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

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

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

MISSION

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

Programme Specific Outcomes

B.Tech (Information Technology) Programme

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

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

Programme Educational Objectives
B.Tech (Information Technology) Programme

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

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

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

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

PROGRAM OUTCOMES

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

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

PEO vs. PO Mapping

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

Graduate Attributes defined by NBA

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

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

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

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

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

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

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

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

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

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

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

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

GA vs. PO Mapping

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

CATEGORIZATION OF COURSES

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

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

B. TECH IT -SCHEDULING OF COURSES

Sem	THEORY / THEORY CUM PRACTICAL / PRACTICAL								CDIO Courses	Audit Courses	Credit
I	22MA110 CALCULUS FOR ENGINEERS (BSC-4)	22PH120 PHYSICS (BSC-3)	22CH130 CHEMISTRY (BSC-3)	22EG140 TECHNICAL ENGLISH (HSMC-2)	22IT160 PROBLEM SOLVING USING COMPUTERS (ESC-3)	22EG170 ENGLISH LABORATORY (HSMC-1)	22PH180 PHYSICS LABORATORY (BSC-1)	22CH190 CHEMISTRY LABORATORY (BSC-1)	22ES150 ENGINEERING EXPLORATION (ESC-2)		20
II	22IT210 MATRICES AND ORDINARY DIFFERENTIAL EQUATIONS (BSC-4)	22IT220 OPERATING SYSTEMS (PCC-3)	22IT230 COMPUTER ORGANISATION (PCC-3)	22IT240 INFRASTRUTURE AND STORAGE MANAGEMENT (ESC-2)	22IT250 ESSENTIALS OF INFORMATION TECHNOLOGY (PCC-3)	22ME260 ENGINEERING GRAPHICS USING CAD (ESC-3)	22IT270 IT WORKSHOP (ESC-1)	22IT280 OPERATING SYSTEMS LAB (ESC-1)		AUDIT COURSE 1	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-3)		22IT370 DATA STRUCTURES LAB (PCC-1)	22IT380 OBJECT ORIENTED PROGRAMMING 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)	22XXGX0 INTERDISCIPLINARY ELECTIVE (OEC-3)	22IT570 SECURITY LAB (PCC-1)	22IT580 CLOUD COMPUTING LAB (PCC-1)	22IT590 SUSTAINABLE IT SOLUTIONS (PW-3)		23
VI	22IT610 ACCOUNTING AND FINANCE (HSMC-3)	22IT620 ARTIFICIAL INTELLIGENCE (PCC-3)	22ITPX0 Programme Elective (PEC-3)		22IT650 MOBILE APPLICATION DEVELOPMENT (PCC-3)	22XXFX0 BASIC SCIENCE ELECTIVE (OEC-3)	22IT670 PROFESSIONAL COMMUNICATION (HSMC-2)	22IT680 DATA SCIENCE LAB (PCC-1)	22IT690 ARTIFICIAL INTELLIGENCE (PW-3)		21
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 (PEC-3)	22IT770 VIRTUALIZATION TECHNOLOGIES LAB (PCC-1)	22IT780 MULTIMEDIA LAB (PCC-1)	22IT790 SCALABLE SYSTEMS/CYBER SECURITY (PW-3)		22
VIII	22ITPX0 Programme Elective (PEC-3)	22ITPX0 Programme Elective (PEC-3)	22ITPX0 Programme Elective (PEC-3)						22IT810 Major Project (PW-3)		12

HSMC	BSC	ESC	PCC	PEC	PW	Total
11	24	22	55	30	12	160

Passed in Board of Studies meeting on 3.06.2022

Approved in 63th 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:

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3. Dr. S.P. Suriya Prabha, suriyaprabha@tce.edu
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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:

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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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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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3. P.VijayaPrabha pvpit@tce.edu

22IT160	PROBLEM SOLVING USING COMPUTERS

Category	L	T	P	Credits
ESC	2	0	2	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	B	90
CO2	Solve the given problem statement using programming concepts such as data types, operators, conditions and loops	TPS3	B	90
CO3	Make use of functions, scoping and abstraction in development of simple applications	TPS3	B	90
CO4	Use File I/O and exception handling in development of simple applications	TPS3	B	90
CO5	Examine the given problem to Implement, test and debug the solution using Python programming language.	TPS4	B	80
CO6	Use python libraries such as random, numpy, matplotlib, etc in the development of applications	TPS3	B	90

Mapping with Programme Outcomes

COs	PO 1	PO 2	PO3	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		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						Assignments						Terminal					
	Theory						Practical (Observation, Record and Test)												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	5	10	10						10						10						10			
CO2	10	10	20						20						20						20			
CO3	5	10	10						20						20						20			
CO4									10						10						10			
CO5			10						20						20						20			
CO6									20						20						20			

*****Assignments include solving worksheets, quiz, problem solving using Python programs, mini-project implementation in teams .

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 – Numbers, 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, Divide and Conquer

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

Python Libraries and Modules – Math, Numpy, Scipy, Random, Date & Time, Matplotlib – Simple Games Development

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
1.5	Programming – High level languages, language translators, syntax, semantics	1
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	1
2.4	Problem Solving Techniques – Simple Problems and Algorithms	
2.5	Loops, Nested loops	1
2.6	Problem Solving Techniques – Solving by Analogy, Factorization	1
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	3
3.2	Keyword Arguments, Default values, Variable arguments	
3.3	Scoping – Global variables	
3.4	Problem Solving Techniques – Recursion	
3.5	Problem Solving Techniques - Divide and Conquer	
4	**Structured types, Mutability, Higher Order Functions**	
4.1	Sets	1
4.2	Dictionaries	1
4.3	List comprehension, Mutable Immutable data types	1
4.4	File I/O	1
4.5	Exceptions	1
4.6	Applications	
5	**Python Libraries and Modules**	
5.1	Math, Numpy, Scipy, Date & Time Libraries	2
5.2	Random Library	1
5.3	Matplotlib Library	1
5.4	Simple Game Development	2
	Total Hours	**24**

List of Experiments

Ex.No	Experiment Name	No. of Hours	COs
1.	Simple Programs	2	CO1, CO2, CO5
2.	Branching Programs	2	CO1, CO2, CO5
3.	Looping Programs	2	CO1, CO2, CO5
4.	Applications using Strings, Lists, Tuples	2	CO2, CO5
5.	Functions and Scoping	2	CO3, CO5

6.	Applications using List Comprehension, Sets, Dictionary	2	CO3, CO5
7.	Matrix Applications		CO3, CO5
8.	Applications using built-in and user defined Exceptions	2	CO4, CO5
9.	Applications using File Handling	4	CO4, CO5
10.	Mini-project using Python Libraries	4	CO6
	Total Hours	**24**	

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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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

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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

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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:

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