S	M	L	S			M		M	M	M	M	M	L

S- Strong; M-Medium; L-Low

Assessment Pattern:

CO	Internal				Terminal			
	Mini Project				Theory			
TPS Scale	1	2	3	4	1	2	3	4
CO1		10				15		
CO2			10			10	15	
CO3			20				20	
CO4			40				15	
CO5			10				15	
CO6				10				10

Syllabus

Introduction to Generative AI: Historical overview of generative modeling - Types of generative models: GANs, VAEs, autoregressive models- Probabilistic modeling and generative processes - Generative vs. discriminative models: differences and use cases – Prompt engineering - Evaluation metrics.

Generative Adversarial Networks (GANs): Generator and discriminator architectures in GANs - Training process: adversarial training, Nash equilibrium - Variants of GANs: DCGANs, WGANs, CGANs

Variational Autoencoders (VAEs): Encoder and decoder architectures in VAEs - Latent space representation and sampling techniques - Loss functions for training VAEs: reconstruction loss, KL divergence

Applications of GANs and VAEs: Image generation and synthesis using GANs - Data generation and augmentation with VAEs - Text-to-image synthesis, image in-painting, and style transfer - Building a simple GAN or VAE model in TensorFlow or PyTorch

Training and Fine-Tuning Generative Models: Hyperparameter tuning for generative models - Transfer learning and pre-training techniques - Regularization methods for preventing over-fitting - Generating images, text or audio using pre-trained generative models - Demonstrating the impact of hyperparameters on model performance

Ethics and Challenges in Generative AI: Bias and fairness issues - Privacy concerns in generating synthetic data - Adversarial attacks and defenses

Future Trends in Generative AI: Retrieval Augmented Generation (RAG), Multi-modal generative models: combining text, image, and audio generation - Integration of generative AI with other AI fields like reinforcement learning

Learning Resources

1. Generative AI with Python and TensorFlow 2: Create images, text, and music with VAEs, GANs, LSTMs, Transformer models, Joseph Babcock, Raghav Bali, 2021.
2. Generative Deep Learning: Teaching Machines to Paint, Write, Compose, and Play, David Foster, 2019
3. Deep Learning, Ian Goodfellow, Yoshua Bengio, and Aaron, 2016
4. Coursera - "Build Basic Generative Adversarial Networks (GANs)"

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours
1	**Introduction to Generative AI**	
1.1	Historical overview of generative modeling	1
1.2	Types of generative models: GANs, VAEs, autoregressive models	
1.3	Probabilistic modeling and generative processes	1
1.4	Generative vs. discriminative models: differences and use cases - Evaluation metrics.	
2	**Generative Adversarial Networks (GANs)**	
2.1	Generator and discriminator architectures in GANs	1
2.2	Training process: adversarial training, Nash equilibrium	2
2.3	Variants of GANs: DCGANs, WGANs, CGANs	1
3	**Variational Autoencoders (VAEs)**	
3.1	Encoder and decoder architectures in VAEs	1
3.2	Latent space representation and sampling techniques	1
3.3	Loss functions for training VAEs: reconstruction loss, KL divergence	1
4	**Applications of GANs and VAEs**	
4.1	Image generation and synthesis using GANs	2
4.2	Data generation and augmentation with VAEs	2
4.3	Text-to-image synthesis, image in-painting, and style transfer	2
4.4	Building a simple GAN or VAE model in TensorFlow or PyTorch	2
5	**Training and Fine-Tuning Generative Models**	
5.1	Hyperparameter tuning for generative models	1
5.2	Transfer learning and pre-training techniques	1
5.3	Regularization methods for preventing over-fitting	1
5.4	Generating images or text using pre-trained generative models	2
5.5	Demonstrating the impact of hyperparameters on model performance	2
6	**Ethics and Challenges in Generative AI**	
6.1	Bias and fairness issues	2
6.2	Privacy concerns in generating synthetic data	
6.3	Adversarial attacks and defenses	
7	**Future Trends in Generative AI**	
7.1	Multi-modal generative models: combining text, image, and audio generation	2
7.2	Integration of generative AI with other AI fields like reinforcement learning	
	Total Lecture Hours	28

Course Designer(s):

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22IT2B0	SOFTWARE VULNERABILITY ANALYSIS AND MITIGATION TECHNIQUES

Category	L	T	P	Credit
PEES	1	0	2	2

Preamble

Software vulnerabilities are critical points of failure within applications that malicious actors exploit to compromise security, often resulting in data breaches, financial losses, and reputational damage. This course provides a foundational understanding of software vulnerability analysis and techniques for mitigating these threats. It equips students with knowledge of common vulnerabilities, frameworks for secure coding, and methods to strengthen security through vulnerability identification and prevention strategies

Prerequisite

Nil

CourseOutcomes

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 causes and impacts of vulnerabilities in web and mobile applications, highlighting the need for robust security frameworks across both platforms.	TPS2	70	75
CO2	Apply relevant security protocols (e.g., SSL/TLS) and configure response headers to mitigate risks in both web and mobile applications.	TPS3	70	70
CO3	Analyze applications to identify security flaws, referencing the OWASP Top 10 for both web and mobile vulnerabilities, such as Insecure Data Storage and Injection.	TPS4	70	65
CO4	Implement secure coding practices and apply a "Shift Left" approach to prevent security risks, focusing on unauthorized access prevention for web and mobile data storage.	TPS3	70	70
CO5	Evaluate the effectiveness of security measures in web and mobile applications through vulnerability assessments, making improvements based on testing outcomes.	TPS4	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			S							S	L	M	L
CO2	S	M	L		S			S				S	M	M	M
CO3	S	S	M	L	S	S		S	M	M	M	S	S	S	M
CO4	S	M	L		S			S				S	M	M	M
CO5	S	S	M	L	S	S		S			M	S	S	S	M

S-Strong; M-Medium; L-Low

AssessmentPattern

CO	Internal				Terminal			
	Written Test				Practical			
TPS Scale	1	2	3	4	1	2	3	4
CO1		10						
CO2		10	10				25	
CO3			10	10				25
CO4		10	10				25	
CO5			20	10				25

Syllabus

Software Vulnerability Analysis: Security breaches - Security frameworks – Case Studies on High Profile Data Breach, Insecure data storage, Insecure APIs, Week Authentication and Authorization, Insecure Direct Object References

Common Protocols and Security Response Headers: SSL/HTTP protocols - Security response headers - Implementation.

OWASP Top 10 Overview: (Practical sessions) OWASP web application security risks – Broken Access Control, Crypto Failures, Injection, Insecure Design, Misconfigurations, Vulnerable & Outdated Components, Identification & Authentication Failures, Software & Data Integrity Failures, Log Failures

Tools and scanners for Vulnerability Analysis: Burp Suite, OWASP ZAP, and mobile-specific tools like MobSF

Secure Coding and Prevention Strategies: Mitigation Strategies: Server-Side Forgery Requests, Secure coding approaches, AWS Buckets Takeovers prevention, and Server Takeovers prevention - Shift Left security approach - Threat modelling in development lifecycle.

TextBook

1. Andrew Hoffman, “Web Application Security: Exploitation and Countermeasures for Modern Web Applications”, O'Reilly Media, First Edition, 2023

ReferenceBooks&webresources

1. Dafydd Stuttard, Marcus Pinto, “The Web Application Hacker's Handbook: Discovering and Exploiting Security Flaws,” 2nd Edition,Wiley,2011,ISBN:1118026470/978-1118026472.
2. "Practical Mobile Forensics" by Heather Mahalik, Rohit Tamma, and Satish Bommisetty Publisher: Packt Publishing, Fourth Edition, 2022
3. StuartMcClure,JoelScambray,Kurtz,”HackingExposed7:NetworkSecuritySecrets & Solutions”, 7thEdition, McGraw-Hill Prof Med/Tech, 2012, ISBN13:9780071780285
4. Andrew S. Tanenbaum and David J. Wether all, “Computer Networks”, 5th Edition, Pretice Hall,2011,IB-13:9780132126953
5. OWASP Security Testing Guide (https://www.owasp.org/index.php/File:OWASP_Testing_Guide_v2_pdf.zip)
6. OWASP:http://www.owasp.org
7. WASC:http://www.webappsec.org/
8. SANS:http://www.sans.org

CourseContentsandLectureSchedule

Module No.	Topic	No. of Periods
1	**Introduction to Web Application Security**	
1.1	Overview - Security breaches	1
1.2	Security frameworks – Need for robust web application security	1
1.3	Case Studies on High Profile Data Breach, Insecure data storage, Insecure APIs, Week Authentication and Authorization, Insecure Direct Object References	2
2	**CommonProtocolsandSecurityResponseHeaders**	
2.1	ESSL/HTTPprotocols	1
2.2	Securityresponseheaders-Implementation	1
3	**OWASP Top10 Overview**	
3.1	OWASP web application security risks – Broken Access Control, Crypto Failures, Injection, Insecure Design, Misconfigurations	1
3.2	Vulnerable & Outdated Components, Identification & Authentication Failures	1
3.3	Software & Data Integrity Failures, Log Failures	2
4	**Secure Coding and Prevention Strategies**	
4.1	Mitigation Strategies: Server-Side Forgery Requests, Secure coding approaches	1
4.2	AWS Buckets Takeovers prevention, and Server Takeovers prevention	1
4.3	Shift Left security approach	1
4.4	Threat modeling in development life cycle	1
	Total	**14**

Practical

	Topic	No. of Periods
1	**OWASP Top 10 Vulnerabilities – Experimentation**	
1.1	OWASP web application security risks – Broken Access Control, Crypto Failures,	2
	Injection, Insecure Design, Misconfigurations	1
1.2	Vulnerable & Outdated Components,	2
	Identification & Authentication Failures	1
1.3	Software&DataIntegrityFailures,Log Failures	2
2	**Tools and scanners for Vulnerability analysis**	
2.1	Vulnerability Analysis with Burp Suite	2
2.2	Vulnerability Analysis with OWASP ZAP	2
2.3	Vulnerability Analysis with MoBSF	2
	Total	14

CourseDesigner(s):

1. PrateekTiwari, Security head, Zomato pt@zomato.com
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22IT1D0	BUILD ENTERPRISE APPLICATIONS USING LOW CODE PLATFORMS

Category	L	T	P	Credit
PEES	1	0	0	1

Preamble

This course explores how low-code technology enables professionals—from developers to business analysts—to create robust, scalable applications with minimal coding. By simplifying complex development processes, low-code platforms accelerate digital transformation, allowing enterprises to respond swiftly to market demands, improve operational efficiency, and enhance customer experiences.

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	Apply core low-code principles using components to create foundational applications and workflows	TPS 3	70	70
CO2	Apply various app types to basic real-time applications that meet specific business requirements.	TPS 3	70	70
CO3	Develop an app from scratch, publishing and managing the application for end-user deployment.	TPS 3	70	70
CO4	Develop and configure a Model-Driven App to deliver a data-driven business solutions	TPS 3	70	70
CO5	Design and implement automated workflows to streamline business processes.	TPS 3	70	70
CO6	Apply all the principles to address practical business use cases through low-code solutions.	TPS 3	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	M	M	L
CO2	S	M	L		S							S	M	M	L
CO3	S	M	L		S							S	M	M	L
CO4	S	M	L		S							S	M	M	L
CO5	S	M	L		S							S	M	M	L
CO6	S	M	L		S							S	M	M	L

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	Internal						Terminal					
	Mini Project											
TPS Scale	**1**	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	-	-	10	-	-	-	5	5	5	-	-	-
CO2	-	-	10	-	-	-	5	5	5	-	-	-
CO3	-	-	10	-	-	-	5	5	10	-	-	-
CO4	-	-	20	-	-	-	5	5	10	-	-	-
CO5	-	-	20	-	-	-	5	5	10	-	-	-
CO6	-	-	30	-	-	-	-	-	10	-	-	-

Syllabus

Introduction to Low-Code Applications: Overview of Low-Code Platforms, Microsoft Power Platform,Business Use Cases, Microsoft Cloud Setup

MS Power Apps: Introduction to Power Apps, Types of apps- Canvas, Model-Driven,Portals Real time Applications

Canvas Apps Development : Canvas Apps, Basic Customizations, Building from Scratch, Connecting to Data Sources, UI Customizations, Implementing Functions & Formulas, Publishing & Managing the Application

Model-Driven Apps Development : Model-Driven Apps, Advanced Configuration & Customization, Connecting with Dataverse for Data Storage, Publishing & Managing Model-Driven Apps

MS Power Automate: Power Automate & Flows, Integration with Other Microsoft Services, Advanced Features: Conditions, Loops, and Switch Cases, Integration with Power Apps

Learning Resources

1. https://learn.microsoft.com/en-us/
2. https://community.powerplatform.com/
3. https://learn.microsoft.com/en-us/power-apps/

Course Contents and Lecture Schedule

Module No	Topic	No. of Lecture Hours	Course Outcomes
1.	**Introduction to Low-Code Applications**		CO1
1.1	Overview of Low-Code Platforms	1	
1.2	Microsoft Power Platform		
1.3	Business Use Cases		
1.4	Microsoft Cloud Setup	1	
2.	**MS Power Apps**		CO2
2.1	Introduction to Power Apps	1	
2.2	Types of apps- Canvas, Model-Driven,Portals		

2.3	Real time Applications		
3	**Canvas Apps Development**		CO3
3.1	Canvas Apps	1	
3.2	Basic Customizations		
3.3	Building from Scratch	2	
3.4	Connecting to Data Sources		
3.5	UI Customizations	1	
3.6	Implementing Functions & Formulas		
3.7	Publishing & Managing the Application	1	
4	**Model-Driven Apps Development**		CO4
4.1	Model-Driven Apps,	1	
4.2	Advanced Configuration & Customization		
4.3	Connecting with Dataverse for Data Storage	1	
4.4	Publishing & Managing Model-Driven Apps	1	
5	**MS Power Automate**		CO5
5.1	Power Automate & Flows	1	
5.2	Integration with Other Microsoft Services		
5.3	Handling Advanced Features	1	
5.4	Integration with Power Apps	1	
	Total Lecture Hours	**14**	

Course Designers:

1. Mr. Venkat Aravamudan venkat@rortechnologies.onmicrosoft.com
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22IT1E0	SERVER OBSERVABILITY FRAMEWORK

Category	L	T	P	Credit
PEES	1	0	0	1

Preamble

Server Observability Framework provide an in-depth understanding of the strategies, tools, and best practices for ensuring that server infrastructure is both observable and manageable. The course will explore the principles of observability metrics, logs, and trace and to effectively integrate them into server environments**.**

Prerequisite

- None

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 significance of Server Observability	TPS2	70	80
CO2	Perform Application Hosting in the Cloud environment	TPS3	70	70
CO3	Use OpenTelemetry tool for Server Observability	TPS3	70	70
CO4	Integrate OpenTelemetry tool for analyzing Web server and applications	TPS4	70	65
CO5	Use OpenTelemetry tool for observing Web server and applications	TPS4	70	65
CO6	Explain the use of AI techniques in Server Observability	TPS2	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			S	M	M	M	L	L	L	M
CO2	S	M	L		S			S	M	M	M	L	M	M	M
CO3	S	M	L		S			S	M	M	M	L	M	M	M
CO4	S	S	M	L	S			S	M	M	M	L	S	M	M
CO5	S	S	M	L	S			S	M	M	M	L	S	M	M
CO6	M	L			S			S	M	M	M	L	M	M	M

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	Continuous Assessment Mini Project				Terminal			
TPS SCALE	1	2	3	4	1	2	3	4
CO1	5	5			5	5		
CO2		10	10			5	10	
CO3		10	10			5	10	
CO4			10	10		5	15	5
CO5			10	10		5	15	5
CO6	5	5			5	5		

Syllabus

Observability - Core pillars of Observability - Observability Tools and Technologies - Importance of Observability

Java App Deployment in Web Server - Role of Web Server - Setting Up Server Environment - Application Deployment - Cloud Hosting

OpenTelemetry Basics - OpenTelemetry architecture overview, Understanding SDK and API components, Instrumentation concepts

Integrating OpenTelemetry to Java Application - Basic Instrumentation in Java - Automatic Instrumentation - Context Propagation and Distributed Tracing- Collecting Metrics with OpenTelemetry - Deploying and Testing the OpenTelemetry Integration

Implementation - Metrics Collection – Tracing - Logging Integration- Instrumentation - Monitoring and Alerting – Case Study

Cloud-native Monitoring Services – Overview of Cloud Provider Services - CloudWatch, Azure Monitor, Google Cloud Monitoring

AI-based Observability - Use cases - Anomaly Detection, Proactive Monitoring

Learning resources

1. https://github.com/open-telemetry/opentelemetry-demo
2. https://www.udacity.com/course/cloud-developer

Course Contents and Lecture Schedule

Module No	Topic	No. of Periods
1.	**Observability**	
1.1	Core pillars of Observability	1
1.2	Observability Tools and Technologies	
1.3	Importance of Observability	1

2.	**Java App Deployment in Web Server**	
2.1	Role of Web Server	1
2.2	Setting Up Server Environment	
2.3	Application Deployment	1
2.4	Cloud Hosting	
3.	**Open Telemetry Basics**	
3.1	OpenTelemetry architecture overview	1
3.2	Understanding SDK and API components	1
3.3	Instrumentation concepts	
4.	**Integrating Open Telemetry to Java Application**	
4.1	Basic Instrumentation in Java	1
4.2	Automatic Instrumentation	
4.3	Context Propagation and Distributed Tracing	1
4.4	Collecting Metrics with OpenTelemetry	
4.5	Deploying and Testing the OpenTelemetry Integration	1
5.	**Implementation**	
5.1	Metrics Collection – Tracing- Logging Integration	1
5.2	Instrumentation- Monitoring and Alerting-Case Study	
6.	**Cloud-native Monitoring Services**	
6.1	Overview of Cloud Provider Services	1
6.2	CloudWatch, Azure Monitor,	
6.3	Google Cloud Monitoring	1
7	**AI-based Observability**	
7.1	Use cases - Anomaly Detection	1
7,2	Proactive Monitoring	1
	Total	**14**

Course Designer(s):

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SYLLABI

FOR

AUDIT COURSES

23CHAD0 INDIAN CONSTITUTION AND KNOWLEDGE SYSTEMS

23CHAE0 UNIVERSAL HUMAN VALUES AND ETHICS

B.E. / B.Tech. DEGREE PROGRAMME

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2023-24 ONWARDS

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
THIAGARAJAR COLLEGE OF ENGINEERING
(A Government Aided Autonomous Institution Affiliated to Anna University)
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Passed in BoS Meeting 18.11.2024 Approved in Academic Council Meeting 21.12.2024

23CHAD0	INDIAN CONSTITUTION AND KNOWLEDGE SYSTEMS

Category	L	T	P	Credit
AC	2	0	0	0

Preamble

This course offers a comprehensive exploration of India's constitutional framework and its rich traditional knowledge systems, fostering a universal approach to value-based education. It helps students develop a deeper understanding of reality through self-exploration and value-based learning. The course highlights how ancient Indian practices in areas like literature, arts, science, healthcare, and agriculture align with modern governance principles. Students will learn to appreciate the relevance of these traditions in solving today's challenges. By the end of the course, students will understand how India's knowledge heritage and constitutional values work together to support sustainable and inclusive development.

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 core principles, features, and structure of the Indian Constitution, including its role in shaping modern democracy and governance.	TPS2	70	85
CO2	Interpret the fundamental rights, duties, and directive principles enshrined in the Constitution and their implications for individual and societal development.	TPS2	70	85
CO3	Assess the significance of the Constitution in addressing contemporary issues and promoting justice, equality, and sustainable development.	TPS2	70	85
CO4	Describe the key concepts, diversity, and significance of Indian traditional knowledge systems across various domains such as arts, sciences, and ecology.	TPS2	70	85
CO5	Compare Indian traditional knowledge with modern knowledge systems and identify their complementary roles in addressing societal challenges.	TPS2	70	85
CO6	Demonstrate the application of traditional knowledge in modern contexts, emphasizing sustainability, holistic living, and cultural reservation.	TPS2	70	85

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's category	Continuous Assessment Tests		Seminar
	1	2	-
Remember	40	40	0
Understand	60	60	100
Apply	0	0	0
Analyze	0	0	0
Evaluate	0	0	0
Create	0	0	0

Syllabus

Indian Constitution

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
11. Emergency Provisions: National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21

Indian Knowledge Systems

Traditional and Modern Knowledge: Two Worlds of Knowledge

Phases of Exploration: Contributions of Sir Arthur Cotton in irrigation, smallpox vaccination advancements, and agricultural reforms by Voelcker and Howard.

Indian Art and Science: Havell's work in Indian art, Gaekwad of Baroda's push for technical education, and contributions to Ayurveda (Hakim Ajmal Khan) and indigenous drugs (R.N. Chopra).

Linking Science and Rural Development

Pioneering Models: Tagore's Sriniketan experiment, YMCA's Marthandam model, Gandhi's rural development ideas, and Nehru's perspectives on growth.

Post-Independence and Global Recognition

Modernization of Knowledge: Integration of traditional practices in modernization efforts and the rise of activism for traditional knowledge recognition.

Global Mechanisms: Efforts by UNESCO, WHO, UNEP, WIPO, and WTO for protecting and sharing traditional knowledge.

Intellectual Property Rights (IPR) and Traditional Knowledge

Theoretical Background: Strategies for safeguarding traditional knowledge through positive protections and defensive mechanisms.

Traditional Knowledge for Basic Needs

Cultural Practices: Midwifery traditions (Dai System), surface flow irrigation tanks, and community housing rights.

Biodiversity and Genetic Resources: Success stories like Jeevani (Kanis' herbal medicine) and AYUSH-based cosmetics.

Traditional Knowledge in Manufacturing and Industry

Notable Contributions: Channa Patna toys, Payyanur sacred rings, and innovations in drug discovery.

Cultural Expressions

Heritage and Modern Relevance: Banarasi sarees, classical music, yoga's evolution, and Sanskrit's role in artificial intelligence.

Text Book

- Durga Das Basu, 'Introduction to The Constitution of India', LexisNexis Butterworths Wadhwa, 20th Edition, Reprint 2011.
- Constitution of India, National Portal of India, Web link: https://www.india.gov.in/my-government/constitution-india
- Nirmal Sengupta "Traditional Knowledge in Modern India Preservation, Promotion, Ethical Access and Benefit Sharing Mechanisms" Springer, 2019.

Reference Books & web resources

- Amit Jha, "Traditional Knowledge System in India", Atlantic Publishers and Distributors Pvt Ltd, 2009.
- Basanta Kumar Mohanta, Vipin Kumar Singh "Traditional Knowledge System and Technology in India", Pratibha Prakashan, 2012.
- Kapil Kapoor, Michel Danino "Knowledge Traditions and Practices of India", Central Board of Secondary Education, 2012.
- NPTEL video lecture on "Ayurvedic Inheritance of India", Video link: https://nptel.ac.in/courses/121/106/121106003/#.
- YouTube video on "Introduction to Indian Knowledge Systems", Video link: https://www.youtube.com/watch?v=LZP1StpYEPM.
- YouTube video on "12 Great achievements of Indian Civilization", Video link: https://www.youtube.com/watch?v=xmogKGCmclE)

Course Designers

Adopted from AICTE MODEL CURRICULUM 2022

23CHAE0	UNIVERSAL HUMAN VALUES AND ETHICS

Category	L	T	P	Credit
AC	2	0	0	0

Preamble

This course presents a universal approach to value education by developing the right understanding of reality through the process of self-exploration. The course primarily focus es on affecting a qualitative transformation in the life of the student rather than just a transfer of information. The course introduces the holistic worldview and its implications, a critical appraisal of the prevailing notions is also made to enable the students discern the difference on their own right.

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	Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society.	TPS2	70	85
CO2	Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.	TPS2	70	85
CO3	Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society	TPS2	70	85
CO4	Understand the harmony in nature and existence and work out their mutually fulfilling participation in nature	TPS2	70	85
CO5	Distinguish between ethical and unethical practices.	TPS2	70	85
CO6	Prepare strategy to actualize a harmonious environment wherever they work and lead an ethical life Course	TPS2	70	85

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Assessment Pattern

Bloom's category	Continuous Assessment Tests		Seminar
	1	2	-
Remember	40	40	0
Understand	60	60	100
Apply	0	0	0
Analyze	0	0	0
Evaluate	0	0	0
Create	0	0	0

Syllabus

INTRODUCTION TO VALUE EDUCATION

Value Education – Need, Basic Guidelines, Content and Process, Self-Exploration – meaning, importance and process, Continuous Happiness and Prosperity – A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities – The basic requirements, Understanding Happiness and Prosperity – A critical appraisal of the current scenario, Method to fulfil the above human aspirations – UNDERSTANDING and living in harmony at various levels.

HARMONY IN THE HUMAN BEING

An understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' – Sukh and Suvidha, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, the meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya.

HARMONY IN THE FAMILY AND SOCIETY

Understanding harmony in the family – The basic unit of human interaction, understanding values in a human-to-human relationship; Understanding Trust – The foundational value in relationship, Difference between intention and competence, Understanding Respect – as the right evaluation, Difference between respect and differentiation; the other salient values in a relationship, Understanding the harmony in the society – comprehensive Human Goals, Visualizing a universal harmonious order in society– Undivided Society, Universal Order – From family to world family!

HARMONY IN NATURE AND EXISTENCE

Understanding the harmony in Nature, Interconnectedness, self-regulation and mutual fulfilment among the four orders of nature – recyclability, Understanding Existence as Coexistence of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.

IMPLICATIONS OF THE ABOVE HOLISTIC UNDERSTANDING OF HARMONY ON PROFESSIONAL ETHICS

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in

Professional Ethics – augmenting universal human order, the scope and characteristics of people-friendly and eco-friendly, Holistic Technologies, production systems and management models – Case studies, Strategy for the transition from the present state to Universal Human Order – At the level of individual: as socially and ecologically responsible engineers, technologists and managers, At the level of society: as mutually enriching institutions and organizations.

Text Book

- R R Gaur, R Sangal, G P Bagaria, “A Foundation Course in Human Values and Professional Ethics”, Excel Books, New Delhi, 2nd Revised Edition, 2019.

Reference Books & web resources

- A Nagaraj, “Jeevan Vidya: Ek Parichaya”, Jeevan Vidya Prakashan, Amarkantak, 1999.
- A N Tripathi, “Human Values”, New Age Intl Publishers, New Delhi, 2004.
- “The Story of Stuff” (Book).
- Mohandas Karamchand Gandhi, “The Story of My Experiments with Truth”.
- E F Schumacher, “Small is Beautiful”
- Cecile Andrews, “Slow is Beautiful”
- J C Kumarappa, “The Economy of Permanence”
- Pandit Sunderlal, “Bharat Mein Angreji Raj”
- Dharampal, “Rediscovering India”
- Mohandas K Gandhi, “Hind Swaraj or Indian Home Rule”
- Maulana Abdul Kalam Azad, “India Wins Freedom”
- Romain Rolland, “Vivekananda” (English)
- Romain Rolland, “Gandhi” (English)

Course Designer(s):

Adopted from AICTE Model Curriculum 2022

22ITRH0	EDGE COMPUTING FOR SMART SYSTEMS	Category	L	T	P	Credit
		PEES	3	0	0	3

Preamble

This course aims to provide a comprehensive understanding of computing paradigms such as Edge/Fog/Cloud computing significant to modern IOT applications and the relevance of well-known ML/DL techniques for prominent use-cases

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	Review the benefits and use cases of modern computing paradigms such as Edge, Fog, and Cloud.	TPS 2	70	75
CO2	Adapt suitable storage techniques and platforms for Fog/Edge-based IoT applications	TPS 3	70	75
CO3	Use containerization techniques for application deployment in Fog/Edge	TPS 3	70	65
CO4	Perform Task offloading among Fog/Edge devices and the cloud.	TPS 3	70	60
CO5	Make use of EdgeML for data analytics applications.	TPS 3	70	65
CO6	Perform real-time data integration and analysis for edge computing applications.	TPS 3	70	65

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	CAT 1			ASSIGNMENT 1			CAT 2			ASSIGNMENT 2			Terminal		
TPS Scale	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
CO1	10	10	-	-	-	-	-	-	-	-	-	-	5	5	-
CO2	5	10	30	-	20	-	-	-	-	-	-	-	3	5	15
CO3	5	10	20	-	-	80	-	-	-	-	-	-	2	5	10
CO4	-	-	-	-	-	-	5	10	30	-	-	40	2	5	15
CO5	-	-	-	-	-	-	5	10	20	-	-	40	3	5	10
CO6	-	-	-	-	-	-	10	10	-	-	-	20	5	5	-

Syllabus

Computing Paradigms: Cloud vs Fog vs Edge computing Concepts - Characteristics-Services – Challenges - Fog/Edge Computing: Architecture - Motivations – Performance Enhancements - Enabling Technologies – overview of Edge-based applications.

IoT, Edge and Fog: Introduction to IoT platform - Communication Protocols: MQTT – CoAP – Kafka - Azure IoT Hub-AWS IoT Platform

Edge Storage and Data Processing: Design of Key-Value Stores – Apache Cassandra – Consistency Solutions - Spark Fundamentals – Installation of Apache Spark – Data processing with Spark

App Deployment in Edge: Containerization with Docker-Kubernetes

Workload offloading – Mathematical formulations for Task offloading – Task offloading techniques

Edge Intelligence : Traditional IoT Platform – Issues – ML on Cloud vs ML on Edge EdgeML – Advantages – Applications – Workflow of Edge ML - ML-based Predictive Analytics at Edge

Usecases: Fog-based real-time sensor data analysis - Vehicular Networks - 5G systems

Learning Resources

1. “Fog and Edge Computing: Principles and Paradigms”, Rajkumar Buyya (Editor), Satish Narayana Srirama (Editor), Wiley, 2019
2. "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press), 2017
3. "Cloud Computing: Principles and Paradigms”, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wiley, 2011
4. "Cloud and Distributed Computing: Algorithms and Systems", Rajiv Misra, Yashwant Patel, Wiley 2020

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods	CO
1	**Computing Paradigms**		
1.1	Cloud vs Fog vs Edge computing Concepts	2	CO1
1.2	Characteristics-Services - Challenges	1	CO1
1.3	Fog/Edge Computing : Architecture - Motivations	1	CO1

Module No.	Topic	No. of Periods	CO
1.4	Performance Enhancements - Enabling Technologies	1	CO1
1.5	Overview of Edge-based applications	1	CO1
2	**IoT, Edge and Fog**		
2.1	Introduction to IoT platform	1	CO2
2.2	Communication Protocols: MQTT – CoAP	1	CO2
2.3	Kafka	1	CO2
2.4	Azure IoT Hub	1	CO2
2.5	AWS IoT Platform	1	CO2
3	**Edge Storage and Data Processing**		
3.1	Design of Key-Value Stores	1	CO2
3.2	Apache Cassandra Consistency Solutions	1	CO2
3.3	Consistency Solutions	1	CO2
3.4	Spark Fundamentals	1	CO2
3.5	Installation of Apache Spark	1	CO2
3.6	Data processing with Spark	2	CO2
4	**App Deployment in Edge**		
4.1	Containerization with Docker	2	CO3
4.2	Kubernetes	1	CO3
5	**Workload offloading**		
5.1	Mathematical formulations for Task offloading	1	CO4
5.2	Task offloading techniques based on DL methods	2	CO4
6	**Edge Intelligence for IoT**		
6.1	Traditional IoT Platform – Issues	1	CO5
6.2	ML on Cloud vs ML on Edge	2	CO5
6.3	EdgeML – Advantages – Applications	1	CO5
6.4	Workflow of Edge ML	2	CO5
6.5	ML-based Predictive Analytics at Edge	2	CO5
7	**Usecases**		
7.1	Fog-based real-time sensor data analysis	1	CO6
7.2	Vehicular Networks	1	CO6
7.3	5G systems	1	CO6
	Total lectures	**36**	

Course Designer(s):

1. Dr. S. Padmavathi, Professor, IT, spmcse@tce.edu
2. Mrs S. Thiruchadai Pandeeswari, Assistant Professor, IT eshwarimsp@tce.edu

22ITRJ0 AI FOR CYBERSECURITY

Category	L	T	P	Credit
PEES	3	1	0	3

Preamble

This course explores Cybersecurity principles and the transformative application of Artificial Intelligence and Machine Learning to enhance threat detection, analysis, and response. The ethical implications and risks associated are analysed with both traditional and intelligent security practices. The goal is to equip learners with the knowledge and critical thinking skills to develop resilient and ethical Cybersecurity solutions for evolving threats.

Prerequisite

- 22IT510 Information security
- 22IT520 Machine Learning

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	Detail the fundamental principles and practices of Cybersecurity, including threat landscapes, security controls, and risk management frameworks.	TPS2	80	75
CO2	Apply digital forensics principles and techniques to investigate cyber incidents, collect and report digital evidence	TPS 3	70	70
CO3	Respond to various cyber incidents, implement incident response plans, and ensure business continuity and disaster recovery.	TPS 3	70	70
CO4	Develop expert systems using knowledge representation techniques for threat detection and response	TPS 3	70	70
CO5	Apply AI and Machine Learning techniques to address specific Cybersecurity use case scenarios, enhancing detection, analysis, and response capabilities.	TPS 3	70	70
CO6	Assess the ethical implications and potential risks associated with Cybersecurity practices, digital forensics investigations, and the deployment of AI and ML in this domain.	TPS 4	70	65

Mapping with Programme Outcomes

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

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	1	2	3	1	2	3	4	1	2	3	4	1	2	3	4
CO1	10	10			20											10		
CO2	10	10	25			40										5	10	
CO3		10	25			40										5	15	
CO4							5	10	20				30				15	
CO5								10	20				40			5	15	
CO6							5	10		20				30		5		15

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

Syllabus

Introduction to Cybersecurity – Core concepts - Security principles and goals, Cyber threats – Types – OWASP security risks, Attack vectors, Threat vectors, Security controls, Risk management frameworks – NIST CSF, ISO 27001, Major cyber attacks.

Digital Forensics – Principles, Types of digital evidence, Forensic process, Legal and ethical considerations – Laws and regulations, Admissibility of evidence and chain of custody, Evidence acquisition, Analysis techniques – File system, log and registry analysis, Memory forensics. Case studies - Investigation of Network intrusion, Insider threat, and Compromised server.

Cyber incidents – Lifecycle of cyber incident response – Preparation, detection and analysis, containment, eradication, recovery and lessons, Incident response – Roles and responsibilities, communication, escalation procedures. Business continuity and Disaster recovery– Planning, backup, recovery procedures and testing, Tabletop exercise on incident response.

Expert systems – Knowledge representation – Logic and inferences, Knowledge base for cyber security threats, RETE Graph, Forward and backward chaining for Cybersecurity scenarios. Case studies – SIEM correlation engines, phishing detection.

AI and Machine learning – AI/ML for threat detection – anomaly and user behaviour prediction using SVM and Isolation forest algorithms. Malware analysis and classification using random forest and CNN algorithms. Vulnerability score prediction and prioritization using XGBoot. Issues and challenges in automated AIML application for Cybersecurity. Practical sessions – Building AI/ML based security model using Python frameworks.

Ethical considerations – Privacy, data protection, responsible disclosure, Forensics – Data integrity, witness responsibilities, Building Responsible AI models.

Risks – Human error, misconfiguration, insider threat, Forensics – data breaches and tampering, AI/ML – adversarial attacks, reliance on automation.

Reference Books& web resources

1. William Stallings and Lawrie Brown, “Computer Security: Principles and Practice”, Pearson Education, Fourth Edition, 2018.
2. OWASP Foundation, “OWASP Top 10 - 2021: The 10 Most Critical Web Application Security Risks”**,** OWASP Foundation, 2021(https://owasp.org/www-project-top-ten/).
3. Bill Nelson, Amelia Phillips, Christopher Steuart, and Andrew McWhorter, “Guide to Computer Forensics and Investigations”, Cengage Learning, Sixth Edition, 2019.
4. Dipanjan Sarkar, Raghav Bali, and Tushar Sharma, *Practical Machine Learning with Python: A Problem-Solver’s Guide to Building Real-World Intelligent Systems*, Apress, 2017.

5. Clarence Chio and David Freeman, “Deep Learning for Security”, O'Reilly Media, 2018.
6. Patrick Lin, Simon Rogerson, and Johnny Soraker, “Cybersecurity Ethics: An Introduction”, Routledge, 2020.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Introduction to Cybersecurity**	
1.1	Core concepts - security principles and goals	1
1.2	Cyber threats – types	1
1.3	Attack vectors and threat vectors, security controls	1
1.4	Risk management frameworks	1
1.5	Case studies – Major cyber attacks	1
2	**Digital forensics**	
2.1	Principles, Types of digital evidence	1
2.2	Digital forensics process	1
2.3	Legal and ethical considerations	1
2.4	Admissibility and chain of custody	1
2.5	Digital evidence acquisition	1
2.6	Forensic analysis techniques	1
2.7	Use case discussions	1
3	**Network vulnerabilities and security.**	
3.1	Network protocols, vulnerabilities and exploitation	1
3.2	Patch management, configuration hardening	1
3.3	Assessment using tools and reporting	1
3.4	Security measures – Firewalls, IDS	1
3.5	Access control and encryption techniques	1
3.6	Hands-on session - Vulnerability assessment	1
4	**Cyber incidents**	
4.1	Cyber Incident Response Lifecycle	1
4.2	Preparation and detection to recovery and lessons	
4.3	Developing Incident Response Plans	1

Module No.	Topic	No. of Periods
4.4	Handling Different Types of Incidents	1
4.5	Planning, backup, recovery procedures and Testing	1
4.6	Tabletop exercise on incident response	1
5	**AI/ML Solutions for Cybersecurity**	
5.1	AI/ML for threat detection	1
5.2	Malware analysis and classification	1
5.3	Vulnerability score prediction and prioritization	1
5.4	SIEM enhancement using AI/ML algorithms	1
5.5	Issues and challenges	
5.6	Lab session – Implement basic AI/ML security model	2
6	**Ethical considerations and Risk management**	
6.1	Privacy, data protection, responsible disclosure	1
6.2	Data integrity, witness responsibilities	1
6.3	AI/ML – Bias, fairness	1
6.4	Accountability, potential for misuse	1
6.5	Human error, misconfiguration, insider threat	1
6.6	Data breaches and tampering	1
6.7	AI/ML – adversarial attacks, reliance on automation	1
	Total	36

Course Designer(s):

1. Dr.M.Suguna, Associate Professor, Dept. of IT mscse@tce.edu
2. Dr.C.Deisy, Professor and Head, Dept. of IT hodit@tce.edu

22IT1F0	AI-DRIVEN WORKFLOW AND ETL AUTOMATION

Category	L	T	P	Credit
PEES	1	0	0	1

Preamble

Modern data teams rely on visual pipeline designers, event-driven automation engines and scriptable modules to ingest, transform and route data, and then enrich it with AI-based decisioning. This course guides students through building real-world ETL workflows using node-based designers, lightweight code snippets and pre-built model connectors, culminating in fully monitored, production-ready pipelines.

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	Apply the components and lifecycle of automated data pipelines, including visual-node ingestion, transformation steps and embedded model-driven enrichment.	TPS 3	70	70
CO2	Illustrate and configure end-to-end ETL workflows by combining node-based flows with custom script modules.	TPS 3	70	70
CO3	Develop anomaly-detection and text-processing inference steps within pipelines to validate and enhance data quality.	TPS 3	70	70
CO4	Illustrate multi-step workflows with dynamic triggers, branching logic, retry policies and error-handling guards.	TPS 3	70	70
CO5	Apply and secure runtime AI model calls and webhook-driven notifications through custom connectors.	TPS 3	70	70
CO6	Illustrate pipeline execution via logs and dashboards, analyse performance metrics, and optimize for reliability, throughput and cost efficiency.	TPS 3	70	70

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	Internal						Terminal					
	Mini Project											
TPS Scale	1	2	3	4	5	6	1	2	3	4	5	6
CO1	-	-	10	-	-	-	5	5	5	-	-	-
CO2	-	-	10	-	-	-	5	5	5	-	-	-
CO3	-	-	10	-	-	-	5	5	10	-	-	-
CO4	-	-	20	-	-	-	5	5	10	-	-	-
CO5	-	-	20	-	-	-	5	5	10	-	-	-
CO6	-	-	30	-	-	-	-	-	10	-	-	-

yllabus

Foundations of Automated Workflows & ETL : Introduction to automated data workflows: lifecycle overview , Data ingestion patterns: streaming vs batch ,Transform steps: mapping, joins, aggregations, Automated enrichment using embedded models

Visual Pipeline Design & Scripting Modules: Building node-based data flows, Embedding script blocks for custom logic, Connecting to relational and file-based sources, Test and debug the ingest-transform-load pipeline

In-Pipeline AI: Quality Assurance & Enrichment: Anomaly detection operators using node and script-based techniques, Text-processing tasks (tokenization, cleaning) , Automated feature-extraction snippets

Orchestration & Runtime Control: Workflow scheduling and event triggers, Branching, loops, retries, and SLA guards, Dynamic workflows with parameters and conditional paths

Model Integration & Webhook-Driven Actions: Packaging inference tasks as callable operators , Runtime credential management (tokens, secrets, secure APIs) , Trigger-based alerts and downstream notifications

Monitoring, Logging & Optimization: Centralized observability dashboards, Throughput and latency tuning, Cost-effective resource allocation

Case Study: Walkthrough of a retail-analytics pipeline: Sales Performance Analysis, Customer Segmentation & Behavior Tracking, Inventory Optimization, Pricing Intelligence & Competitor Monitoring, Store Footfall and Layout Analytics

Learning Resources

1. Data Engineering with Python: Work with Massive Datasets to Design Data Models and Automate Data Pipelines Using Python (2nd Edition), Paul Crickard, Packt Publishing, 2023
2. Fundamentals of Data Engineering: Plan and Build Robust Data Systems, Joe Reis & Matt Housley, O'Reilly Media, 2022
3. https://docs.n8n.io
4. https://hub.knime.com

Course Contents and Lecture Schedule

Module No.	Topic	No of Periods	CO
1	**Foundations of Automated Workflows & ETL**		
1.1	Introduction to automated data workflows: lifecycle overview	1	CO1
1.2	Data ingestion patterns: streaming vs batch	1	CO1
1.3	Transform steps: mapping, joins, aggregations, Automated enrichment using embedded models		CO1
2	**Visual Pipeline Design & Scripting Modules**		
2.1	Building node-based data flows	1	CO2
2.2	Embedding script blocks for custom logic	1	CO2
2.3	Connecting to relational and file-based sources		CO2
2.4	Test and debug the ingest-transform-load pipeline	1	CO2
3	**In-Pipeline AI: Quality Assurance & Enrichment**		
3.1	Anomaly detection operators using node and script-based techniques	1	CO3
3.2	Text-processing tasks (tokenization, cleaning)		CO3
3.3	Automated feature-extraction snippets	1	CO3
4	**Orchestration & Runtime Control**		
4.1	Workflow scheduling and event triggers	1	CO4
4.2	Branching, loops, retries, and SLA guards	1	CO4
4.3	Dynamic workflows with parameters and conditional paths	1	CO4
5	**Model Integration & Webhook-Driven Actions**		
5.1	Packaging inference tasks as callable operators	1	CO5
5.2	Runtime credential management (tokens, secrets, secure APIs)	1	CO5
5.3	Trigger-based alerts and downstream notifications		CO5
6	**Monitoring, Logging & Optimization**		
6.1	Centralized observability dashboards	1	CO5
6.2	Throughput and latency tuning, Cost-effective resource allocation		CO5
7	**Case Study**		
7.1	Walkthrough of a retail-analytics pipeline	1	CO6
7.2	Sales Performance Analysis, Customer Segmentation & Behaviour Tracking, Inventory Optimization, Pricing Intelligence & Competitor Monitoring, Store Footfall and Layout Analytics		CO6
	Total Lecture Hours	**14**	

Course Designers:

1. Mr.Ajmeer Kaja Mohideen ajmeercec04@gmail.com
2. Dr.S.Muthuramalingam smrit@tce.edu
3. Ms.C.V.Nisha Angeline cvnait@tce.edu

Ajmeer Kaja Mohideen, who serves as an Advisor at Tarcin Robotics LLP, a technology firm based in Madurai, Tamil Nadu. He specializes in IT consulting, technical support, web development, educational consulting, training, and computer networking.

22IT1H0	FLUTTER TECHNOLOGIES

Category	L	T	P	Credit
PEES	1	0	0	1

Preamble

This course enables the students to learn Flutter and Dart from the ground up, step-by-step and help them build engaging native mobile apps for both Android and iOS

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	Review the benefits of Dart Language	TPS 2	70	70
CO2	Model the architecture of Dart and Flutter	TPS 3	70	70
CO3	Use various Components to design the UI of the app.	TPS 3	70	70
CO4	Make use of various web services and Firebase to deploy the app	TPS 3	70	70
CO5	Utilize various debugging tools to handle errors and to perform Unit Testing	TPS 3	70	70
CO6	Apply Flutter concepts for societal or business requirements	TPS 3	70	70

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	Internal			Terminal		
	Mini Project					
TPS Scale	1	2	3	1	2	3
CO1	-	10	-	5	10	-
CO2	-	-	10	5	5	5
CO3	-	-	10	5	5	10
CO4	-	-	20	5	5	10
CO5	-	-	20	5	5	10
CO6	-	-	30	-	-	10

Syllabus

Hybrid App development Introduction : Challenges - Benefits - Dart Language architecture: The Language - Core Libraries - Packages -Development- Platforms of Dart

Flutter high level architect : Architectural Layer - Reactive user interfaces - State management -Platform Embedding- Flutter Versions

UI Components : Widgets - Free Styling- Enums- Multiple Constructors- scaffold - Container- stack- Layout - Gestures - Navigation - Routing-Adding Forms

Web Services : Writing flutter app on web - Launching DART DEV Tools - DART Web Service API -Accessing REST API - JSON - Serialization - Firebase

Testing : Debugging Tools - OEM Debugger -Build modes : Error Handling - Integration Testing

Use Cases: Healthcare – Telemedicine apps, Education – E-learning platforms, HRMS – Employee portals, Inventory – Stock tracking

Learning Resources

1. Flutter for Cross-Platform App Development, Temidayo Adefioy, Orange Education, 2024
2. Building Cross-Platform Apps with Flutter and Dart: Build scalable apps for Android, iOS, and web from a single codebase, Deven Joshi, BPB Publications, 2023
3. https://dart.dev/
4. https://flutter.dev/

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods	CO
1.	**Hybrid App development Introduction**		
1.1	Introduction : Challenges, Benefits	1	CO1
1.2	Dart Language architecture		CO1
1.3	The Language		CO1
1.4	Core Libraries	1	CO1

1.5	Packages		CO1
1.6	Development		CO1
1.7	Platforms of Dart		CO1
2.	**Flutter high-level architect**		
2.1	Architectural Layer		CO2
2.2	Reactive user interfaces		CO2
2.3	State management	2	CO2
2.4	Platform Embedding		CO2
2.5	Flutter Versions		CO2
3	**UI Components**		
3.1	Widgets	1	CO3
3.2	Free Styling		CO3
3.3	Enums	1	CO3
3.4	Multiple Constructors		CO3
3.5	Scaffold	1	CO3
3.6	Container,stack,Layout		CO3
3.7	Gestures		CO3
3.8	Navigation and Routing	1	CO3
3.9	Adding Forms		CO3
4	**Web Services**		
4.1	Writing Flutter app on the web		CO4
4.2	Launching DART DEV Tools		CO4
4.3	DART Web Service API		CO4
4.4	Accessing REST API	2	CO4
4.5	JSON		CO4
4.6	Serialization		CO4
4.7	Firebase		CO4
5	**Testing**		
5.1	Debugging Tools		CO5
5.2	OEM Debugger		CO5
5.3	Build modes	2	CO5
5.4	Error Handling		CO5
5.5	Integration Testing		CO5
6	**Use Cases**		
6.1	Healthcare – Telemedicine apps	1	CO6
6.2	Education – E-learning platforms		CO6
6.3	HRMS – Employee portals	1	CO6
6.4	Inventory – Stock tracking		CO6
	Total Lectures	**14**	

Course Designers:

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Sivanesh Selvan- Lead Product Developer - Level 2 at SurveySparrow
Sivanesh Selvan has a varied work experience, beginning in 2017. In 2018, they began working at Amphisoft Technologies Pvt. Ltd., as a Product Engineer, and then as a Product Engineer Intern. In 2021, they began working at SurveySparrow as a Product Developer and then as a Senior Product Developer.

		Category	L	T	P	Credit
22IT1G0	**GENERATIVE MODELING FOR INDUSTRIAL APPLICATIONS (COMMON TO CSE, IT AND CSBS)**	**PEES**	**1**	**0**	**0**	**1**

Preamble

This course explores and evaluates the industrial applications of advanced generative modeling techniques, with a focus on how these methods can enhance efficiency, innovation, and automation across various sectors. This includes examining the use of generative models in healthcare, finance and industrial applications.

Prerequisite

Nil

Course Outcomes

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

CO1	Course Outcome 1 (CO1)	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	Describe the core concepts, mathematical foundations and real-world uses of generative models.	TPS2	70	70
CO2	Examine the core mathematical principles and architectural differences of generative models such as VAEs, GANs, and Autoregressive Models.	TPS4	70	60
CO3	Apply appropriate generative models to practical tasks such as image synthesis, text generation, and time series forecasting based on their characteristics and strengths.	TPS3	70	65
CO4	Apply advanced optimization techniques and evaluation metrics to fine-tune pre-trained generative models and assess their quality and performance effective	TPS3	70	65
CO5	Analyze generative modeling techniques to solve domain-specific problems in healthcare, finance, and natural language processing.	TPS4	70	60
CO6	Apply strategies for scaling and deploying generative models to handle large datasets and real-time applications, including integration with large language models (LLMs)	TPS3	70	65

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO1	PSO2	PSO3
CO1	M	L										L		

CO2	S	S	M	L	S	M	M	M	M		S	S	S	M
CO3	S	M	L		M	M					M	M	S	L
CO4	S	M	L		M	M					M	M	S	L
CO5	S	S	M	L	S	M	M	M	M		S	S	S	M
CO6	S	M	L		M	M					M	M	S	L

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	Internal				Terminal			
	Mini -Project				Theory			
TPS Scale	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
CO1		20			5	5		
CO2				20		5		20
CO3			20			5	15	
CO4			10				10	
CO5				20				20
CO6			10			5	10	

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

Syllabus

Generative Modeling: Discriminative and generative models, explicit vs implicit generative models, Probability distributions, Concept of latent variables, inference in latent variables

Generative Model Architectures:

Variational Autoencoders (VAEs): Deep dive into VAEs, their mathematical Foundations, and applications, Architectural Variations: Convolutional VAEs, recurrent VAEs, hierarchical VAEs

Generative Adversarial Networks (GANs): Explore advanced GAN architectures like StyleGAN, and BigGAN.

Transformers in generative models: GPT, BERT, and their variants, Time Series Forecasting, combining generative models with large language models (LLMs)

Techniques for optimization and Evaluation Metrics: Fine-tuning pre-trained models, Advanced evaluation metrics for generative models, Techniques for assessing model quality and performance

Applications in Specialized Domains: Healthcare: Use of generative models for medical imaging, drug discovery, and personalized medicine.

Finance: Applications in fraud detection, algorithmic trading, and risk management.

Natural Language Processing (NLP): Advanced text generation, summarization, translation, and conversational agents.

Industrial applications: defect detection in manufacturing, product design automation, and predictive maintenance

Scalability and Deployment: Strategies for scaling generative models for large datasets and real-time applications, Deployment of generative models in production environments using cloud platforms.

Learning Resources

1. Shaun Wassell, “Generative AI for Python Developers”, Pearson, First Edition, 2024.
2. Joseph Babcock and Raghav Bali , “Generative AI with Python and TensorFlow 2: Create images, text, and music with VAEs GANs, LSTMs, Transformer models”, Packt Publishing , First Edition, 2021.
3. Akshay Kulkarni, Adarsha Shivananda, Anoosh Kulkarni, Dilip Gudivada, “Applied Generative AI for Beginners”, Apress, First Edition, 2023.
4. Amit Bahree, “Generative AI in Action”, Manning Publications, First Edition, 2024.
5. NPTEL- “Programming with Generative AI” , by Prof. Viraj Kumar, IISc Bangalore, https://onlinecourses.nptel.ac.in/noc25_cs137/preview,
6. Coursera – “"Build Basic Generative Adversarial Networks (GANs)”, Sharon Zhou, https://www.coursera.org/learn/build-basic-generative-adversarial-networks-gans,

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Generative Modeling**	
1.1	Discriminative and generative models, explicit vs implicit generative models	1
1.2	Probability distributions, Concept of latent variables, inference in latent variables	
2	**Generative Model Architectures:**	
2.1	**Variational Autoencoders (VAEs):** Deep dive into VAEs, their mathematical Foundations, and applications	1
2.2	**Architectural Variations:** Convolutional VAEs, recurrent VAEs, hierarchical VAEs	2
2.3	**Generative Adversarial Networks (GANs):** Explore advanced GAN architectures like StyleGAN, and BigGAN	1
2.4	**Transformers in generative models:** including GPT, BERT, and their variants, Time Series Forecasting	2
2.5	Combining generative models with large language models (LLMs)	1
2.6	**Techniques for optimization and Evaluation Metrics:** Fine-tuning pre-trained models	1
2.7	Advanced evaluation metrics for generative models, Techniques for assessing model quality and performance	
3	**Applications in Specialized Domains**	
3.1	**Healthcare:** Use of generative models for medical imaging, drug discovery, and personalized medicine	1

Module No.	Topic	No. of Periods
3.2	**Finance:** Applications in fraud detection, algorithmic trading, and risk management.	1
3.3	**Natural Language Processing (NLP):** Advanced text generation, summarization, translation, and conversational agents	1
3.4	**Industrial applications:** defect detection in manufacturing, product design automation, and predictive maintenance	
4	**Scalability and Deployment**	
4.1	Strategies for scaling generative models for large datasets and real-time applications	1
4.2	Deployment of generative models in production environments using cloud platforms.	1
	Total	14

Course Designer(s):

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Dr. Suresh Rajappa currently serves as a Global Data Leader and Chief Data Officer at KPMG, Dallas, USA, driving global data strategy, architecture, and monetization, achieving revenue growth and scalability while leading a 10x team expansion through innovation, analytics, and digital transformation.

22ITVA0	EMOTIONAL INTELLIGENCE IN DIGITAL ERA	Category	L	T	P	Credit
		VAC	0	0	0	0

Preamble

The rising prevalence of mental health issues in children, adolescents, and young adults has become an escalating public health issue, impacting approximately10%-20% of young People on a global scale. The digital age has brought both benefits and challenges to well-being. Students learn on using technology to enhance well-being and flourishing, shifting from a solely problem-focused approach to a more holistic view of human experience

Syllabus

Introduction to Emotional Intelligence : Emotional Intelligence Introduction, Science behind driving emotions, Impact on Decision Making, Amygdala hijack, happiness and positive psychology, effects of positive and negative thoughts on the brain, Happiness as a Policy Issue, Measuring Happiness Globally, Policies to Increase Happiness, Well Being with PERMA(Positive emotion, Engagement, Relationships, Meaning and Accomplishment)Model, Case Studies discussion and activities.

The Effects of Media on Cognition: Social media and young adults, The influence of social media on mental health, Social Media effect on Neuro science and brain impacts to behavioral changes, The role of social media in addiction - The impact of media on human psychology, Case Studies on Media addiction, Algorithm driven content with Attention Engineers.

Living with Technology: The role of technology in our everyday lives, role of AI in human emotion recognition, Technology vs Mental Health: Finding Balance, Case Studies for the impact of advertisement on everyday lives, Affective Computing, Computational model mimics humans' ability to predict emotions, Case Studies

Strategies for implementing positive psychology: Prosocial Behavior - Psychological Factors Directing Helping Behavior, Understanding Altruism and Egoism, Dissecting neural mechanisms of prosocial behavior, Case Studies for Brain (Thoughts, Feelings and Behavior) and success stories of empirical studies, Modeling Emotions, WHO, WFMH Organization for Mental Health

Outcomes and Deliverable

Emotional Intelligence and Positive psychology interventions in the digital era can lead to improved mental and emotional well-being, reduced negative motions, and increased happiness, optimism, and life satisfaction. Digital platforms and technologies facilitate access to these interventions and can be used to build connections, reduce stigma, and promote positive psychological outcomes like resilience and self-growth

Text Book Reference

1.https://ocw.mit.edu/ans7870/9/9.00SC/MIT9_00SCF11_text.pdf

Additional Readings

1. Ben-Shahar,Tal.Happier:LearntheSecretstoDailyJoyandLastingFulfillment. McGraw-Hill, 2007. ISBN: 9780071492393. [Preview with Google Books]

2. https://web.education.unimelb.edu.au/assets/pospsych/Positive%20psychology%20and%20the%20internet_%20A%20mental%20health%20opportunity.pdf
3. https://ppc.sas.upenn.edu/learn-more/perma-theory-well-being-and-perma-workshops
4. https://www.hbs.edu/ris/Publication%20Files/Happiness%20runs%20in%20a%20circular%20motion_1d986896-2f38-4578-ad93-e90bd82b07fd.pdf
5. https://med.stanford.edu/content/dam/sm/phs-MCK/documents/cdev.13549.pdf
6. https://pmc.ncbi.nlm.nih.gov/articles/PMC8169714/
7. https://www.media.mit.edu/projects/sleepstim/overview/

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Introduction to Positive Psychology**	
1.1	Emotional Intelligence Introduction, Science behind driving emotions, Impact on Decision Making	2
1.2	Amygdala hijack, happiness and positive psychology, effects of positive and negative thoughts on the brain	1
1.3	Happiness as a Policy Issue, Measuring Happiness Globally, Policies to Increase Happiness	1
1.4	Well Being with PERMA(Positive emotion, Engagement, Relationships, Meaning and Accomplishment)Model	1
1.5	Case Studies discussion and activities	2
2	**The Effects of Media on Cognition**	
2.1	Social media and young adults, The influence of social media on mental health	2
2.2	Social Media effect on Neuroscience and brain impacts to behavioral changes	2
2.3	The role of social media in addiction - The impact of media on human psychology	1
2.4	Case Studies on Media addiction, Algorithm driven content with Attention Engineers	2
3	**Living with Technology**	
3.1	The role of technology in our everyday lives, role of AI in human emotion recognition	2
3.2	Technology vs Mental Health: Finding Balance, Case Studies for the impact of advertisement on everyday lives	2
3.3	Affective Computing, Computational model mimics humans' ability to predict emotions	2
3.4	Case Studies	2
4	**Strategies for implementing positive psychology: Prosocial Behaviour**	

Module No.	Topic	No. of Periods
4.1	Psychological Factors Directing Helping Behaviour	2
4.2	Understanding Altruism and Egoism	2
4.3	Dissecting neural mechanisms of prosocial behaviour	2
4.4	CaseStudiesforBrain(Thoughts,FeelingsandBehavior) And success stories of empirical studies, Modeling Emotions, WHO, WFMH Organisation for Mental Health	2
	Total	30

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