CURRICULUM AND DETAILED SYLLABI

FOR

B. E. DEGREE PROGRAMME
(Electronics and Communication Engineering)

FIRST SEMESTER

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2022-23

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 04.06.2022 Approved in Academic Council Meeting 25.06.2022

Vision and Mission of the Department

Vision:

To empower the Electronics and Communication Engineering students with technological excellence, professional commitment and social responsibility.

Mission:

ME1. Attaining academic excellence in Electronics and Communication Engineering through dedication to duty, innovation in learning and research, state of the art laboratories and industry driven skill development.

ME2. Establishing suitable environment for the students to develop professionalism and face life challenges with ethical integrity.

ME3. Nurturing the students to understand the societal needs and equip them with technical expertise to provide appropriate solutions.

ME4. Providing breeding ground to obtain entrepreneurial skills and leadership qualities for self and social growth.

Program Educational Objectives (PEOs):

PEO1. Graduates will be capable of developing specification and design procedures, prototyping and test methodologies for modern electronics and communication systems and gadgets that perform analog and digital processing functions.

PEO2. Graduates will be able to work and adapt to changes in allied areas of Electronics and Communication Engineering through personal success and life long learning.

PEO3. Graduates will be able to identify technological requirements for the society and provide cost effective solutions.

- These objectives will be evidenced by professional visibility (publications, presentations, inventions, patents and awards), entrepreneurial activities, international activities (participation in international conferences, collaborative research and employment abroad)

Program Outcomes:
Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze 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**: 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 modeling 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.

Program Specific Outcomes:
Engineering Graduates will be able to

PSO1. Design circuits and systems for complex engineering problems in Electronics and Communication and allied areas.
PSO2. Apply research methodologies to provide solutions for contemporary problems in the areas including RF, Signal Processing, Image Processing, VLSI, Optical Communication, Networks and Embedded Systems for given specifications.
PSO3. Actively contribute as a member or leader in diverse teams, and communicate effectively on complex engineering activities and involve in life-long learning, by applying reasoning and ethical principles.

PEO- Mission Mapping:

	ME1	ME2	ME3	ME4
PEO1	S	M	M	L
PEO2	L	S	M	M
PEO3	M	L	S	M

PEO-PO-PSO Mapping:

	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**
PEO1	■	■	■	■	■			■	■	■			■	■	
PEO2	■							■	■	■	■	■	■		■
PEO3	■	■				■	■	■					■	■	

PO-GA Mapping:

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

TCE PROFICIENCY SCALE (CDIO Curriculum Framework)

TCE Proficiency Scale (TPS)	Proficiency	Cognitive	Affective	Psychomotor
TPS1	To have been exposed to	Remember	Receive	Perception, Set
TPS2	To be able to interpret and imitate	Understand	Respond	Guided Response
TPS3	To be skilled in the practice or implement	Apply	Value	Mechanism
TPS4	To be able to participate in and contribute	Analyse	Organise	Complex Overt Responses
TPS5	To be able to judge and adapt	Evaluate	Organise	Adaptation
TPS6	To be able to lead and innovate	Create	Characterize	Origination

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B. E. DEGREE PROGRAMME
(Electronics and Communication Engineering)

CREDIT DISTRIBUTION

(For the students admitted in the Academic Year 2022-23 onwards)

S.No	Category	Credits
A	**Foundation Courses (FC)**	**54-66**
	Humanities and Social Sciences including Management (HSMC)	9-12
	Basic Science (BSC)	24- 27
	Engineering Science (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 (PW)**	**12**
F	**Internship and Mandatory Audit Courses prescribed by as per Regulatory Authorities (Not to be included for CGPA)**	**-**
	Minimum Credits to be earned for the award of the Degree	**160** (from A to E) and the successful completion of F

SCHEDULING OF COURSES FOR STUDENTS JOINING FROM ACADEMIC YEAR 2022-23 ONWARDS (B.E. ECE Programme) *

Sem	Theory / Theory cum Practical / Practical								CDIO courses	Audit Courses (Mandatory Non-credit}	Credit
	1	2	3	4	5	6	7	8			
I	22MA110 Calculus for Engineers (BSC-4)	22PH120 Physics (BSC-3)	22CH130 Chemistry (BSC-3)	22EG140 Technical English (HSMC-2)	22EC160 Computer Aided Engg. Graphics (TCP) (ESC-3)	22EG170 English Laboratory (HSMC-1)	22PH180 Physics Laboratory (BSC-1)	22CH190 Chemistry Laboratory (BSC-1)	22EC190 Engineering Exploration (TCP) (ESC-2)		20
II	22EC210 Matrices and Linear Algebra (BSC-3)	22EC220 Digital Circuit Design PCC-4 (TCP)	22EC230 Field Theory and Transmission Lines (TCP) PCC-3	22EC240 Electric and Magnetic Circuits (TCP) (PCC-4)	22EC250 Electronic Devices (ESC-3)	22EF260 Problem Solving using Computers (TCP) (ESC-3)				22YYXX0 Audit Course	20
III	22EC310 Probability and Statistics BSC-3	22EC320 Analog Circuit Design (TCP) (PCC-4)	22EC330 Network-Analysis and Synthesis (BSC-3)	22EC340 Computer Organization and Microprocessor (TCP) (PCC-4)	22EC350 Signals and Systems (TCP) (PCC-4)	22EC360 Object-Oriented Programming (ESC-3)					21
IV	22EC410 Optimization BSC-3	22EC420 Mixed Signal Circuit Design (TCP) (PCC-3)	22EC430 RF Circuit Design (TCP) (PCC-4)	22EC440 Microcontrollers and Embedded Systems (TCP) (PCC-4)	22EC450 Discrete-Time Signal Processing (TCP) (PCC-4)	22EC460 Introduction to Data Science (ESC-2)			22ES490 Design Thinking (ESC-3)	22YYXX0 Audit Course	23

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V	22EC510 Data Communication Networks (TCP) (PCC-4)	22EC520 VLSI Circuits and Systems PCC-3	22EC530 Antennas and Wave Propagation (TCP) (PCC-3)	22EC540 Sensors and Instrumentation (PCC-2)	22EC550 Analog and Digital Communication (TCP) (PCC-4)		22YYGX0 Interdisciplinary Elective (OE-3)		22EC590 Electronics - Design Project (PW-3)		22
VI	22EC610 Accounting and Finance (HSMC-3)	22EC620 Image Processing (TCP) (PCC-3)	22ECPX0 (PSE – 3)		22EC630 Optical and Wireless Communication (TCP) (PCC-4)	22EC640 Systems Software (ESC-2)	22YYFX0 Basic Science Elective (OE-3)	22EG650 Professional Communication (HSMC-3)	22EC690 Communications - Design Project – (PW-3)		24
VII	22ECPX0 (PSE – 3)	22ECPX0 (PSE – 3)	22ECRX0 (PEES – 3)	22ECRX0 (PEES – 3)	22ECRX0 (PEES – 3)				22EC790 Secure Communication or Data Engg. Design Project (PW-3)		18
VIII	22ECPX0 (PSE – 3)	22ECPX0 (PSE – 3)	22ECPX0 (PSE – 3)						22EC890 Final Project (PW-3)		12

This schedule shows an optimal way of completing the B.E. Degree programme successfully in 4 Years ***Total Credits for Curricular Activities: 160***

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B. E. DEGREE PROGRAMME
(Electronics and Communication Engineering)

COURSES OF STUDY
(For the students admitted in the Academic Year 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
THEORY CUM PRACTICAL						
22EC160	Computer Aided Engineering Graphics	ESC	2	-	2	3
22EC190	Engineering Exploration	ESC	1	-	2	2
PRACTICAL						
22EG170	English Laboratory	HSMC	-	-	2	1
22PH180	Physics Laboratory	BSC	-	-	2	1
22CH190	Chemistry Laboratory	BSC	-	-	2	1
Total			**14**	**1**	**10**	**20**

BSC : Basic Science Courses
HSMC : Humanities and Social Science including Management 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. DEGREE PROGRAMME
(Electronics and Communication Engineering)

SCHEME OF EXAMINATIONS
(For the Students admitted in the academic year 2022-23 onwards)

FIRST SEMESTER

.#	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
THEORY CUM PRACTICAL								
5	22EC160	Computer Aided Engineering Graphics	3	50	50	100	25	50
6	22EC190	Engineering Exploration	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.

22MA110	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

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

S- Strong; M-Medium; L-Low

Assessment Pattern

CO	Assessment 1						Assessment 2						Terminal (%)			
	Written Test 1 (%)			Assignment 1 (%)			Written Test 2 (%)			Assignment 2 (%)						
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%).

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

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", 14th edition, Pearson, New Delhi, 2018.
2) Howard Anton, Irl Bivens and Stephen Davis, “Calculus: Early Transcendentals”, 12th e, 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
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

Module No.	Topic	No. of Periods
	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 Designer(s):

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	Credit
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

None

Course Outcomes

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

	Course Outcome	TCE Proficiency Scale	Expected Proficiency (%)	Expected Attainment Level (%)
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

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
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										

S- Strong; M-Medium; L-Low

Assessment Pattern

	Assessment - I						Assessment - II						Terminal Exam (%)		
	CAT – I (%)			Assg. I * (%)			CAT – II (%)			Assg. II * (%)					
TPS Scale / CO	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
CO1	8	15	22	100									6	6	10
CO2	8	10	15										4	3	10
CO3	4	5	13				-	-	15	100			-	2	15
CO4							4	15	-				4	6	-
CO5							-	-	35				-	3	15
CO6							16	15	-				6	10	-
Total	**20**	**30**	**50**	**100**			**20**	**30**	**50**	**100**			**20**	**30**	**50**

*Assignment I, II –Quiz/ Puzzle/ Case analysis/ Problem-solving/ Presentation/ Writing tasks

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 Books

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

Paul A. Tipler and Gene Mosca, Physics for Scientists and Engineers, 6th Edition, Freeman, 2008 (Chapters – 4, 9 & 10).

Manoj K. Harbola, Engineering Mechanics, 2nd Edition, Cengage, 2018.

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

ELECTROMAGNETIC FIELDS AND WAVES
1. Principles of Physics, Halliday, Resnick and Jearl Walker, 9th Edition, Wiley, 2011 (Chapters - 23, 24, 32 & 33)
2. 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
1. Paul A. Tipler and Gene Mosca, Physics for Scientists and Engineers, 6th Edition, Freeman, 2008 (Chapters – 31 & 33).
2. Ajoy Ghatak, Optics, 5th Edition, Tata McGraw Hill, 2012 (Chapters – 3, 18, 20)

QUANTUM MECHANICS
1. Paul A. Tipler and Gene Mosca, Physics for Scientists and Engineers, 6th Edition, Freeman, 2008 (Chapters – 34 & 35).
2. Stephen T. Thornton and Andrew Rex, Modern Physics for Scientists and Engineers, 4th Edition, Cengage, 2013. (Chapters - 5 & 6).
3. 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 manoeuvres	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
	CAT-I after 12 contact hours	
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
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 -	4

	Scanning tunnelling microscope – Quantum Cascade lasers – Quantum computation (qubit) – Entanglement - Teleportation	
	CAT-II after 12 contact hours	
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-III after 12 contact hours	
	Total	**36**

Course Designer(s):

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

22CH130	CHEMISTRY

Category	L	T	P	Credit
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	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
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

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
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	CAT1						CAT2						Terminal					
TPS Scale	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
CO1	4	20	0										2	8				
CO2	4	0	20										2	4	10			
CO3	4	20	0										2	8				
CO4	8	0	20										2	4	10			
CO5							12	20	20				6	8	10			
CO6							8	20	20				6	8	10			

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

CO	Assignment 1*						Assignment 2*					
TPS Scale	1	2	3	4	5	6	1	2	3	4	5	6
CO1												
CO2			20									
CO3												
CO4			20									
CO5									20			
CO6									20			

*Assessment type: Quiz / Test /Presentation

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

1. P.C. Jain and Monica Jain, A Textbook of Engineering Chemistry, Dhanpat Rai 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", Dhanpat Rai & 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

Module No.	Topic	No. of Periods
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
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 Designer(s):

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22CH140	TECHNICAL ENGLISH

Category	L	T	P	Credit
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

COs	Course Outcomes	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
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

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
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 (%)		
	Written Test 1 (%)			Assignment 1 (%)			Written Test 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)

Suggested Reading:

Books:

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.4th Edn. OUP. 2017.

6. Elbow, Peter. Writing with Power: Techniques for Mastering the Writing Process. New York, Oxford University Press, 1998.

Extensive Reading:

1. Anthology of Select Five Short Stories
2. Tagore, Rabindranath. *Chitra, a Play in One Act.* London, Macmillan and Co., 1914.

Websites:

1. www.englishclub.com
2. owl.english.purdue.edu
3. www.oxfordonlineenglish.com
4. www.bbclearningenglish.com
5. tcesrenglish.blogspot.com

Course Contents and Lecture Schedule

S.No	Topic	No. of Hours
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:

1. Dr.A.Tamilselvi tamilselvi@tce.edu
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3. Dr.G. JeyaJeevakani gjjeng@tce.edu
4. Dr. R. TamilSelvi rtseng@tce.edu

22EC160	COMPUTER AIDED ENGINEERING GRAPHICS

Category	L	T	P	Credit
ESC	2	0	2	3

Preamble

Engineering Graphics is referred as language of engineers. An engineer needs to understand the geometry of any object through its orthographic or pictorial projections. The knowledge on engineering graphics is essential in proposing new product designs through drawings and in reading or understanding the existing drawings. This course covers manual drawing of points, straight lines and Computer aided Drawing of orthographic projection of planes & solids and isometric projection of simple and combined solids.

Prerequisite

Basic knowledge about geometry of objects.

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

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Assessment Pattern

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

Marks Allocation for Internal Assessment:

Sl. No	Description	Marks
1	Submission of Drawing sheets	60
2	Test	40
	Total	**100***

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

Syllabus

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

Geometric constructions and projections of points (in all quadrants) and projections of straight lines (in first quadrant) inclined to one reference plane. (Manual Drawing).

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

Projections (Elevation and Plan) of plane surfaces in first quadrant, inclined to any one reference plane by rotating object method using Computer Aided Drafting software.

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

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

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

Text Book

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

Reference Books

1. Shah M.B, and Rana B.C (2009) "Engineering Drawing and Computer Graphics",

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

Course Contents and Lecture Schedule

#	Topic	Lecture Hours	Practice Hours
1	**Introduction**- Significance of engineering graphics, Use of drawing instruments –Standards, Lettering and dimensioning, Scales, Orthographic Projection-Principles of orthographic projections,	1	1
2	Geometric constructions, Projection (Elevation and Plan) of points located in all quadrants, Projection (Elevation and Plan) of straight lines (in first quadrant) inclined to one reference plane (HP / VP). (Manual Drawing).	3	3
3	Drawing orthographic views (Front view, Top view and side view) of objects from the given isometric view (Manual Drawing).	2	2
4	Projection (Elevation and Plan) of plane surfaces in first quadrant, inclined to HP by rotating object method using Computer Aided Drafting software.	3	3
5	Projection (Elevation and Plan) of plane surfaces in first quadrant, inclined to VP by rotating object method using Computer Aided Drafting software.	3	3
6	Projection (Elevation and Plan) of regular solids (Prisms, Pyramids, Cylinder and cone) in first quadrant, by rotating object method when the axis is inclined to HP using CAD software.	3	3
7	Projection (Elevation and Plan) of regular solids (Prisms, Pyramids, Cylinder and cone) in first quadrant, by rotating object method when the axis is inclined to VP using CAD software.	3	3
8	Isometric projection – Principle, isometric scale, Isometric views and Isometric views of single simple solids and combined solids (Prisms, Pyramids, Cylinder, Cone, frustum of pyramid, frustum of cone in vertical positions only) using CAD software.	3	3
9	Isometric views of irregular solids from orthographic views by 3-D modelling using Computer Aided Drafting software.	3	3
	TOTAL	**24**	**24**

Marks Allocation for Continuous Assessment:

Sl. No	Description	Marks
1	Manual Drawing sheets (A4) submission	15
2	Computer Aided Drafting (CAD) Exercises	20
3	Continuous Assessment Test (CAT) using CAD software	15
Total		**50**

Question Pattern for Terminal Examination (Using CAD software only):

Question Number	Description	Type	Marks
1	Projection (Elevation and Plan) of points in all quadrants and straight lines (in first quadrant) inclined to any one reference plane.	Either or type	10
2	Orthographic views (Front view, Top view and side view) of objects from the given isometric view.	Either or type	10
3	Projection (Elevation and Plan) of plane surfaces (in first quadrant) inclined to any one reference plane.	Either or type	20
4	Projection (Elevation and Plan) of solids (in first quadrant) inclined to any one reference plane.	Either or type	20
5	3-D modelling of combined solids (Prisms, Pyramids, Cylinder, Cone, frustum of pyramid, frustum of cone in vertical positions only) and their isometric view.	Either or type	20
6	3-D modelling of irregular solids from orthographic views and their isometric view.	Either or type	20
Total			**100**

Note:

1. **One test or two tests will be conducted locally by respective Faculty In - charges during regular class hours to account for continuous assessment test (CAT) marks.**
2. **Terminal Practical examination (3 hrs) will be conducted centrally by the office of Controller of Examinations.**

Course Designers:

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22EC190	ENGINEERING EXPLORATION

Category	L	T	P	Credit
ESC	1	0	2	2

Preamble

The Course Electronics and Communication Engineering Exploration provide an introduction to Engineering and specifically to Electronics and Communication Engineering fields. It is designed to help the student to learn about engineering and how it affects our everyday lives. The students develop their fundamental understanding of critical concepts of Electronic controls in Consumer products and about Telecommunication through practical sessions.

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 technological & engineering development, change and impacts of engineering	TPS2	70	70
CO2	Demonstrate the basic concepts of Electronics and functional blocks of communication system	TPS3	70	70
CO3	Interpret the role of Electronic controls in Domestic appliances	TPS3	70	70
CO4	Apply the concept of Electronics and Communication Engineering Design Process for building an electronic hardware	TPS3	70	70

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Assessment Pattern

	Assesment-1						Assesment-2			Terminal Examination		
	THEORY						PRACTICAL			PRACTICAL		
CO	Case study			CAT-1								
TPS Scale	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
CO1		50			50							
CO2			50			50						
CO3									40			40
CO4									60			60

Syllabus

What is Engineering: Engineering Requirement, Engineering disciplines, Engineering advancements. **Electronics and Communication Engineering**: Evolution, Theme areas, Concepts in Electronics**-** Active and Passive Components, Signals and EM spectrum– Functional blocks of Wired and Wireless Communication, Communication systems/devices – PSTN, Mobile phone. **Consumer Electronics-** Electrical and Electronic aspects, Electronic controls in Domestic appliances, Audio and Video systems; **Engineering Design:** Problem definition, idea generation through brainstorming and researching, solution creation through evaluating and communicating, test/analysis, final solution and design improvement.

List of Experiments:

1. Identification of components, sources and measuring instruments - experimenting with active and passive components: resistor (voltage division/current division), capacitors and inductors
2. Domestic electrical wiring
3. Practicing soldering and de-soldering
4. Schematic and Layout preparation using CAD tool
5. Practicing PCB fabrication
6. Mini project based on Engineering Design Process demonstrating electronic controls in Domestic appliances

Reference Books

- Ryan A.Brown, Joshua W.Brown and Michael Berkihiser: “Engineering Fundamentals: Design, Principles, and Careers”, Goodheart-Willcox Publisher, Second Edition, 2014.
- Saeed Moaveni, “Engineering Fundamentals: An Introduction to Engineering”, Cengage learning, Fourth Edition, 2011.
- Lynford L. Goddard, Young Mo Kang, Steven J. McKeown, Alexandra Haser, Cori C. Johnson, Madison N. Wilson, “A Project-Based Exploration of Electrical and Computer Engineering” Goddard Independent Publishing, Second Edition, 2020.
- Bali S.P, “Consumer Electronics”, Pearson Education, 2017.
- William D.Stanley amd John.M. Jeffords, “ Electronic Communications Principles and Systems”, Cengage Learning, 2009 (India Edition).

Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**Engineering**	
1.1	Engineering Requirement, Engineering disciplines, Engineering advancements	1
1.2	**Electronics and Communication –** Evolution, Theme areas	1
1.3	Active and Passive Components	1
2	**Tele Communication System**	
2.1	Functional blocks of Wired and Wireless Communication	1
2.2	Communication System/devices – PSTN, Mobile phone	2
3	**Consumer Electronics**	
3.1	Electrical and Electronic aspects in Domestic appliances	1
3.2	Electronic controls in Domestic appliances	1
3.3	Audio and Video systems	1
4	**Engineering Design Process**	
4.1	Problem definition	1
4.2	Idea generation through brainstorming and researching	
4.3	Solution creation through evaluating and	1

Module No.	Topic	No. of Periods
	communicating	
4.4	Test/Analysis	1
4.5	Final solution and design improvement	
	Theory	12
	Practical	24
	Total	**36**

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22EG170	ENGLISH LABORATORY	Category	L	T	P	Credit
		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

COs	Course Outcomes	TCE Proficiency Scale
CO1	Interpret words correctly through listening and watching general and technical online contents	TPS1
CO2	Develop appropriate pronunciation skills through listening and speaking practices	TPS3
CO3	Build and apply a wide range of lexicons in general and technical presentations	TPS3
CO4	Identify and apply the key ideas and spoken English features learnt through auditory and visual listening tools	TPS3
CO5	Experiment with inventiveness by creating a blog, vlog, or YouTube channel.	TPS3
CO6	Prepare and deliver oral and written presentations using digital tools.	TPS3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
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**

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

S.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 (Tens Voices, SV Agreement, Prepositions, Coherence Markers, Relative Clauses, Mod 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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22PH180	PHYSICS LABORATORY

Category	L	T	P	Credit
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

	Course Outcome	TCE Proficiency Scale	Expected Proficiency (%)	Expected Attainment Level (%)
CO1	Analyze 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

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	S	M	L	-	M	-	-	-	S	-	-	L
CO2.	S	M	L	-	M	-	-	-	S	-	-	L
CO3	S	M	L	-	M	-	-	-	S	-	-	L
CO4	S	M	L	-	M	-	-	-	S	-	-	L
CO5	S	M	L	-	M	-	-	-	S	-	-	L
CO6	S	M	L	-	M	-	-	-	S	-	-	L
CO7	S	M	L	-	M	-	-	-	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	Credit
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	TCE Proficiency Scale
CO1	Estimate the chemical water quality parameters of sample water / effluent	TPS3
CO2	Demonstrate presence of calcium ions in milk sample	TPS3
CO3	Determine the surface tension of solvent mixtures	TPS3
CO4	Estimate pH and acid content of samples using pH metric and conductometric titrations	TPS3
CO5	Illustrate the strength of oxidisable materials present in given sample by potentiometric method	TPS3
CO6	Determine Fe^{2+} ion in effluent using colorimetric method	TPS3
CO7	Calculate the efficiency of electroplating	TPS3
CO8	Determine the rate of corrosion of metal & alloy using potentio-dynamic polarisation method	TPS3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
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/Activities with CO Mapping

Experimental List	CO
Quantitative Analysis	
Estimation of total hardness of water sample	CO1

Estimation of COD of industrial effluent	CO1
Determination of calciumion inmilk 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 potentiodynamic polarisation technique (TAFEL)	CO8

Learning Resources

1. Vogel's Textbook of Quantitative Chemical Analysis (8^{TH}edition, 2014)
2. LaboratoryManual – Department of Chemistry, Thiagarajar College of Engineering (2022)

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