Bharatiya Vidya Bhavan's

Sardar Patel Institute of Technology

(Autonomous Institute Affiliated to University of Mumbai)

Revision: SPIT-1-18

Bachelor of Technology (B.Tech)

First Year Engineering
(Sem. I and Sem. II)

Effective from Academic Year 2018 -19

Academic Council Approval: **20/01/2018**

Dr. Rita Das *Head of Department*	*Dr. Surendra Rathod* *Dean Academics*	*Dr. Prachi Gharpure* *Principal*

Principal
Sardar Patel Institute of Technology
Bhavans Andheri Campus
Munshi Nagar, Andheri (West)
Mumbai - 400 058.

Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Scheme for First Year B.Tech.

Group 1: Computer Engineering and Information Technology

SEM I (Group 1)						
Course Code	**Course Name**	**Group**	**Teaching Scheme (Hrs./week)**			**Credits**
			L	**T**	**P**	**Total**
BS11	Engineering Mathematics I	BS	4	1	--	5
BS12	Applied Physics I	BS	3	--	--	3
BS13	Applied Chemistry I	BS	2	--	--	2
ES11	Basic Electrical and Electronics Engineering	ES	3	--	--	3
ES12	Engineering Mechanics	ES	3	1	--	4
ESL11	Basic Electrical and Electronics Engineering Lab	ES	--	--	2	1
ESL12	Engineering Mechanics Lab	ES	--	--	2	1
BSL14	Applied Science I Lab	BS	--	--	2	1
ESL13	Workshop I	ES	--	--	2	1
HSS11	Basic Communication Skills	HSS	1	2	--	2
	Total		16	4	8	23
SEM II (Group 1)						
Course Code	**Course Name**	**Group**	**Teaching Scheme (Hrs./week)**			**Credits**
			L	**T**	**P**	**Total**
BS 21	Engineering Mathematics II	BS	4	1	--	5
BS22	Applied Physics II	BS	3	--	--	3
BS23	Applied Chemistry II	BS	2	--	--	2
ES24	Programming Methodology and Data Structures	ES	3	--	--	3
ES25	Engineering Graphics	ES	3	1	--	4
ESL24	Programming Methodology and Data Structures Lab	ES	--	--	2	1
ESL25	Engineering Graphics Lab	ES	--	--	2	1
BSL24	Applied Science II lab	BS	--	--	2	1
ESL23	Workshop II	ES	--	--	2	1
MC21	Environmental Studies	MC	1	--	--	1
MC22	Constitution of India	MC	1	--	--	1
	Total		17	2	8	23

Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Group 2: Electronics and Electronics & Telecommunication

SEM I (Group 2)						
Course Code	**Course Name**	**Group**	**Teaching Scheme (Hrs./week)**			**Credits**
			L	**T**	**P**	**Total**
BS11	Engineering Mathematics I	BS	4	1	--	5
BS12	Applied Physics I	BS	3	--	--	3
BS13	Applied Chemistry I	BS	2	--	--	2
ES14	Programming Methodology and Data Structures	ES	3	--	--	3
ES15	Engineering Graphics	ES	3	1	--	4
ESL14	Programming Methodology and Data Structures Lab	ES	--	--	2	1
ESL15	Engineering Graphics Lab	ES	--	--	2	1
BSL14	Applied Science I Lab	BS	--	--	2	1
ES13	Workshop I	ES	--	--	2	1
HSS11	Basic Communication Skills	HSS	1	2	--	2
	Total		16	4	8	23
SEM II (Group 2)						
Course Code	**Course Name**	**Group**	**Teaching Scheme (Hrs./week)**			**Credits**
			L	**T**	**P**	**Total**
BS21	Engineering Mathematics II	BS	4	1	--	5
BS22	Applied Physics II	BS	3	--	--	3
BS23	Applied Chemistry II	BS	2	--	--	2
ES21	Basic Electrical Technology	ES	3	--	--	3
ES22	Engineering Mechanics	ES	3	1	--	4
ESL21	Basic Electrical Technology Lab	ES	--	--	2	1
ESL22	Engineering Mechanics Lab	ES	--	--	2	1
BSL24	Applied Science II lab	BS	--	--	2	1
ESL23	Workshop II	ES	--	--	2	1
MC21	Environmental Studies	MC	1	--	--	1
MC22	Constitution of India	MC	1	--	--	1
	Total		17	2	8	23

Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Evaluation Scheme

Group 1: Computer Engineering and Information Technology

SEM I (Group 1)						
Course Code	**Course Name**	**Group**	**Marks**			
			ISE	**MSE**	**ESE**	**Total**
BS11	Engineering Mathematics I	BS	20	20	60	100
BS12	Applied Physics I	BS	20	20	60	100
BS13	Applied Chemistry I	BS	20	20	60	100
ES11	Basic Electrical and Electronics Engineering	ES	20	20	60	100
ES12	Engineering Mechanics	ES	20	20	60	100
ESL11	Basic Electrical and Electronics Engineering Lab	ES	40	--	20	60
ESL12	Engineering Mechanics Lab	ES	40	--	20	60
BSL14	Applied Science I Lab	BS	50	--	--	50
ESL13	Workshop I	ES	50	--	--	50
HSS11	Basic Communication Skills	HSS	30	20	50	100
	Total					820
SEM II (Group 1)						
Course Code	**Course Name**	**Group**	**Marks**			
			ISE	**MSE**	**ESE**	**Total**
BS 21	Engineering Mathematics II	BS	20	20	60	100
BS22	Applied Physics II	BS	20	20	60	100
BS23	Applied Chemistry II	BS	20	20	60	100
ES24	Programming Methodology and Data Structures	ES	20	20	60	100
ES25	Engineering Graphics	ES	20	20	60	100
ESL24	Programming Methodology and Data Structures Lab	ES	40	--	20	60
ESL25	Engineering Graphics Lab	ES	50	--	50	100
BSL24	Applied Science II lab	BS	50	--	--	50
ESL23	Workshop II	ES	50	--	--	50
MC21	Environmental Studies	MC	20	--	30	50
MC22	Constitution of India	MC	10	10	30	50
	Total					860

Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Group 2: Electronics and Electronics & Telecommunication

SEM I (Group 2)						
Course Code	**Course Name**	**Group**	**Marks**			
			ISE	**MSE**	**ESE**	**Total**
BS11	Engineering Mathematics I	BS	20	20	60	100
BS12	Applied Physics I	BS	20	20	60	100
BS13	Applied Chemistry I	BS	20	20	60	100
ES14	Programming Methodology and Data Structures	ES	20	20	60	100
ES15	Engineering Graphics	ES	20	20	60	100
ESL14	Programming Methodology and Data Structures Lab	ES	40	--	20	60
ESL15	Engineering Graphics Lab	ES	50	--	50	100
BSL14	Applied Science I Lab	BS	50	--	--	50
ES13	Workshop I	ES	50	--	--	50
HSS11	Basic Communication Skills	HSS	30	20	50	100
	Total					860
SEM II (Group 2)						
Course Code	**Course Name**	**Group**	**Marks**			
			ISE	**MSE**	**ESE**	**Total**
BS21	Engineering Mathematics II	BS	20	20	60	100
BS22	Applied Physics II	BS	20	20	60	100
BS23	Applied Chemistry II	BS	20	20	60	100
ES21	Basic Electrical Technology	ES	20	20	60	100
ES22	Engineering Mechanics	ES	20	20	60	100
ESL21	Basic Electrical Technology Lab	ES	40	--	20	60
ESL22	Engineering Mechanics Lab	ES	40	--	20	60
BSL24	Applied Science II lab	BS	50	--	--	50
ESL23	Workshop II	ES	50	--	--	50
MC21	Environmental Studies	MC	20	--	30	50
MC22	Constitution of India	MC	10	10	30	50
	Total					820

Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs./week)			Credits Assigned			
		L	T	P	L	T	P	Total
BS11	Engineering Mathematics-I	4	1	--	4	1	--	5
		Examination Scheme						
		ISE		MSE		ESE		Total
		20		20		60		100

Course Objectives: To develop mathematical skills for solving engineering problems.

Pre-requisite Course Codes		HSC level Mathematics
After successful completion of the course, student will be able to		
Course Outcomes	**CO1**	To find powers, roots and logarithm of a complex number and separate function of a complex number into real and imaginary parts
	CO2	To find nth order derivative of a function and product of functions
	CO3	To expand the given function as power series
	CO4	To differentiate a function partially and apply it to extremise functions
	CO5	To find rank of a matrix and solve system of linear equations and its applications
	CO6	To solve system of linear equations by Numerical Methods and to encode and decode messages

Module No	Module name	Unit No.	Topics	Ref	Hrs.
1	**Complex Numbers**		**Revision:** Complex Numbers as ordered pairs, Argand's diagram, Cartesian, Polar and Exponential form of Complex Numbers.		01
		1.1	De'moivre's Theorem and its application to determine powers of complex numbers. Roots of complex numbers by De'moivre's Theorem	1,2,3, 5	03
		1.2	Expansion of $\sin n\theta$ and $\cos n\theta$ in terms of powers of$\sin\theta$and$\cos\theta$. Expansion of $sin^n\theta$and $cos^n\theta$ in terms of sines and cosines		02
		1.3	Hyperbolic Function: Circular function and relation between circular and hyperbolic function, Inverse hyperbolic functions. Separation into real and imaginary parts of complex functions.		05
		1.4	Logarithm of complex numbers.	1,2,3, 5	02
2	**Differential Calculus**	2.1	Successive Differentiation: nth derivative of standard functions.	1,2,3, 5	02
		2.2	Leibnitz's Theorem on nth derivative of product		02

			of two functions.		
		2.3	Infinite series: Maclaurin's series (without proof). Expansion of standard functions, Expansion of function in power series using i) Maclaurin's series ii) Standard series method iii) Method of differentiation and integration iv) Method of substitution.		05
		2.4	Taylor's Series (Without Proof).i) Expansion of function $f(x+h)$in powers of x and h ii) $f(x)$ in powers of $(x-a)$		01
3	**Partial Differentiation**	3.1	Partial derivatives of first and higher order, total differential coefficient and total derivative. Partial derivatives of Composite and Implicit functions.	1,2,3, 5	04
		3.2	Euler's theorem on homogeneous functions with two and three independent variables, deduction from Euler's theorem		03
		3.3	Application of partial derivatives: i) Local Maxima and Minima of functions of two variables. ii) Lagrange's Method of undetermined multipliers.		04
4	**Matrix and Vectors**		**Revision:** Revision of basic matrix and vectors.		01
		4.1	Rank of Matrix, Normal form, and Echelon form.	1,2,3, 4,5,6, 7	03
		4.2	Consistency and solution of simultaneous linear homogeneous and Non-homogeneous equations.		04
		4.3	Application of solving system of equations in electrical networks, traffic control and balancing chemical equations.		02
		4.3	Linear dependence and independence of vectors.		02
		4.4	Curl and divergence of a vector.		01
		4.5	Solution of system of linear algebraic equations, by (1) Gauss Elimination Method, (2) Gauss Jacobi Iteration Method, (3) Gauss Seidel Method.		03
		4.6	Application of matrices to Coding and De-coding		02
				Total	52

References:

[1] Kreyszig, "Advanced Engineering Mathematics", 9th edition, John Wiley

[2] H.K.Dass,"Advanced Engineering Mathematics", 28th edition,S.Chand, 2010

[3] Grewal B.S., "Higher Engineering Mathematics", 38th edition, Khanna Publication

[4] H Anton and CRorres,"Elementary Linear Algebra Application Version", 6th edition, JohnWiley& Sons, 2010

[5] Jain and Iyengar, "Advanced Engineering Mathematics", 4th edition, Narosa Publishing House, Pvt. Ltd, 2014

[6] S.S. Sastry, "Introductory Methods of Numerical Analysis", 4th edition, Prentice-Hall of IndiaPvt.Ltd.

[7] M. Eisenberg, "Hill Cipher and Modular Linear Algebra", 3 Nov 1999

Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs./week)			Credits Assigned			
BS12	Applied Physics I	L	T	P	L	T	P	Total
		3	-	-	3	-	-	3
		Examination Scheme						
		ISE			MSE		ESE	Total
		20			20		60	100

COURSE OBJECTIVE:

To provide the knowledge and methodology necessary for solving problems in the field of engineering

Pre-requisite Course Codes		HSC level physics
After successful completion of the course, student will be able to		
Course Outcomes	C01	Illustrate the knowledge of crystallography and identify crystal structure using X-ray diffraction
	C02	Comprehend the Physics of semiconductors and apply the same to electronic devices
	C03	Identify various engineering materials based on their electrical and magnetic properties
	C04	Apply the knowledge of superconductivity for various potential applications
	C05	Describe the working of transducer to produce ultrasonic waves and its various applications

Module No.	Module Name	Unit no.	Topics	Ref.	Hrs.
1	Crystallography	1.1	Space lattice, Unit Cell and its characteristics, Bravais lattices, Cubic crystal system; HCP structure, Special cubic crystal structures:- Diamond structure, ZnS structure, NaCl structure, $BaTiO_3$ structure	1,2, 4	06
		1.2	Miller indices of crystallographic planes & directions; interplanar distance; introduction to X-rays, X-ray diffraction and Bragg's law; Determination of crystal structure	1,2, 4	05
		1.3	Ligancy and Critical radius ratio; Point defects	1,2, 4	02
2	Semiconductors	2.1	Band formation in solids and classification of solids on band theory; drift, mobility and	1,2, 4	03

			conductivity in conductors; Fermi-Dirac distribution function and Fermi level in a conductor, insulator		
		2.2	intrinsic and extrinsic semiconductors; intrinsic conductivity and extrinsic conductivity; Law of mass action, charge neutrality condition; intrinsic carrier concentration, electron and hole concentration; Extrinsic carrier concentration as a function of temperature; Effect of impurity concentration and temperature on the Fermi Level; Hall Effect and its applications. Drift and Diffusion current density	1,2, 4	04
		2.3	Formation of a P-N junction, depletion region and barrier potential; Energy band structure of P-N Junction (unbiased, forward-bias, reverse-bias); concept of carrier current densities in p-n junction in equilibrium, forward bias and reverse bias; Breakdown mechanism - zener effect and avalanche	1,2, 4	03
		2.4	P-N junction devices: LED, zener diode, photoconductors, photovoltaic solar cells and Bipolar Junction Transistors	1,2, 4	03
3	Dielectric and Magnetic materials	3.1	Dielectric constant, polarization, relative permittivity, dielectric susceptibility, Relation between three electric vectors D, E and P, Effect of dielectric on capacitance; Polarizability; Clausius-Mossotti equation, Types of polarization; Ferroelectric materials, Applications of dielectric materials - Requirement of good insulating material, some important insulating material	2,3, 4	04
		3.2	Origin of magnetization using Atomic Theory; classification of magnetic materials; Origin of ferromagnetism, domain theory and Hysteresis loss; Soft & hard magnetic materials and their applications	1,2, 3,4	03
4	Superconductivity	4.0	Introduction, Meissner Effect; Type I and Type II superconductors; BCS Theory (concept of Cooper pair), Josephson junction; Applications of superconductors- SQUID, MAGLEV	4	03
5	Ultrasonics	5.0	Ultrasonic Waves; Methods of production of ultrasonic waves - Piezoelectric Oscillator & Magnetostriction Oscillator; low and high frequency applications	4	03
				Total	39

References:

[1] Kittel Charles and Paul McEuen,"Introduction To Solid State Physics", New Delhi,8th ed, John Wiley & Sons, 2015.

[2] Pillai S,"Solid State Physics", 7th ed, New age international, 2015.

[3] Dekker A J, "Electric Engineering Materials", PHI,1970.

[4] Bhattacharya D K and Tandon, "Engineering Physics", 1st ed, New Delhi, Oxford Press, 2015.

Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs./week)			Credits Assigned			
		L	T	P	L	T	P	Total
BS13	Applied Chemistry - I	2	0	0	2	0	0	2
		Examination Scheme						
		ISE		MSE		ESE		Total
		20		20		60		100

Course Education Objective:

- To provide necessary background of applied chemistry suited for relevant areas of engineering.

Pre-requisite Course Codes		HSC Level Chemistry
After successful completion of the course, student will be able to		
Course Outcomes	**CO1**	Estimate different types of hardness in water
	CO2	Illustrate purification techniques for water for domestic and industrial applications.
	CO3	Illustrate synthesis, properties and applications of polymers
	CO4	Illustrate different types of lubricants and their key properties and applications under varied operating parameters.
	CO5	Apply Gibb's Phase Rule to different chemical systems in equilibrium
	CO6	Illustrate synthesis, properties and applications of carbon nano-materials.

Module No	Module Name	Unit No.	Topics	Ref.	Hrs.
1	**Water**	**1.1**	Impurities in water, Hardness of water and types of hardness	1, 2, 4	1
		1.2	Determination of Hardness of water by EDTA method and numerical problems	1, 2	1
		1.3	Softening of water by Hot and Cold lime Soda method, Zeolite process, Ion Exchange process and numerical problems	1, 2	3
		1.4	Desalination of Brackish Water by electrodialysis, Reverse osmosis and ultra-filtration	1,2	1
		1.5	BOD, COD, Definition and Significance, numerical problems based on COD.	1, 2, 4	1

Module No	Module Name	Unit No.	Topics	Ref.	Hrs.
2	Polymers	2.1	Introduction to polymers, Classification of polymers and Molecular weights	1, 2, 3	1
		2.2	Addition and Condensation Polymerization, Thermoplastic and Thermosetting plastic;	1, 2, 3	1
		2.3	Effect of heat on polymers (Glass transition temperature and melting)	1,2	1
		2.4	Fabrication of plastic by Compression, Injection and Extrusion moulding	1,2	1
		2.5	Preparation, properties and uses of Urea formaldehyde, Kevlar, PMMA	1, 2, 3	1
		2.6	Latest Applications:Conductingpolymers, Liquid crystal polymers, Engineering Plastics, Polymers in medicine and surgery, Polymer blends and alloys,	1, 2, 3,4	2
		2.7	Rubbers: Drawbacks of natural rubber, Vulcanization of rubber, Preparation, properties and uses of Silicone and Polyurethane rubber.	1, 2, 3	1
3	Lubricants	3.1	Definition, functions of a lubricant, Mechanism of lubrication	1, 2, 4	1
		3.2	Solid lubricants (graphite), Semisolid lubricants (Grease, only general preparation, properties, and operating parameters), Additives in blended Oils,(Viscosity Index improvers, oiliness carriers, deposit inhibitors, antioxidants), Synthetic lubricants	1,2	2
		3.3	Properties of lubricants : viscosity index, Flash and fire points, Cloud and pour points, Acid value and numerical problems, Saponification value and numerical problems,	1, 2, 4	1
		3.4	Selection of lubricants: ICE, gears, refrigeration.	1, 2, 4	1
4	Phase Rule	4.1	Gibb's Phase Rule, Terms involved with examples, Advantages and Limitations of Phase Rule.	1, 2	1
		4.2	One Component System (Water),	1, 2	1
		4.3	Reduced Phase Rule, Two Component System (Pb- Ag).	1, 2	1

Module No	Module Name	Unit No.	Topics	Ref.	Hrs.
5	Carbon Nano Materials	5.1	Introduction to nanomaterials, Fullerenes, Carbon nanotubes	1, 4	1
		5.2	Synthesis: Tops down and Bottoms Up Approach, (LASER ablation, CVD)	1, 4	1
		5.3	Properties of Fullerenes, Applications of nanomaterials in catalysis, electronics and communications, energy sciences, environment, medicine.	1, 4	1
	Total				26

References:

[1] P. C. Jain & M. Jain, *Engineering Chemistry*, 16th Ed, New Delhi, India:Dhanpat Rai Publishing Co. (P) Ltd., 2014
[2] S. S. Dara & S. S. Umare,*A Textbook of Engineering Chemistry*, 12th ed., New Delhi, India: S. Chand & Co. Ltd., 2013
[3] S. Chawla, *A Textbook of Engineering Chemistry*, 3rd ed.,Delhi, India:Dhanpat Rai & Co. (Pvt.) Ltd., 2015
[4] S. Agarwal, *Engineering Chemistry Fundamentals and Applications*, Isted, Delhi, India: Cambridge Univ. Press., 2015

Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs./week)			Credits Assigned			
		L	T	P	L	T	P	Total
ES11	Basic Electrical and Electronics Engineering	3	-	--	3	--	--	3
		Examination Scheme						
		ISE		MSE		ESE		Total
		20		20		60		100

Pre-requisite Course Codes		--
Course Outcomes	CO1	Compute various electrical quantities of given dc circuit using circuit simplification techniques and various network theorems.
	CO2	Describe the concept of ac circuit and its resonance phenomena for a given RL, RC and RLC circuit.
	C03	Compare Diode, BJT, FET on the basis of their operation and applications.
	CO4	Implement applications using OPAMP and timer circuit.

Module No.	Unit No.	Topics	Ref.	Hrs.
Prerequisite	A	Concept of e.m.f, potential difference, current, ohm's law, resistance, resistivity, series and parallel connections, power dissipation in resistance, effect of temperature on resistance		02
	B	Capacitors, with uniform and composite medium, energy stored in capacitor, R-C time constant.		
	C	Magnetic field, Faraday's laws of Electromagnetic induction, Hysterics and eddy current losses, energy stored in an inductor, time constant in R-L circuit		
1		**DC circuit**		
	1.1	Kirchhoff 's laws, Ideal and practical voltage and current source, Source transformation, Star-delta transformation	1,2	03
	1.2	Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem	1,2	03
2		**AC circuit**		
	2.1	Generation of alternating voltage and currents, RMS and Average value, form factor , crest factor, AC through resistance, inductance and capacitance	2,3	03
	2.2	R-L , R-C and R-L-C series and parallel circuits, power and power factor	2,3	04
	2.3	Series and parallel resonance, Q-factor and bandwidth	2,3	03

3		**Diode, BJT and applications**		
	3.1	Half wave, Full wave and Bridge rectifier circuit, Filter circuit, Zener as a regulator, Clipper and clamper circuit using diode	4	03
	3.2	BJT operation, CE, CB and CC configuration of BJT, BJT as a switch, BJT as a current amplifier and voltage amplifier, Testing of BJT using digital multimeter,	4	03
4		**FET operation and applications**		
	4.1	FET operation, Configuration of FET, Common source FET amplifier, Comparison between BJT and FET, advantages of negative feedback in CE and CS amplifier,	4	03
	4.2	Barkhausen stability criterion in oscillator, RC phase shift oscillator, Hartley and colpitts oscillator, Crystal oscillator	4	03
5		**Operational amplifier**		
	5.1	Operational amplifier, block diagram representation, IDEAL opamp characteristics, open loop configuration	5	02
	5.2	Opamp applications: Opamp as an inverting and noninverting amplifier, opamp as a adder, subtractor, precision rectifier,	5	03
	5.3	Introduction of IC555 timer, Internal block diagram of IC555, Astable, monostable and bistable mode using IC555	5	03
			Total	**39**

References:

[1] B.L.Theraja "Electrical Technology" Vol-I and II, S. Chand Publications, 23rd ed. 2003.

[2] Joseph A Edminister, "Schaum's ouline of theory and problems of electric circuits" Tata McGraw Hill, 2nd edition

[3] S.Sivanagaraju, G. Kishor, C. Srinivasa Rao, " Electrical Circuit Analysis" CENGAGE Learning

[4] David Bell, " Electronic Devices and Circuits" Fifth Edition, Oxford University Press

[5] Ramakant A. Gayakwad, "OPAMP and Linear ICs", 4th Edition, Prentice Hall / Pearson Education, 2001.

Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs./week)			Credits Assigned			
		L	T	P	L	T	P	Total
ES12/ES22	Engineering Mechanics	3	1	--	3	1	--	4
		Examination Scheme						
		ISE		MSE		ESE		Total
		20		20		60		100

Course Outcomes:

ES12/ES22 Engineering Mechanics	Learners will be able to…
CO1	Determine resultant of coplanar force system or equivalent force system (force & couple)
CO2	Construct the Free Body Diagram of real world problems and apply the conditions of equilibrium to determine the reactive forces for a given coplanar force system
CO3	Analyse the equilibrium of rigid bodies subjected to dry friction by using the laws of friction
CO4	Determine vectorically the resultant force and the reactive force for a 3-Dimensional force system
CO5	Determine the position, velocity and acceleration in different frames of reference for motion of a particle and plot the motion curves for rectilinear motion. Also Locate the Instantaneous Center of Rotation & determine the angular velocity for rigid bodies
CO6	Determine velocities of particle after collision

Module No.	Unit No.	Topics	Ref.	Hrs.
1 System of Coplanar Forces	1.1	Resultant of Concurrent forces, Parallel forces, Non-Concurrent Non-Parallel system of forces, Moment of force about a point, Couples, Varignon's Theorem. Distributed Forces in a plane.	1, 3	7
2 Equilibrium of System of Coplanar Forces	2.1	Condition of equilibrium for concurrent forces, parallel forces and Non-concurrent Non-Parallel or general force system and Couples. Equilibrium of connected bodies.	1, 3	4
	2.2	**Types of supports**, loads, Beams, Determination of reactions at supports for various types of loads on beams.	2,3	3
3 Friction	3.1	Introduction to Laws of friction, Cone of friction, Equilibrium of bodies on inclined plane, Application to problems involving wedges, ladders.	1, 3	5
4	4.1	Rectangular Components of Forces in Space, Resultant of	1, 2	5

Forces in space		Space forces, Moment of a Force about a point, axis and line. Equilibrium of a particle in space.		
5 Kinematics	5.1	**Kinematics of Particle** Motion along straight and curved path, Rectangular component of velocity and acceleration, Tangential & Normal component of acceleration, Motion curves(a-t, v-t, s-t curves), Projectile motion,	1, 2	7
	5.2	**Kinematics of Rigid Bodies** Instantaneous center of rotation for the velocity, velocity diagrams for bodies in plane motion, (up to 2 linkage mechanism)	1, 2	4
6 Kinetics of Particles	6.1	**Impulse and Momentum:**-Principle of Linear Impulse and Momentum. Law of Conservation of momentum. Impact and collision.	1, 2	4
				39 hrs

Recommended Books:

1. F.P. Beer, E.R. Johnston Jr., *Vector Mechanics for Engineers – Statics and Dynamics*, 9th ed., NY, USA, McGraw-Hill, 2010.
2. E.W. Nelson, C.L. Best, W.G. McLean, *Engineering Mechanic: Statics and Dynamics*, 5th ed., NY, USA, Schaum's Outline Series, McGraw-Hill, 1998.
3. A.K. Tayal, *Engineering Mechanics: Statics and Dynamics*, 13th ed., Delhi, Umesh Publications, 2005.

Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs./week)			Credits Assigned			
		L	T	P	L	T	P	Total
ESL11	Basic Electrical and Electronics Engineering Lab	--	--	2	--	--	1	1
		Examination Scheme						
		ISE		MSE		ESE		Total
		40		--		20		60

Pre-requisite Course Codes		
Course Outcomes	CO1	Compute electrical parameters for the given circuit using network theorem.
	CO2	Verify the resonance phenomenon for a given RLC circuit.
	CO3	Implement amplifier and oscillator using FET.
	CO4	Design amplifier for the given gain using operation amplifier .
	CO5	Compare astable, monostable and bistablemultivibrator circuit using given IC.

Exp. No.	Experiment Details	Ref.	Marks
1	Verification of Kirchoff's law by comparing a simulation result and by implementing the circuit on breadboard.	1,2	**5**
2	Verification of superposition theorem by comparing a simulation result and by implementing the circuit on breadboard.	1,2	**5**
3	Verification of maximum power transfer theorem by comparing a simulation result and by implementing the circuit on breadboard.	1,2	**5**
4	Obtain bandwidth of the given RLC circuit by comparing a simulation result and by implementing the circuit on breadboard.	1	**5**
5	Obtain the given gain using a BJT amplifier circuit and observe input and output waveforms. Write a C program for BJT amplifier circuit.	1	**5**
6	Measure the oscillator frequency for a RC phase shift oscillator. Compare the oscillator circuit using hartley and colpitts oscillator circuit	1	**5**
7	Obtain the given gain using an OPAMP in inverting and non inverting mode.	3	**5**
8	Design a timer circuit to switch on LED after a given time duration also modify the circuit for different on time of the LED.	3	**5**
		Total Marks	**40**

References:

[1] Joseph A Edminister, "Schaum's ouline of theory and problems of electric circuits" Tata McGraw Hill, 2nd edition

[2] B.L.Theraja "Electrical Technology" Vol-I S. Chand Publications, 23rd ed. 2003.

[3] M. B. Patil, V. Ramanarayanan, V. T. Ranganathan, "Simulation of Power Electronics Circuits", Narosa publication

Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs./week)			Credits Assigned			
		L	T	P	L	T	P	Total
ESL12/ESL22	Engineering Mechanics Laboratory	--	--	2	--	--	1	1
		Examination Scheme						
		ISE		MSE		ESE		Total
		40		--		20		60

Course Outcomes:

ESL12/ESL22 Engineering Mechanics Laboratory	Learners will be able to…
CO1	Draw force polygon for a coplanar force system and also determine resultant force using principle of moment
CO2	Determine reactive forces using conditions of equilibrium and Lami's theorem
CO3	Determine coefficient of friction for various contact surfaces
CO4	Obtain the various parameters for motion of a particle
CO5	Determine coefficient of restitution for collision
CO6	Design and conduct an experiment to demonstrate principles of statics and dynamics

Experiment No.	Experiment Details	Marks.
1	Draw the force polygon and determine the resultant of forces for concurrent coplanar force system.	05
2	Use the conditions of equilibrium for parallel force system and determine the support reactions.	05
3	Apply the principle of moment for equilibrium of levers.	05
4	Determine the coefficient of friction for glass slab and a metal plate on an inclined plane.	05
5	Determine the axial forces using Lami's theorem for Jib crane apparatus.	05
6	Use the conditions of equilibrium for non-concurrent non-parallel force system and draw the force polygon.	05
7	Measure the acceleration due to gravity with the help of simple pendulum apparatus.	05
8	Determine the range of projectile and the time of flight for the projectile motion.	05
9	Using the timing car apparatus 1. Plot the motion curves for linear motion under low friction; plot time vs distance, velocity 2. Demonstrate linear motion on an inclined plane	05

	3. Verify the law of conservation of momentum 4. Determine the coefficient of restitution for collision	
10	Plot the motion of projectile using air-cushion table apparatus.	05

Note: Students should perform minimum eight experiments under ISE component for successful completion of course.

Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs./week)			Credits Assigned			
BSL14	Applied Science I Lab	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
		-	-	2	-	-	1	1
		Examination Scheme						
		ISE	**MSE**		**ESE**			**Total**
		50	-		-			50

Applied Physics Lab

Course Outcomes	Learners will be able to	
	C01	Develop experimental skills for the use of laboratory instruments and tools
	C02	Develop an ability of understanding of concepts and principles of physics
	C03	Develop practical abilities (observation, recording data and analyzing results)
	C04	Comprehend importance of precision, accuracy of the experimental data

Experiment No.	Experiment Details	Marks*
1	To study I-V characteristics of a zener diode	**5**
2	To determine energy band gap of a semiconductor	**5**
3	To determine Hall coefficient, the type, density and the mobility of majority charge carriers in extrinsic semiconductors using Hall effect	**5**
4	To determine the retentivity and coercivity of a ferromagnetic material from its hysteresis curve	**5**
5	To determine dielectric constant of a given material	**5**
6	To measure velocity of ultrasonic waves in liquid medium using ultrasonic interferometer	**5**
7	To determine Planck's constant using photo cell	**5**
	Total Marks	**25**

*Any 5 experiments

Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Applied Chemistry Lab

Course Outcomes	Learners will be able to	
	CO1	Estimate the different types of hardness in water
	CO2	Remove hardness in water using suitable softening technique
	CO3	Identify suitable method of disposal of wastewater based on its Chemical Oxygen Demand (COD)
	CO4	Evaluate the molecular weight of polymer.
	CO5	Evaluate key properties of lubricants such as temperature dependence of viscosity, acid value and flash point.
	CO6	Illustrate the use of instruments like conductometer in acid base titrations

Exp. No.	Experiment Details	Ref.	Marks
1	Determination of total, temporary and permanent hardness of water sample	1, 2	**5**
2	Removal of hardness using ion exchange column	1, 2	**5**
3	Determination of Chemical oxygen demand (COD) in a waste water sample	2	**5**
4	Molecular weight determination of polymers by Oswald's Viscometer	2	**5**
5	To determine flash point of a lubricating oil	2	**5**
6	Determination of Viscosity of oil by Redwood Viscometer	1, 2	**5**
7	Determination of acid value of lubricant oil	2	**5**
8	Determination of amount of strong acid present in a solution by conductometric titration	2	**5**
		Total Marks	25*

* Any five from the above list of experiments will be performed

References:

[1] P. C. Jain & M. Jain, *EngineeringChemistry,* XV third reprint, New Delhi, India, Dhunpat Rai Publishing Co. (P) Ltd., 2010.

[2] S. S. Dara, *A Text Book on Experiments and Calculations in Engineering Chemistry*", IXthed, New Delhi, India, S. Chand & Company Ltd., 2003.

Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs./week)			Credits Assigned			
		L	T	P	L	T	P	Total
ESL13	Workshop I	--	--	2	--	--	1	1
		Examination Scheme						
		ISE		MSE		ESE		Total
		50		-		-		50

Course Objective:

The objective is to develop technical life skill sets. This exercise also aims in inculcating respect for physical work and hard labor in addition to some amount of value addition by getting exposed to interdisciplinary engineering domains.

Trade No.	Topics	Ref.	Hrs.
1	**Carpentry** • Use and setting of hard tools like hacksaws, jack planes, chisels and gauges for construction of various joints, wood turning and modern wood turning methods. • Term work to include one carpentry job involving a joint and report on demonstration of a job involving wood turning	1	8
2	**Electrical board wiring** • House wiring, staircase wiring, wiring diagram for fluorescent tube light, Godown wiring and three phase wiring for electrical motors.	6,7	8
3	**Hardware and Networking:** • Dismantling of a Personal Computer (PC), Identification of Components of a PC such as power supply, motherboard, processor, hard disk, memory (RAM, ROM), CMOS battery, CD drive, monitor, keyboard, mouse, printer, scanner, pen drives, disk drives etc. • Assembling of PC, Installation of Operating System (Any one) and Device drivers, Boot-up sequence. Installation of application software (at least one) • Basic troubleshooting and maintenance • Identification of network components: LAN card, wireless card, switch, hub, router, different types of network cables (straight cables, crossover cables, rollover cables) Basic networking and crimping.	4,5	8

4	**Introduction to 3D Modelling** • Developing a CAD file *.iges*or *.step* of 3D model to export it as a *.stl* file for the purpose of 3D printing.	3	4

References:

1. P. Kannaiah; K. L. Narayana, *Workshop Manual*, Scitech Publishers
2. Venkat Reddy, *Workshop Manual*, BS Publication
3. Sham Tickoo, *AutoCAD 2017*, Dreamtech Press
4. Gookin Dan, Troubleshooting your PC For Dummies, 2nd edition
5. Lowe Doug, Networking for Dummies
6. Frederic P Hartwell, Herbert P. Richter, W.C. Schwan, *Wiring simplified: Based on 2017 National Electrical Code"*
7. OSCAD, an open source tool for circuit design, simulation, analysis and PCB design" SPD publication.

ISE Distribution	**Marks**
Carpentry	10
Hardware & Networking	10
Electrical Board Wiring	10
3D modeling	10
Journal / Quiz	10

Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	**T**	**P**	**L**	**T**	**P**	**Total**
HSS11	Basic Communication Skills	1	2	-	1	1	-	2
		Examination Scheme						
		ISE**		**MSE***		**ESE**		
		30		20		50		

* MSE will be evaluated on the basis of speech, to be delivered by students on a given topic.
** ISE will be evaluated on the basis of marks scored in tutorials, out of 30.

Pre-requisite Course Codes		HSC level
After successful completion of the course, student will be able to		
Course Outcomes	**CO1**	Apply the principles of communication for professional communication
	CO2	Demonstrate the use of advanced vocabulary and grammar in spoken and written communication
	CO3	Assimilate and respond to received information using active listening and reading skills
	CO4	Prepare and confidently deliver a formal speech using right voice modulation
	CO5	Produce precise and concise business documents in the required format

Module No.	Module Name	Unit No.	Topics	Ref.	Hrs.
1	**Communication Theory**	1.1	Introduction, concept and meaning	3	1
		1.2	Barriers in communication	3	1½
		1.3	Methods – verbal, non-verbal, formal, informal	4	1 ½
		1.4	Organizational communication	4	1
2	**Grammar & Vocabulary**	2.1	Common grammatical concepts and structures	8	1
		2.2	Advanced grammar & enriching vocabulary	1	1
3	**Listening & Reading**	3.1	Listening Skills: Listening with a purpose	5	1
		3.2	Reading Skills: Skimming and scanning, comprehending the general idea and sub topics	5	1
		3.3	Note making	5	1
4	**Speaking & Writing**	4.1	Speaking Skills: Intonation & modulation	6	½
		4.2	Basics of public speech and gaining confidence	6	½
		4.3	Writing Skills: Summarizing	6	1

		4.4	Business Correspondence: Letter / Email writing basic structure & types	6	1
				TOTAL	**13 hrs.**

Tutorial No.	**Tutorial Details**	**Ref.**	**Marks**
1	Making a presentation on George Bernard Shaw's *Pygmalion* to assert the importance of theory in enhancing communication skills	8	-
2	Performing a group activity in class to demonstrate the ability to identify and overcome barriers in communication	3	-
3	Performing listening sessions in the language lab	-	-
4	Completing exercises on grammar and vocabulary: one word substitutions, phrases, idioms, etc.	8	10
5	Undertaking reading sessions in the language lab	-	-
6	Completing exercises on reading comprehension and summarization	3	10
7	Writing formal lettersand emails to exhibit business correspondence skills	6	10
8	Creating and putting up a blog	-	-
	TOTAL MARKS		30

References:

1. Michael McCarthy and Felicity O'Dell. *English Vocabulary in Use.* India: Cambridge University Press, 1999.
2. John Eastwood. *Oxford Practice Grammar.* India: Oxford, 1999.
3. Meenakshi Raman and Sangeeta Sharma. *Communication Skills.* India: Oxford India, 2011.
4. Shirley Mathew, *Communication Skills.* Pune, India: Technical Publications, 2013.
5. Rhoda A Doctor and Aspi H Doctor. *Communication Skills.* Mumbai, India: Sheth Publishers, 2009.
6. MeeraBharwani. *Communication Skills.* Mumbai, India: Synergy Knowledgeware, 2010.
7. Geoffrey Leech, Et al. *English Grammar for Today.* UK: Palgrave, 2005.
8. George Bernard Shaw. *Pygmalion.* London, UK: Penguin, 1914.

Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs./week)			Credits Assigned			
		L	T	P	L	T	P	Total
BS21	Engineering Mathematics-II	4	1	--	4	1	--	5
		Examination Scheme						
		ISE		MSE	ESE			Total
		20		20	60			100

Course Objectives: To develop mathematical skills for solving engineering problems.

Pre-requisite Course Codes		HSC level Mathematics
After successful completion of the course, student will be able to		
Course Outcomes	**CO1**	To solve differential equations of first order
	CO2	To solve differential equations of higher order using operators
	CO3	To apply techniques of solving Differential Equations of first order to electrical engineering problems
	CO4	To apply techniques of Numerical Integration, Beta & Gamma and Differentiation under integral sign to evaluate integrals
	CO5	To evaluate integrals in various co-ordinate system
	CO6	To calculate Area, Mass of Lamina and volume of regions

Module No	Module name	Unit No.	Topics	Ref	Hrs.
1	**Linear Differential Equations (First order)**	1.1	Exact differential Equations, Equations reducible to exact form by using integrating factors.	1,2,3, 6,7	03
		1.2	Linear differential equations (Review), equation reducible to linear form, Bernoulli's equation.		03
		1.3	Simple application of differential equation of first order and first degree to electrical engineering problem		02
		1.4	Numerical solution of ordinary differential equations of first order and first degree using (a)Taylor's series method (b)Euler's method (c) Modified Euler method (d) Runga-Kutta fourth order formula.	1,2,3, 6	04

2	**Linear Differential Equations (Higher order)**	2.1	Linear Differential Equation with constant coefficient- complementary function, particular integrals of differential equation of the type f(D)y = X where X is e^{ax},sin(ax+b), cos (ax+b), $e^{ax}V$, xV.	1,2,3, 6,7	08
		2.2	Cauchy's homogeneous linear differential equation and Legendre's differential equation, Method of variation of parameters.		03
3	**Integration (One variable)**	3.1	Beta and Gamma functions and its properties.	1,2,3, 6	05
		3.2	Differentiation under integral sign with constant limits of integration.		02
4	**Multiple Integrals & Applications**	4.1	Tracing of curves and standard solids.	1,2,3, 5,6	02
		4.2	Double integration-definition, Evaluation of Double Integrals.		03
		4.3	Change the order of integration, Evaluation of double integrals by changing the order of integration and changing to polar form.		05
		4.4	Triple integration definition and evaluation (Cartesian, cylindrical and spherical polar coordinates).		04
		4.5	Application of double integrals to compute Area, Mass and Volume. Application of triple integral to compute volume.		04
5	**Numerical Methods**	5.1	Numerical Integration by Trapezoidal, Simpson's 1/3rd and 3/8th rule and its applications to study motion of a moving body.	1,2,3, 4,6,8	04
				Total	52

NOTE: ISE component will be evaluated through assignments conducted in the tutorial sessions.

References:

[1] Kreyszig, "Advanced Engineering Mathematics", 9th edition, John Wiley
[2] H.K.Dass," Advanced Engineering Mathematics", 28th edition,S.Chand, 2010
[3] Grewal B.S., "Higher Engineering Mathematics", 38th edition, Khanna Publication
[4] S.C. Chapra and R.P. Canale, "Numerical Methods for Engineers with Programming and
[5] Software Applications", McGrawHill, Newyork 1998
[6] Thomas & Finney, "Calculus & Analytic Geometry", 9th edition, Addison Wesley.
[7] Jain and Iyengar, "Advanced Engineering Mathematics", 4th edition, Narosa Publishing House, Pvt Ltd, 2014
[8] Dennis G. Zill, "A First Course in Differential Equations with Modelling Applications, Cengage Learning
[9] S.S. Sastry, "Introductory Methods of Numerical Analysis", 4th edition, Prentice-Hall of India Pvt. Ltd.

Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs./week)			Credits Assigned			
BS22	Applied Physics II	L	T	P	L	T	P	Total
		3	-	-	3	-	-	3
		Examination Scheme						
		ISE		MSE		ESE		Total
		20		20		60		100

COURSE OBJECTIVE:

To make learners aware about the role and relevance of physics in engineering and technology.

Pre-requisite Course Codes		HSC level physics
After successful completion of the course, student will be able to		
Course Outcomes	C01	Comprehend the interference in thin films and Fraunhofer diffraction
	C02	Illustrate the principle, construction and working of various lasers and its applications
	C03	Explain the basics of fibre optics and its applications in optical fibre technology
	C04	Demonstrate the basic knowledge of quantum mechanics
	C05	Derive Maxwell's equations using the concepts of electrodynamics
	C06	Comprehend the significance of nanoscience and nanotechnology and its applications

Module No.	Module Name	Unit no.	Topics	Ref.	Hrs.
1	Interference and Diffraction	1.1	Interference by division of amplitude and division of wavefront; Thin film interference - interference in thin films of constant thickness due to reflected and transmitted light, origin of colours in thin films, interference in thin films of non-constant thickness (wedge-shaped) due to reflected light, formation of Newton's rings Applications of interference – testing of surface flatness, determination of thickness of thin wire, refractive index of a liquid, wavelength of incident light, radius of curvature of a lens; Anti-reflection coating, Highly reflecting films	2,3,4	07
		1.2	Fraunhofer diffraction at a single slit, Fraunhofer diffraction at a double slit, Fraunhofer diffraction due to N	2,3,4	04

			slits; Diffraction grating - Plane transmission grating		
		1.3	Rayleigh's criterion, resolving power of a diffraction grating, dispersive power of a diffraction grating; determination of wavelength of light using a plane transmission grating	2,3,4	02
2	LASER	2.1	Processes - Absorption of light, spontaneous emission, stimulated emission; Einstein's equations Population inversion; metastable states; pumping and pumping schemes; optical resonance cavity	2,4	03
		2.2	Solid state laser – Ruby and Nd:YAG laser, Gas laser – Helium Neon laser, semiconductor laser; Applications of laser in industry, medicine and holography. (construction & reconstruction of holograms)	2,4	03
3	Fibre Optics	3.1	Total internal reflection, critical angle; optical fibre – construction and types; Numerical aperture, cone of acceptance; V-number, number of modes of propagation	2,4	03
		3.2	Losses in optical fibre – attenuation and dispersion; Applications – optical fibre communication link, optical fibre sensors, medical applications	2,4	01
4	Quantum Mechanics	4.1	Introduction to quantum mechanics, Wave particle duality, de Broglie wavelength; experimental verification of de Broglie theory; wave packet, group velocity and phase velocity; Wave function, Physical interpretation of wave function; Heisenberg's uncertainty principle; Electron diffraction experiment; Applications of uncertainty principle	1,2	04
		4.2	Schrodinger's time dependent wave equation, time independent wave equation; Application of time-independent Schrodinger equation - Particle trapped in one dimensional box and Potential barrier	1,2	03
5	Electromagnetism	5.1	Coulomb's law; divergence and curl of electrostatic field; continuous charge distribution; application of Gauss' law for spherical symmetry	2,5	03
		5.2	Divergence of magnetic induction, Biot-Savart law; Ampere's circuit law; Faraday's law of emf; Maxwell's equations	2,5	04
6	Nanotechnology	6.0	Introduction to nanotechnology; important tools in nanotechnology – SEM, TEM, AFM; Applications of nanomaterials	2	02
				Total	39

References:

[1] Beiser Arthur, "Concepts of Modern Physics", 6th ed, McGraw Hill Education, 2009.

[2] Bhattacharya D K and Tandon, "Engineering Physics", 1st ed, New Delhi, Oxford Press, 2015.

[3] Halliday and Resnick, "Fundamentals of Physics", 10th ed, Wiley, 2013.

[4] Ghatak A, "Optics", 5th ed, McGraw Hill Education, 2012.

[5] Griffiths D, "Introduction to Electrodynamics", 4th ed, Pearson Education, 2015.

Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs./week)			Credits Assigned			
		L	T	P	L	T	P	Total
BS23	Applied Chemistry - II	2	0	0	2	0	0	2
		Examination Scheme						
		ISE		MSE		ESE		Total
		20		20		60		100

Course Objective:

- To provide necessary background of applied chemistry suited for relevant areas of engineering

Pre-requisite Course Codes		HSC Level Chemistry
After successful completion of the course, student will be able to		
Course Outcomes	CO1	Identify methods for corrosion control based on knowledge of different types of corrosion and factors affecting rate of corrosion
	CO2	Illustrate mechanism of combustion of fuels based on knowledge of their composition and properties
	CO3	Describe principle, construction and working of different types of batteries and fuel cells for varied applications
	CO4	Illustrate composition, properties and applications of different alloys
	CO5	Apply the principles of green chemistry to various industrial processes to minimize adverse impact on public health and environment
	CO6	Illustrate the properties and applications of different composite materials.

Module No	Module Name	Unit No.	Topics	Ref.	Hrs.
1	Corrosion	1.1	Introduction, Dry or Chemical Corrosion i) Due to oxygen ii) Due to other gases	1,2,4	1
		1.2	Wet or Electrochemical corrosion- Mechanism i) Evolution of hydrogen type ii) Absorption of oxygen	1,2	1
		1.3	Types of Electrochemical Corrosion- Galvanic cell corrosion, differential aeration and its various forms	1,2	1

1	**Corrosion**	**1.4**	Factors affecting the rate of corrosion- i) Position of metal in galvanic series,ii) overvoltage, iii) relative area of anodic and cathodic parts, v) purity of metal, nature of the corrosion product, vi) temperature, vii) moisture, viii) influence of pH, and ix) conductance of the medium	1,2	1
		1.5	Methods to decrease the rate of corrosion- Material selection, Proper designing, Cathodic protection- i) Sacrificial anodic protection ii) Impressed current method, Metallic coatings, Cathodic and anodic coatings; Methods of application of coatings - i) hot dipping, (galvanizing, and tinning), ii) metal cladding, and iii) Electroplating	1,2,4	2
2	**Fuels**	**2.1**	Definition, classification of fuels, Characteristics of a good fuel, Calorific value- Definition, Gross or Higher calorific value & Net or lower calorific value, units of heat, (only cal/g or kcal/kg),	1,2	1
		2.2	Dulong's formula & numerical for calculations of Gross and Net calorific values.	1	1
		2.3	Solid fuels- Analysis of coal- Proximate and Ultimate Analysis with Significance and numerical.	1,2	1
		2.4	Liquid fuels- Brief description of Fractional Distillation with diagram and fractions,	1,2	1
		2.5	Knocking, Octane number, Cetane number Antiknocking agents, Catalytic converter, unleaded petrol (use of MTBE),	1,2	1
		2.6	Combustion- Calculations for requirement of only oxygen and air (by weight and by volume only) for given solid & gaseous fuels.	1,2	2
3	**Batteries and Battery Technology**	**3.1**	Introduction, electrochemical principles used in batteries,	2	1
		3.2	Primary cells, Secondary Batteries, (Nickel-Cadmium, Nickel-Hydrogen, Nickel-Metal Hydride, Rechargeable Lithium ion batteries)	2	2
		3.3	Reserve Batteries, Fuel cell.	2	1

Module No	Module Name	Unit No	Topics	Ref No	Hours
4	Alloys	4.1	Introduction, Ferrous alloys, plain carbon steels, Limitations of plain carbon steels, Alloy Steels	1	1
		4.2	Application of alloy steels: heat resistant and corrosion resistant steels (only nichrome and stainless steel)	1	1
		4.3	Non-Ferrous alloys- Composition, properties and uses of- Alloys of Aluminum- i) Duralumin Alloys of Copper- (I) Brasses-i) Commercial brass ii) German silver, (II) Bronzes- i) Gun metal ii) High phosphorous bronze. Alloys of Pb - i) Wood's metal ii)Tinmann's solder. Shape Memory Alloys: Definition, Properties and Applications.	1	1
5	Green Chemistry	5.1	Introduction, Twelve Principles of Green Chemistry, Numericals on Atom Economy	2	1
		5.2	Industrial Applications: Synthesis of Adipic Acid, Green Solvents (Water, Ionic Liquids, Supercritcal Fluids), Green Fuels	2	2
6	Composite Materials	5.1	Composite: Introduction, Characteristic properties and applications of composite materials. Constitution- i) Matrix phase ii) Dispersed phase	1,2,3,4	1
		5.2	Classification of composites, Fiber reinforced Plastics, Structural -composites- i) Laminates (ii) Sandwich Panels,	1,2	1
		5.3	Cermets, Ceramics, Preparation and uses of Alumina and Silicon Carbide.	1,2,3,4	1
	Total				**26hrs**

References:

[1] P. C. Jain & M. Jain, *EngineeringChemistry*, 16th ed , New Delhi, India:Dhanpat Rai Publishing Co. (P) Ltd., 2014

[2] S. S. Dara & S. S. Umare, *A Textbook of EngineeringChemistry*, 12th ed. , New Delhi, India: S. Chand & Co. Ltd., 2013

[3] S. Chawla, *A Textbook of EngineeringChemistry*, 3rd ed., Delhi, India: DhanpatRai & Co. (Pvt.) Ltd., 2015

[4] S. Agarwal, *EngineeringChemistry Fundamentals and Applications*, Isted , Delhi, India: Cambridge Univ. Press., 2015

Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs./week)			Credits Assigned			
		L	T	P	L	T	P	Total
ES14/ES24	Programming Methodology & Data Structures	3	--	--	3	--	--	3
		Examination Scheme						
		ISE		MSE		ESE		Total
		20		20		60		100

Pre-requisite Course Codes		--
After successful completion of the course, student will be able to		
Course Outcomes	CO1	Provide solutions using structured and modular programming approach.
	CO2	Apply four primary constructs - sequential, iterative branching and recursive.
	CO3	Perform file handling and basic input output.
	CO4	Apply Stack, Queue and linked list operations for simple problem solving

Module No.	Unit No.	Topics	Ref.	Hrs.
1	1.1	**Introduction to C-Programming:** Algorithm, flowchart, Character set, standard Data types **Operators:**Arithmetic, Relational and logical, Assignment, Unary,Conditional, Bitwise, Comma, other operators. Expression, statements, Library Functions, Preprocessors	1,2,3	11
	1.2	**Control structures:** **Branching Structures**: If statement, If-else Statement, multi-way decision, Switch statement, Continue statement , Break statement **Iterative Structures:** while , do-while , for , Nested Control Structures	1,2,3	
	1.3	**Structured Data types and pointers:** **Arrays:**Declaration, Definition, Accessing array element, One-dimensional array, Two-Dimensional array **Pointer:**Introduction to pointers, Definition and uses of Pointers, Address operator, Dereferencing Pointer, Void Pointer	1,2,3	
2	2.1	**Functions:**Defining a Function, Accessing a Function, Function Prototype, Passing Arguments to a Function, Recursion	1,2,3	04
	2.2	**Storage Classes:** Auto , Extern , Static, Register	1,2,3	02
	2.3	**Strings:** Array of strings, String functions	1,2,3	02
	2.4	**Structures & Union:** Declaration, Initialization, structure within structure, Array of Structure, Operation on structures, Concept of Union,Difference between structure and union	1,2,3	02
3	3.1	**Pointers revisited:**Pointers to Pointers,Pointers and Array, Passing Arrays to Function, Pointers and Function, Pointers and two dimensional Array, Array of Pointers, Dynamic Memory	1,2,3	04

		Allocation		
	3.2	**File Handling:**Types of File, File operation- Opening, Closing, Creating, Reading, Processing File	1,2,3	03
4	**4.1**	**Introduction to Data Structure:** Linear and Non-Linear **Stack:**Stack as ADT, operations on stack, applications of stack.	4,5	04
	4.2	**Queue:**Queue as ADT , Operation on Queue,Types of Queue-Circular and Priority Queue, Applications of Queue.	4,5	04
5	**5.1**	**Linked List:**Linked List as ADT, Operations on Singly Linked List.	4,5	03
			Total	**39**

References:

[1] Kernighan , Ritchie, "The C programming Language", Prentice Hall of India.

[2] Carlo Ghezi, Mehdi Jazayeri, "Programing Language Concepts", John Wiley & Sons.

[3] Byron Gottfried, "Programing with C", Mc Graw Hill (Schaum's outline series)

[4] T.H.Coreman, C.E. Leiserson,R. L. Rivest, and C. Stein, "Introduction to algorithms", 2nd edition , PHI publications 2005.

[5] Ellis Horowitz, SartajSahni,S.Rajsekaran, "Fundamentals of Computer algorithms" , University press.

Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs./week)			Credits Assigned			
		L	T	P	L	T	P	Total
ES15/ES25	Engineering Graphics	3	1	--	3	1	--	4
		Examination Scheme						
		ISE		MSE		ESE		Total
		20		20		60		100

Course Outcomes:

ES15/ES25 Engineering Graphics	Learners will be able to…
CO1	Construct basic engineering curves
CO2	Draw projection of points and lines
CO3	Draw projection of regular solids inclined to both the reference planes
CO4	Draw the development of lateral surfaces of solids with sections
CO5	Read the 3 dimensional view and draw the orthographic projections
CO6	Read the orthographic projection and draw isometric views

Module No.	Unit No.	Topics	Ref.	Hrs.
1	1.1	**Introduction to Engineering Drawing:-**Types of Lines, Dimensioning Systems as per IS conventions. First angle method of projection only. **Engineering Curves:-**Basic construction of Cycloid and Involutes.	1,3	3
2	2.1	**Projection of Points and Lines:-** Lines inclined to both the Reference Planes (Excluding Traces of lines) and **simple application based problems on Projection of lines**.	1,3	6
3	3.1	**Projection of Solids:-**(Prism, Pyramid, Cylinder, Tetrahedron, Hexahedron and Cone only) Solid projection with the axis inclined to HP and VP. (Exclude Spheres, Composite, Hollow solids and frustum of solids). Use change of position or Auxiliary plane method	1,3	13
	3.2	**Section of Solids:-** Section of Prism, Pyramid, Cylinder, Tetrahedron, Hexahedron & Cone cut by plane perpendicular to at least one reference plane.(Exclude Curved Section Plane). Use change of position or Auxiliary plane method	1,3	
	3.3	**Development of Lateral Surfaces of Sectioned Solids:-** Lateral surface development of Prism, Pyramid,	1,3	

		Tetrahedron, Hexahedron, Cylinder, Cone**with section plane** inclined to HP or VP only. (Exclude DLS of a solid with a hole in it and Reverse Development).		
4	4.1	****Orthographic and Sectional Orthographic Projections:-** • Different views of a simple machine part as per the first angle projection method recommended by I.S. • Full or Half Sectional views of the Simple Machine parts. ****Introduction to AutoCAD:-**Basic Drawing and Editing Commands. Knowledge of setting up layers, Dimensioning, Hatching, plotting and Printing.	2,4	11
5	5.1	****Isometric Views:-** Isometric View/Drawing of blocks of plain and cylindrical surfaces using plain/natural scale only. (Exclude Spherical surfaces). ****Introduction to AutoCAD:-**Commands for isometric snap, 3D modeling: Working in 3-dimensions, Viewing 3D Objects, Basic wireframe models, Extruding, simple revolved objects. Boolean operations.	2,4	6
				39 hrs

**** These modules will be evaluated through laboratory work by using CAD tool.**

NOTE:

1. **ISE component will be evaluated for the A3 size sketch-book for the following topics as a tutorial:**

Sr. No.	Topics
1	Engineering Curves
2	Projection of Lines
3	Projection of Solids
4	Section of Solids
5	Development of Lateral Surfaces
6	Orthographic Projections
7	Sectional Orthographic Projections
8	Isometric View

2. **The above topics done in tutorial will also be included in AutoCAD practice sheets.**
3. **MSE and ESE will be conducted for the module 1 – 3 (i.e. Manual Drawing)**
4. **ESE (Practical Exam) will be conducted for the module 4-5 (i.e. On AutoCAD 2017)**

References:

1. N.D. Bhatt, *Engineering Drawing (Plane and solid geometry)*, Charotar Publishing House Pvt. Ltd.
2. N.D. Bhatt & V.M. Panchal, *Machine Drawing*, Charotar Publishing House Pvt. Ltd.
3. Dhananjay A Jolhe, *Engineering Drawing*, Tata McGraw Hill.
4. Prof. Sham Tickoo (Purdue University) &GauravVerma, "(CAD Soft Technologies) : Auto CAD 2017 (For engineers and Designers)", Dreamtech Press NewDelhi.

Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs./week)			Credits Assigned			
		L	T	P	L	T	P	Total
ESL14/ESL24	Programming Methodology & Data Structure Lab	--	--	2	--	--	1	1
		Examination Scheme						
		ISE		MSE		ESE		Total
		40		10		10		60

Pre-requisite Course Codes		--
After successful completion of the course, student will be able to		
Course Outcomes	CO1	Solve problems using structured programming approach
	CO2	Use various programming constructs.
	CO3	Develop applications using Linear Data Structures.
	CO4	Develop applications using Nonlinear Data Structures.
	CO5	Demonstrate debugging skill.
	CO6	Demonstrate documentation for simple programs.

Exp. No.	Experiment Details	Ref.	Marks
1	To apply various control structures to solve given problem.	1,2,3	5
2	To apply concept of functions to incorporate modularity.	1,2,3	5
3	To develop an application by applying concepts of structures/union.	1,2,3	5
4	To develop an application to demonstrate functionality of Arrays.	1,2,3	5
5	To exploring files as data structure .	4,5	5
6	To explore concepts of Stack as linear data structure by developing application	4,5	5
7	To explore the concepts of Queue as linear data structure by developing application	4,5	5
8	To explore the concept of dynamic memory allocation using Linked list as Non- linear data structure.	1,2,3	5
		Total Marks	40

References:

[1] Kernighan , Ritchie, "The C programming Language", Prentice Hall of India.

[2] Carlo Ghezi, Mehdi Jazayeri, "Programing Language Concepts", John Wiley & Sons.

[3] Byron Gottfried, "Programing with C", McGraw Hill (Schaum's outline series)

[4] T.H.Coreman, C.E. Leiserson,R. L. Rivest, and C. Stein, "Introduction to algorithms", 2nd edition , PHI publications 2005.

[5] Ellis Horowitz, SartajSahni,S.Rajsekaran, "Fundamentals of Computer algorithms" , University press.

Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs./week)			Credits Assigned			
		L	T	P	L	T	P	Total
ESL15/ESL25	Engineering Graphics Laboratory	--	--	2	--	--	1	1
		Examination Scheme						
		ISE			ESE			Total
		50			50			100

Course Outcomes:

ESL15/ESL25 Engineering Graphics Lab.	Learners will be able to…
CO1	Use CAD tool to draw and modify basic 2-dimensional objects with dimensions, line-types & layers as per IS conventions
CO2	Read the 3-dimensional view and draw orthographic projections using CAD tool
CO3	Read the orthographic projections and draw the isometric view using CAD tool
CO4	To read orthographic projections and draw the missing view using CAD tool

Session No.	AutoCAD Session Details	Marks
1	All the draw & modify commands	
2	Layer properties manager, page setup, plotting, etc.	
3	Drawing examples (5 sheets)	05
4	Orthographic Projections (1 problem)	10
5	Orthographic Projections (1 problem)	
6	Sectional Orthographic Projections (1 problem)	15
7	Sectional Orthographic Projections (1 problem)	
8	Isometric view (2 problems)	15
9	Isometric view (2 problems)	
10	Tutorial practice sheets or Missing View problems	05
	Total Marks	50 Marks

NOTE: ISE component will be evaluated based on above work and ESE (Practical Exam) will be conducted on CAD tool for 50 marks.

Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs./week)			Credits Assigned			
BSL24	Applied Science II Lab	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
		-	**-**	**2**	**-**	**-**	**1**	**1**
		Examination Scheme						
		ISE		**MSE**		**ESE**		**Total**
		50		**-**		**-**		**50**

Applied Physics Lab

After successful completion of the course, student will be able to		
Course Outcomes	C01	Develop experimental skills for the use of laboratory instruments and tools
	C02	Develop an ability of understanding of concepts and principles of physics
	C03	Develop practical abilities (observation, recording data and analyzing results)
	C04	Comprehend importance of precision, accuracy of the experimental data

Experiment No.	Experiment Details	Marks*
1	To measure radius of curvature of a plano-convex lens using Newton's Rings	**5**
2	To measure the thickness of a spacer using interference pattern at the air wedge between two glass plates	**5**
3	To determine the wavelengths of a mercury source using a plane diffraction grating	**5**
4	To determine the width of a slit from the diffraction pattern of a single-slit	**5**
5	To determinethegrating element of a diffraction grating using a laser source	**5**
6	To determine numerical aperture of an optical fibre	**5**
7	To measure DC, AC Voltage and Frequencyof AC signal using a Cathode-Ray Oscilloscope	**5**
	Total Marks	**25**

*Any 5 experiments.

Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Applied Chemistry Lab

After successful completion of the course, student will be able to		
Course Outcomes	CO1	Estimate metal content in alloys using different methods
	CO2	Estimate components of proximate analysis of coal
	CO3	Analyze flue gas for its composition
	CO4	Synthesis of bio fuel

Exp. No.	Experiment Details	Ref.	Marks
1	Estimate percentage of Zinc in an alloy of Copper and Zinc by Complexometric titration	1	**5**
2	Estimate percentage of Nickel by Complexometric titration.	1,2	**5**
3	Estimate percentage of Copper in brass by Iodometric Titration	1, 2	**5**
5	Estimate moisture content in coal.	1, 2	**5**
6	Estimate ash content in coal.	1,2	**5**
7	Analyse Flue gas for its composition (by Orsat's Apparatus).	1, 2	**5**
8	Laboratory synthesis of biodiesel.	2	**5**
		Total Marks	25*

* Any five from the above list of experiments will be performed.

References:

[1] P. C. Jain & M. Jain, *Engineering Chemistry*, XV thed reprint, New Delhi, India, Dhunpat Rai Publishing Co. (P) Ltd., 2010.

[2] S. S. Dara & S. S. Umare, *A Textbook of Engineering Chemistry*, XII thed reprint, New Delhi, India, S. Chand & Co. Ltd., 2013.

Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs./week)			Credits Assigned			
		L	T	P	L	T	P	Total
ESL23	Workshop II	--	--	2	--	--	1	1
		Examination Scheme						
		ISE		ESE				Total
		50		-				50

Course Objective:

The objective is to develop technical life skill sets. This exercise also aims in inculcating respect for physical work and hard labor in addition to some amount of value addition by getting exposed to interdisciplinary engineering domains.

Trade No.	Topics	Ref.	Hrs.
1	**Sheet Metal Practice** • Introduction to primary technology processes involving bending, punching and drawing various sheet metal joints, development of joints. • Term work to include a utility job in sheet metal.	1	8
2	**PCB Laboratory Exercises** • Layout drawing, Positive and negative film making, PCB etching and drilling, Tinning and soldering technique.	5	8
3	**Introduction to Electronic Components** • Exposure to usual electronic equipment/instruments such as Multi-meter, Oscilloscope, Function generator, IC tester and Power supply, Information about their front panels, Demonstrations on their working, Hands-on for measurement of component values and DC voltage using multi-meter, AC mains voltage/ 1 KHz Square wave/any small signal from function generator on Oscilloscope, Testing of sample digital ICs using IC tester. **OR** **Repairing of gadgets and appliances:** • Elementary skills of repairing juicer, mixer, grinder, etc.	5	8
4	**3D Printing** • Importing the *.stl* file to generate a *.gcode* for 3D printing through the use of open source softwares like *Cura,* etc.	4	4

References:

1. P. Kannaiah; K. L. Narayana, *Workshop Manual*, Scitech Publishers
2. Venkat Reddy, *Workshop Manual*, BS Publication
3. Sham Tickoo, *AutoCAD 2017*, Dreamtech Press
4. Think3D reference manual
5. Khandpur R.S., *Printed Circuit Boards*, Tata McGraw Hill, 2005.
6. Simon Monk, *Make Your Own PCBs with EAGLE: From Schematic Designs to Finished Boards* McGrawHill publication.
7. Charles Platt, *Encyclopedia of Electronic Components* O′Reilly; 1 edition.

ISE Distribution	Marks
Carpentry	10
PCB Laboratory Exercises	10
Introduction to Electronic Components OR Repairing of appliances	10
3D printing	10
Journal / Quiz	10

Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme			Credits Assigned		
		L	T	P	L	T	P
MC21	Environmental Studies	1	0	0	1	0	0
		Examination Scheme					
		ISE		ESE		Total	
		20		30		50	

After successful completion of the course, student will be able to		
Course Outcomes	**CO1**	Describe various characteristics of ecosystems.
	CO2	Outline different strategies for sustainable development through case studies.
	CO3	Enumerate causes, effects and control measures along with detection tools for environmental pollution with the help of examples and case studies
	CO4	Explain the Clearance, Consent and Authorization Mechanism with the help of case Studies
	CO5	Illustrate the harnessing methods and benefits of renewable sources of energy through real life examples and case studies
	CO6	Illustrate recent trends in environment protection strategies with the help of examples and case studies

Module No	Module Name	Unit No	Topics	Ref	Hours
1	**Ecosystems**	**1.1**	Ecosystem (definition, and classification, nutrient and energy flow); ecological pyramids	1, 2, 3	**1**
2	**Sustainable Development**	**2.1**	Definition of sustainable development, Appropriate Technologies and life cycle studiesas control measures for sustainable development	1, 3	**1**
3	**Environmental Pollution**	**3.1**	Air Pollution: detection tools, causes and effects (climate change, Kyoto Protocol) depletion of ozone layer (Montreal Protocol), photochemical smog; Control measures: Venturi Scrubber and Electrostatic precipitator	4,5	**2**
		3.2	Water Pollution: detection tools, sources and effects (Biomagnification, eutrophication,), Activated sludge method for treatment of domestic wastewater, Industrial wastewater treatment,	2, 6	**1**
		3.3	E-Pollution, Solid waste management by landfill and incineration	3	1
4	**Legal Provisions for**	**4.1**	Clearance Control and Authorisation Mechanism, Environment Impact Assessment	4	1

	environmental protection		(EIA)		
5	**Renewable Sources of Energy**	**5.1**	Renewable sources of energy : Solar, Wind and Hydropower	3, 4	1
6	**Environment and Technology**	**6.1**	Role of technology in environment, Green buildings, Indoor Air Pollution Carbon credits, Disaster management techniques	1, 3, 6	**1**
7	**Presentation and Activity**	**7.1**	**Case Studies, Posters *** Appropriate Technology Air Pollution Water Pollution Legislation Renewable energy sources Green Buildings Natural Disasters Man-made disasters		**4**
			Total		**13**

* to be part of ISE for 20M

List of References:

[1] ErachBharucha, *Textbook of Environmental Studies*, 2nd ed, Hyderabad, India: University Press, 2013
[2] AnubhaKaushik and P.C.Kaushik,*Perspectives in Environmental Studies*, 4th ed, New Delhi, India:New Age International (P) Ltd.
[3] Dr. V.M.Balsaraf, *Environmental Studies*, 1st ed, Mumbai, India:SynergyKnowledgeware, 2013
[4] R.Rajagopalan, *Environmental Studies*, 3rd ed. New Delhi, India: Oxford University Press, 2016
[5] C.S.Rao, *Environmental Pollution Control Engineering*, 2nd ed, New Delhi, India:New Age International Publishers (P)Ltd.
[6] AnanditaBasak, *Environmental Studies*, New Delhi, India:Pearson Education, 2013

Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs./week)			Credits Assigned			
		L	T	P	L	T	P	Total
MC22	Constitution of India	1	-	-	1	-	-	1
		Examination Scheme						
		ISE		MSE	ESE			Total
		10		10	30			50

Pre-requisite Course Codes		---
Course Outcomes	CO1	Student will be able to understand constitution principles
	CO2	Student will be able to co-relate with political system
	CO3	Student will be able to pursue the values of civic life
	CO4	Student will be able to exercise their rights and duties

Day No.	Topics	Hrs.
1	Historical background of constitution	1
2	Philosophy of constitution	1
3	Fundamental Rights – Duties	1
4	Directive principles – with respect to issues	1
5	Separation of powers	1
6	Law making procedure	1
7	Party system – Electoral dynamics	1
8	Challenges to constitutional democracy	1
9	Judicial Administration	1
10	Working of quasi – judicial bodies	1
11	Amendment process and language	1
12	Local self government	1
13	Core issues (Uniform civil code, Article 370, Reservation)	1
14	Landmark cases – Nanavati case, Shah Bano, KeshvanandBhartiVishakha Case etc	1

References:

[1] D.C. Gupta – Indian Government and Politics

[2] D.D. Basu – Introduction to the Constitution of India

[3] P. M. Bakshi - The Constitution of India

[4] M. V. Pylee - Constitutional History of India

Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs./week)			Credits Assigned			
		L	T	P	L	T	P	Total
ES21	Basic Electrical Technology	3	-	--	3	--	--	3
		Examination Scheme						
		ISE		MSE		ESE		Total
		20		20		60		100

Pre-requisite Course Codes		
Course Outcomes	CO1	Compute various electrical quantities of given dc circuit using circuit simplification techniques and various network theorems.
	CO2	Describe the concept of ac circuit and its resonance phenomena for a given RL, RC and RLC circuit.
	C03	Analyze the series and parallel magnetic circuit.
	CO4	Describe characteristics of single phase, three phase ac circuits and transformer equivalent circuit theoretically and graphically
	CO5	Describe the constructional details and working principle of given AC and DC machines

Module No.	Unit No.	Topics	Ref.	Hrs.
Prerequisite	A	Concept of e.m.f, potential difference, current, ohm's law, resistance,resistivity, series and parallel connections, power dissipation in resistance, effect of temperature on resistance		02
	B	Capacitors, with uniform and composite medium, energy stored incapacitor, R-C time constant.		
	C	Magnetic field, Faraday's laws of Electromagnetic induction, Hysterics and eddy current losses, energy stored in an inductor, time constant in R-L circuit		
1	1.1	Kirchhoff 's laws, Ideal and practical voltage and current source, Source transformation, Star-delta transformation	1,2	04
	1.2	Mesh and Nodal analysis, super node and super mesh	1,2	02
	1.3	Superposition theorem, Thevenin's theorem, Norton's theorem,Maximum power transfer theorem	1,2	06
2	2.1	Basic definitions to understand concepts in magnetic circuit, ohm's law in in a magnetic circuit, parallel magnetic circuit, coefficient of coupling, dot convention,	3	03
	2.2	Electrically joined coupled coils: Series adding, Series opposing, parallel adding, parallel opposing, comparison between magnetic and electrical circuit	3	02
3	3.1	Generation of alternating voltage and currents, RMS and Average value, form factor , crest factor, AC through resistance, inductance and capacitance	1,2	03

	3.2	R-L , R-C and R-L-C series and parallel circuits, power and power factor	1,2	03
	3.3	Series and parallel resonance, Q-factor and bandwidth	1,2	04
4	**4.1**	Three phase voltage and current generation, Star and delta connections, relationship between phase and line currents and voltages	1	01
	4.2	Power in three phase circuit, two wattmeter method	1	02
5	**5.1**	Single phase transformer :Construction, working principle, EMF equation, Phasor diagram with resistive, inductive and capacitive load	1,4	03
	5.2	DC machine: Construction, working principle,emf equation,Characteristic, applications	1,4	02
	5.3	Three phase induction motor: Construction, working principle, applications, equivalent circuit of three phase induction motor	1,4	03
	5.4	Single phase induction motor: Construction, working principle, double field revolving theory, split phase, capacitor start and shaded pole motor.	1,4	02
			Total	**42**

References:

[1] B.L.Theraja "Electrical Technology" Vol-I and II, S. Chand Publications, 23rd ed. 2003.

[2] Joseph A Edminister, "Schaum's ouline of theory and problems of electric circuits" Tata McGraw Hill, 2nd edition

[3] S.Sivanagaraju, G. Kishor, C. Srinivasa Rao, " Electrical Circuit Analysis" CENGAGE Learning

[4] D P Kothari and I J Nagrath "Electrical Machines", McGraw Hill, Fourth edition

Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs./week)			Credits Assigned			
		L	T	P	L	T	P	Total
ESL21	Basic Electrical Technology Lab	--	--	2	--	--	1	1
		Examination Scheme						
		ISE		MSE		ESE		Total
		40		--		20		60

Pre-requisite Course Codes		
Course Outcomes	CO1	Compute electrical parameters for the given circuit using network theorem.
	CO2	Verify the resonance phenomenon for a given RLC circuit.
	CO3	Compare single phase and three phase circuit for various terminology.
	CO4	Identify different parts of given ac and dc machines and implement circuit to control speed of motors in clockwise and anticlockwise direction.
	CO5	Implement any application using electronic components.

Exp. No.	Experiment Details	Ref.	Marks
1	Verification of Kirchoff's law	1,2,3	**5**
2	Verification of superposition theorem	1,2,3	**5**
3	Verification of maximum power transfer theorem.	1,2,3	**5**
4	Obtain bandwidth of the given RLC circuit.	1,2,3	**5**
5	Verify the relationship between line voltage/ phase voltage and line current/ phase circuit in three phase circuit	2	**5**
6	Obtain equivalent circuit of transformer using OC and SC test	1,4	**5**
7	List different parts from cut section of DC motor and three phase induction motor and control the speed of both in clockwise and anticlockwise direction.	4	**5**
8	Implement +15V/1A power supply.	5, 6	**5**
	Total Marks		**40**

References:

[1] M. B. Patil, V. Ramanarayanan, V. T. Ranganathan, "Simulation of Power Electronics Circuits", Narosa publication

[2] B.L.Theraja "Electrical Technology" Vol-I and II, S. Chand Publications, 23rd ed. 2003.

[3] Shaum series

[4] Sailendra Nath Bhadra, "Electric Machinery Experiment laboratory practices and simulation study", Narosa

[5] David Bell, "Electronic Devices and Circuits", Oxford University Press

[6] OSCAD by IITB