Bharatiya Vidya Bhavan's

Sardar Patel Institute of Technology

(Autonomous Institute Affiliated to University of Mumbai)

Revision: SPIT-1-19

Bachelor of Technology (B.Tech)
All Branches

First Year Engineering
(Sem. I and Sem. II)
Effective from Academic Year 2019 -20

Board of Studies Approval: Respective Department Boards

Academic Council Approval: 16/01/2019 & 14/05/2019

Rita Das
Dr. Rita Das
Head, ASH department

Dr. Surendra Rathod
Dean Academics
Bharatiya Vidya Bhavan's
Sardar Patel Institute of Technology

Dr. Prachi Gharpure
Principal
Bharatiya Vidya Bhavan's
Sardar Patel Institute of Technology

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 (2019-20)
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	Linear Algebra & Differential Calculus	BS	3	--	--	3
BS12	Engineering Physics	BS	4	1	--	5
ES11	Structured Programming Approach	ES	3	--	--	3
ES12	Digital Circuits	PC	3	--	--	3
BSL11	Computational Mathematics Lab-I	BS	--	--	2	1
BSL12	Engineering Physics Lab	BS	--	--	2	1
ESL11	Structured Programming Approach Lab	ES	--	--	4(2+2)	2
ESL12	Digital Circuits Lab	PC	--	--	2	1
ESL16	Workshop I	ES	--	--	2	1
HSS11	Communication Skills	HSS	2	--	2	3
MC21	Environmental Studies (Non-Credit)	MC	1	--	--	--
ABL-A	Essence of Indian Traditional Knowledge (Non-Credit)	MC	1	--	--	--
	Total		17	1	14	23

SEM II (Group 1)						
Course Code	**Course Name**	**Group**	**Teaching Scheme (Hrs/week)**			**Credits**
			L	**T**	**P**	**Total**
BS21	Differential Equations & Integral Calculus	BS	3	--	--	3
BS23	Engineering Chemistry	BS	2	--	--	2
ES23	Basic Electrical and Electronics Engineering	ES	3	--	--	3
ES24	Engineering Graphics	ES	2	--	--	2
BSL21	Computational Mathematics Lab-II	BS	--	--	2	1
BSL23	Engineering Chemistry Lab	BS	--	--	2	1
ESL23	Basic Electrical and Electronics Engineering Lab	ES	--	--	2	1
ESL24	Engineering Graphics Lab	ES	--	--	4(2+2)	2
ESL25	Python Programming Lab	ES	--	--	2	1
ESL26	Workshop II	ES	--	--	2	1
MC22	Constitution of India (Non-Credit)	MC	1	--	--	--
LSC	Life Skill Courses (Non-Credit)	LA	1	--	--	--
	Total		12	--	14	17

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 (2019-20)

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	Linear Algebra & Differential Calculus	BS	3	--	--	3
BS13	Engineering Chemistry	BS	2	--	--	2
ES13	Basic Electrical Technology	ES	3	--	--	3
ES14	Engineering Graphics	ES	2	--	--	2
BSL11	Computational Mathematics Lab-I	BS	--	--	2	1
BSL13	Engineering Chemistry Lab	BS	--	--	2	1
ESL13	Basic Electrical Technology Lab	ES	--	--	2	1
ESL14	Engineering Graphics Lab	ES	--	--	4(2+2)	2
ESL15	Python Programming Lab	ES	--	--	2	1
ESL16	Workshop I	ES	--	--	2	1
HSS11	Communication Skills	HSS	2	--	2	3
MC22	Constitution of India (Non-Credit)	MC	1	--	--	--
ABL-A	Essence of Indian Traditional Knowledge (Non-Credit)	MC	1	--	--	--
	Total		14	--	16	20

SEM II (Group 2)						
Course Code	**Course Name**	**Group**	**Teaching Scheme (Hrs/week)**			**Credits**
			L	**T**	**P**	**Total**
BS21	Differential Equations & Integral Calculus	BS	3	--	--	3
BS22	Engineering Physics	BS	4	1	--	5
ES21	Structured Programming Approach	ES	3	--	--	3
ES22	Digital Circuits	PC	3	--	--	3
BSL21	Computational Mathematics Lab-II	BS	--	--	2	1
BSL22	Engineering Physics Lab	BS	--	--	2	1
ESL21	Structured Programming Approach Lab	ES	--	--	4(2+2)	2
ESL22	Digital Circuits Lab	PC	--	--	2	1
ESL26	Workshop II	ES	--	--	2	1
MC21	Environmental Studies (Non-Credit)	MC	1	--	--	--
LSC	Life Skill Courses (Non-Credit)	LA	1	--	--	--
	Total		15	1	12	20

Sardar Patel Institute of Technology

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

Evaluation Scheme for First Year B.Tech (2019-20)

Group 1: Computer Engineering and Information Technology

SEM I (Group 1)						
Course Code	**Course Name**	**Group**	**Marks**			
			ISE	**MSE**	**ESE**	**Total**
BS11	Linear Algebra & Differential Calculus	BS	20	20	60	100
BS12	Engineering Physics	BS	20	20	60	100
ES11	Structured Programming Approach	ES	20	20	60	100
ES12	Digital Circuits	PC	20	20	60	100
BSL11	Computational Mathematics Lab-I	BS	40	--	--	40
BSL12	Engineering Physics Lab	BS	40	--	--	40
ESL11	Structured Programming Approach Lab	ES	80	--	20	100
ESL12	Digital Circuits Lab	PC	40	--	--	40
ESL16	Workshop I	ES	50	--	--	50
HSS11	Communication Skills	HSS	80	20	--	100
MC21	Environmental Studies (Non-Credit)	MC	--	--	--	--
ABL-A	Essence of Indian Traditional Knowledge (Non-Credit)	MC	--	--	--	--
	Total		410	100	260	770

SEM II (Group 1)						
Course Code	**Course Name**	**Group**	**Marks**			
			ISE	**MSE**	**ESE**	**Total**
BS21	Differential Equations & Integral Calculus	BS	20	20	60	100
BS23	Engineering Chemistry	BS	15	15	30	60
ES23	Basic Electrical and Electronics Engineering	ES	20	20	60	100
ES24	Engineering Graphics	ES	15	15	30	60
BSL21	Computational Mathematics Lab-II	BS	40	--	--	40
BSL23	Engineering Chemistry Lab	BS	40	--	--	40
ESL23	Basic Electrical and Electronics Engineering Lab	ES	40	--	--	40
ESL24	Engineering Graphics Lab	ES	80	--	20	100
ESL25	Python Programming Lab	ES	40	--	--	40
ESL26	Workshop II	ES	50	--	--	50
MC22	Constitution of India (Non-Credit)	MC	--	--	--	--
LSC	Life Skill Courses (Non-Credit)	LA	---	--	--	--
	Total		360	70	200	630

Sardar Patel Institute of Technology

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

Evaluation Scheme for First Year B.Tech (2019-20)

Group 2: Electronics and Electronics & Telecommunication

SEM I (Group 2)						
Course Code	**Course Name**	**Group**	**Marks**			
			ISE	**MSE**	**ESE**	**Total**
BS11	Linear Algebra & Differential Calculus	BS	20	20	60	100
BS13	Engineering Chemistry	BS	15	15	30	60
ES13	Basic Electrical Technology	ES	20	20	60	100
ES14	Engineering Graphics	ES	15	15	30	60
BSL11	Computational Mathematics Lab-I	BS	40	--	--	40
BSL13	Engineering Chemistry Lab	BS	40	--	--	40
ESL13	Basic Electrical Technology Lab	ES	40	--	---	40
ESL14	Engineering Graphics Lab	ES	80	--	20	100
ESL15	Python Programming Lab	ES	40	--	--	40
ESL16	Workshop I	ES	50	--	--	50
HSS11	Communication Skills	HSS	80	20	--	100
MC22	Constitution of India (Non-Credit)	MC	--	--	--	--
ABL-A	Essence of Indian Traditional Knowledge (Non-Credit)	MC	--	--	--	--
	Total		440	90	200	730

SEM II (Group 2)						
Course Code	**Course Name**	**Group**	**Marks**			
			ISE	**MSE**	**ESE**	**Total**
BS21	Differential Equations & Integral Calculus	BS	20	20	60	100
BS22	Engineering Physics	BS	20	20	60	100
ES21	Structured Programming Approach	ES	20	20	60	100
ES22	Digital Circuits	PC	20	20	60	100
BSL21	Computational Mathematics Lab-II	BS	40	--	--	40
BSL22	Engineering Physics Lab	BS	40	--	--	40
ESL21	Structured Programming Approach Lab	ES	80	--	20	100
ESL22	Digital Circuits Lab	PC	40	--	--	40
ESL26	Workshop II	ES	50	--	--	50
MC21	Environmental Studies (Non-Credit)	MC	--	--	--	--
LSC	Life Skill Courses (Non-Credit)	LA	--	--	--	--
	Total		330	80	260	670

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	Linear Algebra & Differential Calculus	3	-	-	3	-	-	3
		Examination Scheme						
		ISE		MSE	ESE			TOTAL
		20		20	60			100

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

Course Outcomes:

Pre-requisite	HSC level Mathematics		
Course Outcomes	Learners will be able		Cognitive Level
	CO1	To differentiate a function partially.	Knowledge
	CO2	To apply partial derivatives to find extreme values of 2 & more than 2 variables function.	Application
	CO3	To find rank of a matrix.	Comprehension
	CO4	To solve system of linear equations by Numerical Methods and to encode and decode messages.	Application
	CO5	To check if matrix is diagonalizable.	Comprehension
	CO6	To calculate functions of a square matrix and to find google page ranking.	Application

Module No	Unit No.	Topics	Ref	Hrs.
1		**Module name : Differential Calculus(Partial Differentiation)**		
	1.1	Partial derivatives of first and higher order. Partial derivatives of composite and implicit functions.	1,2,3,5	04
	1.2	Euler's theorem on homogeneous functions with two and three independent variables, deduction from Euler's theorem		03
	1.3	Application of partial derivatives: i) Local Maxima and Minima of functions of two variables. ii) Lagrange's Method of undetermined multipliers.		03
2		**Module name : Linear Algebra(Matrices)**		
		Revision: Revision of basic matrices.		01
	2.1	Rank of Matrix, Normal form, and Echelon form.	1,2,3,4,5	03

	2.2	Consistency and solution of simultaneous linear homogeneous and Non-homogeneous equations.		03
	2.3	Application of solving system of equations in electrical networks, traffic control and balancing chemical equations.		02
	2.4	Linear dependence and independence of vectors.		01
	2.5	Solution of system of linear algebraic equations, by (1) Gauss Elimination Method, (2)Gauss Jordan method (3) Gauss Jacobi Iteration method (4) Gauss Seidel Method.		03
	2.6	Application of matrices to Coding and De-coding	7	02
	2.7	Eigen values and Eigen vectors and its properties.(Theorems without proof)	1,2,3,4,5	04
	2.8	Cayley-Hamilton theorem and its applications.		02
	2.9	Similar matrices, diagonalizable matrices and functions of square matrix.		05
	3.0	Derogatory and non-derogatory matrices.		01
	3.1	Application to findgoogle page rank.		02
			Total	**39hrs**

Reference Books:

[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, John Wiley& 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 India Pvt.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			
		L	T	P	L	T	P	Total
BSL11	Computational Mathematics Lab-I	-	-	02	-	-	01	01
		Examination Scheme						
		ISE		MSE	ESE		Total	
		40		--	--		40	

Course Objectives: To develop logical and problem solving skills.

	After successful completion of the course, student will be able to	
Course Outcomes	CO1	Use Scilab as a tool to solve linear equations by various methods specified.
	CO2	Develop an understanding of logic of given methods.

Experiment No.	Experiment Details	Marks
1	To solve linear equations using Gauss Elimination method.	08
2	To solve linear equations using Gauss Jordan method.	08
3	To solve linear equations using Gauss-Jacobi method.	08
4	To solve linear equations using Gauss-Seidel method.	08
5	To find Eigen values and Eigen vectors.	08
	Total Marks	40

***Note: Students have to solve 2 problems using SCILAB in practical session which will be evaluated. In alternate week, tutorials and ISE will be conducted**.

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
BS12/BS22	Engineering Physics	4	1	-	4	1	-	5
		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-requiste Course Codes	HSC level physics		
Course Outcomes	Learners will be able to		Cognitive level
	CO1	Illustrate the knowledge of basic concepts of solid state physics, quantum mechanics and fibre optics	Understanding
	CO2	Visualize and sketch various lattice planes and directions using Miller Indices	Applying
	CO3	Solve the problems by applying the basics of semiconductors	Applying
	CO4	Use the Schrodinger equation to realize the concept of discreteness and quantum tunneling	Applying
	CO5	Explain the working of various LASERs and its practical applications	Understanding
	CO6	Determine the reactions for equilibrium of rigid bodies.	Understanding
	CO7	Demonstrate the understanding of applications of engineering mechanics to MEMS.	Understanding

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	1	04
		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		05
2	Semiconductors	2.1	Conduction in metals and semiconductors; Fermi-Dirac distribution function and Fermi level in a conductor, insulator and semiconductor	1	02
		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		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		03
		2.4	P-N junction devices: LED, zener diode, photoconductors, photovoltaic solar cells and Bipolar Junction Transistors		03

3	Quantum Mechanics	3.1	de-Broglie hypothesis; experimental verification of de Broglie hypothesis; 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	2,3,6	04
		3.2	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 (Tunneling), Harmonic oscillator (qualitative)		04
4	LASER & Fibre Optics	4.1	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
		4.2	Ruby and Helium Neon laser, semiconductor laser; Applications of laser in industry, medicine and holography. (construction & reconstruction of holograms)		03
		4.3	Propagation of light through optical fibre and its types; Numerical aperture, V-number	2,5	02
		4.4	Losses in optical fibre – attenuation and dispersion; Applications – optical fibre communication link, optical fibre sensors, medical applications		02
5	Mechanics and Modern Applications	5.1	Condition of equilibrium for concurrent forces, parallel forces and Non-concurrent Non-Parallel or general force system and Couples. Equilibrium of connected bodies.	7	06
		5.2	Types of supports, loads, Beams, Determination of reactions at supports for various types of loads on beams.	7	04
		5.3	Mechanics of MEMS: Basics of MEM sensors and actuators, Stiffness, Microcantilevers, Microhinges, Microbridges and Microsuspensions.	8	03
				Total	**52**

Recommended Books:

1. Bhattacharya D K and Tandon, "Engineering Physics", 1st ed, New Delhi, Oxford Press, 2015.
2. Halliday and Resnick, "Fundamentals of Physics", 10th ed, Wiley, 2013.
3. Beiser Arthur, "Concepts of Modern Physics", 6th ed, McGraw Hill Education, 2009.
4. Ghatak and Thyagarajan, "Lasers: Fundamentals and Applications", Springer, 2011.
5. Gerd Keiser, "Optical Fiber Communications", McGraw Hill.
6. Robert Eisberg& Robert Resnick, "Quantum Physics of Atoms, Molecules and Solids", Wiley Publications.
7. F.P. Beer, E.R. Johnston Jr., *Vector Mechanics for Engineers – Statics and Dynamics*, 9th ed., NY, USA, McGraw-Hill, 2010.
8. Nicolae Lobontiu and Ephrahim Garcia, *Mechanics of Microelectromechanical Systems*, Kluwer Academic Publishers, 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
BSL12/BSL22	Engineering Physics Lab	-	-	02	-	-	01	01
		Examination Scheme						
		ISE		MSE	ESE		Total	
		40		--	--		40	

Pre-requisite Course Codes-		
Course Outcomes	CO1	To develop experimental skills for the use of laboratory instruments and tools
	CO2	To develop an ability of understanding of concepts and principles of physics
	CO3	To develop practical abilities (observation, recording data and analyzing results)
	CO4	To comprehend importance of precision, accuracy of the experimental data

Experiment No.	Experiment Details	Marks*
1	Determination of energy band gap of a semiconductor	5
2	Hall effect	5
3	Determination of Planck's constant using photo vacuum tube	5
4	Measurement of ultrasonic velocity in liquid medium using ultrasonic interferometer	5
5	Determination of radius of curvature using Newton's Rings	5
6	Determination of the wavelengths of a mercury source and resolving power of a plane diffraction grating	5
7	Study of single-slit diffraction	5
8	Determination of grating element of a diffraction grating using a laser source	5
9	Determination of the numerical aperture of an optical fibre	5
10	Uses of a Cathode-Ray Oscilloscope	5
	Total Marks	40

*Any 8 experiments

Recommended Books:

[1] Harnam Singh, Hemne P.S, "B.Sc Practical Physics", S Chand Publication.
[2] Halliday and Resnick, "Fundamentals of Physics", 10th ed, Wiley, 2013.

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
ES11/ES21	Structured Programming Approach	03	-	--	03	-	--	03
		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	Demonstrate the fundamentals of computer programming.
	CO2	Make use of structured and modular programming approach to implement algorithms.
	CO3	Apply four primary constructs - sequential, iterative, branching and recursion to solve problems.
	CO4	Make use of primitive, derived and user-defined data types to solve problems.
	CO5	Utilise pointers to access arrays, strings, functions and files.

Module No.	Unit No.	Topics	Ref.	Hrs.
1	1.1	**Introduction to Algorithms, flowcharts:** Algorithm definition, Properties of a good algorithm, Symbols of flowcharts, Writing algorithms and drawing flowcharts for a given problem	1,2,3,4	06
	1.2	**Standard Libraries, Data Types, Pointers:** Character set, standard Data types, Introduction to Pointers **Operators:** Arithmetic, Relational and Logical, Assignment, Unary, Conditional, Bitwise, Comma, Other Operators, Expression, Statements	1,2,3,4	
2	2.1	**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	1,2,3,4	06
3	3.1	**Functions:** Defining a Function, Accessing a Function, Function Prototype, Passing Arguments to a Function (Pointers revisited), Recursion	1,2,3,4	10

	3.2	**Arrays:** Declaration, Definition, Accessing array element, One-dimensional array, Two-Dimensional array, Array Pointers revisited	**1,2,3,4**	
4	**4.1**	**Strings:** Array of characters, String functions, String Pointers	**1,2,3,4**	**12**
	4.2	**Structures & Union:** Declaration, Initialization, structure within structure, Array of Structure, Operation on structures, Concept of Union, Difference between structure and union, Structure to pointer, Pointer to Structure	**1,2,3,4**	
5	**5.1**	**File Handling:** Types of File, File operation- Opening, Closing, Creating, Reading, Processing File	**1,2,3,4**	**05**
Total				**39**

Proposed pedagogy: Selected classic algorithmic problems will be used to teach course concepts and language.

References:

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

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

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

[4] V. Rajaraman & Neeharika Adabala, "Computer Programming in C", PHI Learning, Eastern Economy Edition, 2014

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/ESL21	Structured Programming Approach Lab	--	--	2+2	--	--	2	2
		Examination Scheme						
		ISE		MSE	ESE		Total	
		80		--	20		100	

Pre-requisite Course Codes		--
After successful completion of the course, student will be able to		
Course Outcomes	CO1	Make use of structured programming approach to solve problems.
	CO2	Apply various programming language constructs for problem solving.
	CO3	Develop modular code for an application.
	CO4	Develop applications using primitive, derived and user-defined data types to solve problems.
	CO5	Build application programs using pointers and files.

Exp. No.	Experiment Details	Ref.	Marks
1	To apply various control structures to solve given problem.	1,2,3,4	5
2	To develop an application to demonstrate functionality of Arrays.	1,2,3,4	5
3	To apply concept of functions to incorporate modularity.	1,2,3,4	5
4	To develop recursive functions in a program.	1,2,3,4	5
5	To apply various operations on strings.	1,2,3,4	5
6	To develop an application by applying concepts of structures/union.	1,2,3,4	5
7	To use pointers for an application.	1,2,3,4	5
8	To explore operations on files.	1,2,3,4	5
Total Marks			**40**

Proposed pedagogy: Selected classic algorithmic problems will be used to teach course concepts and language.

Note: C++ compiler will be used in the lab for executing programs

References:

[1] Kernighan, Ritchie, *"The C programming Language"*, Prentice Hall of India.
[2] Byron Gottfried, *"Programing with C"*, McGraw Hill (Schaum's outline series).
[3] Carlo Ghezi, Mehdi Jazayeri, *"Programing Language Concepts"*, John Wiley & Sons.
[4] V. Rajaraman&NeeharikaAdabala, *"Computer Programming in C"*,PHI Learning, Eastern Economy Edition, 2014.
[5] John Hubbard, *"Schaum's Outlines Series: Programming With C++"*, McGraw Hill.

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
ES12/22	Digital Circuits	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	Explain various logic gates, SOP, POS forms and their minimization with k-map for given combinational circuits.
	CO2	Construct combinational circuits using given MSI devices.
	CO3	Discuss different types of programmable logic devices like PROM, PAL and PLA
	CO4	Apply the knowledge of flip-flops and MSI to design sequential circuits
	CO5	Design state machines for given state diagrams after state reduction
	CO6	Compare the logic families based on their characteristics

Module No.	Unit No.	Topics	Ref.	Hrs.
1	1.1	**Logic Gates:** Basic gates, Universal gates, Sum of products and products of sum, minimization with Karnaugh Map (upto four variables), Quine Mc'Clusky method and realization.	1,2,3	18
	1.2	**Combinational Circuits using basic gates as well as MSI devices:** Half adder, Full adder, Half Subtractor, Full Subtractor, Multiplexer, Demultiplexer, Decoder, Comparator (Multiplexer and Demultiplexer gate level upto 4:1).	1,2,3	
	1.3	**Concepts** of PROM, PAL and PLA.	4,5	
2	2.1	**Sequential Logic:** Latches and Flip-Flops. Conversions of Flip-Flops, Timing Considerations and Metastability.	1,2,3	12
	2.2	**Counters:** Asynchronous, Synchronous Counters, Up Down Counters, Mod Counters, Ring Counters Shift Registers, Universal Shift Register	1,2,3	
	2.3	MSI counters (IC 7490, IC 74160, IC 74163, IC 74169), MSI Shift registers (IC 74194) and their applications	4,5	
3	3.1	Mealy and Moore Machines, Clocked synchronous state machine analysis, State reduction techniques and state assignment, Clocked synchronous state machine design.	4,5	04

4	**4.1**	**Logic Families:** Types of logic families (TTL and CMOS), characteristic parameters (propagation delays, power dissipation, Noise Margin, Fan-out and Fan-in), transfer characteristics of TTL NAND, Interfacing CMOS to TTL and TTL to CMOS.	2,3	5
			Total	**39**

References:

[1] William I. Fletcher, 'An Engineering Approach to Digital Design', PHI., First Edition

[2] R. P. Jain, "Modern Digital Electronics", Tata McGraw Hill, Forth Edition

[3] Morris Mano, "Digital Design", Pearson Education, Forth Edition

[4] John F. Wakerly, "Digital Design Principles And Practices, third Edition Updated, Pearson Education, Third Edition

[5] Stephen Brown and Zvonko Vranesic, "Fundamentals of digital logic design with VHDL", McGraw Hill, Second 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
ESL12/22	Digital Circuits Lab	--	--	2	--	--	1	1
		Examination Scheme						
		ISE			MSE		ESE	Total
		40			--		--	40

Pre-requisite Course Codes		EL33 (Digital Circuits)
After successful completion of the course, student will be able to		
Course Outcomes	CO1	Construct logic circuits using gate to realize given function
	CO2	Construct logic circuits using MSI ICs to realize given function
	CO3	Validate the design of combinational and sequential logic circuits by hardware implementation
	CO4	Test and troubleshoot given logic circuits
	CO5	Create an application using concepts of digital circuits

Exp. No.	Suggested List of Experiments	Ref.	Marks
1	Experiment based on combinational logic at gate level	1,2	5
2	Experiment based on combinational logic using MSI circuits	1,2	5
3	Experiment based on TTL and CMOS logic families	1,2	5
4	Experiment based on sequential circuits	1,2	5
5	Experiment based on Moore and Mealy machine	1,2	5
6	**Mini-Project:** Design and implement an application using digital circuit concepts.	1,2	15
		Total Marks	40

References:

[1] Datasheets and application notes of LSI and MSI circuits.

[2] R. P. Jain and M. M. S. Anand "Digital Electronics Practice Using Integrated Circuits," TataMc Graw Hill Education

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
BS13/ BS23	Engineering Chemistry	2	-	-	2	-	-	2
		Examination Scheme						
		ISE	MSE		ESE		TOTAL	
		15	15		30		60	

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, learner will be able to		
Course Outcomes	CO1	Relate thermodynamic principles and laws to crucial applications like heat engines (Understanding)
	CO2	Summarize properties and applications of different materials like polymers, ceramics, alloys , nanomaterials, conductors and insulators (Understanding)
	CO3	Identify methods for corrosion control based on knowledge of different types of corrosion and factors affecting rate of corrosion (Application)
	CO4	Compare different sources of energy like conventional fossil fuels, alternative fuels, batteries, fuel cells with respect to availability, working principles, constitution, efficiency of performance and environmental impact (Understanding)
	CO5	Apply knowledge of electrochemistry and green chemistry in the interest of public health and environment (Application)

Module No	Module Name	Unit No.	Topics	Ref.	Hrs.
1	Thermodynamics	1.1	Introduction, Terminology, Concepts of Internal Energy and Thermodynamic equilibrium, Zeroth and First Law of Thermodynamics, Implications and Limitations of Fist law	1, 2,	1
		1.2	Concept of Enthalpy, Joule Thomson Effect, Carnot's Cycle, Carnot's theorem and related numericals, Second Law of thermodynamics	1, 2	2
		13	Overview of applications of thermodynamics	1,2	1
2	Polymers	2.1	Introduction to polymers, Effect of heat on polymers : Glass transition temperature and melting with significance;	2, 3,4	1
		2.2	Latest Applications: Conducting polymers, Liquid crystal polymers, Engineering Polymers,	2, 3,4,5	2
3	Corrosion	3.1	Introduction, Dry corrosion (i) Due to oxygen (ii) Due to other gases	2,3	1
		3.2	Mechanism of Electrochemical corrosion, Galvanic, differential aeration corrosion, Significance of galvanic series for corrosion phenomenon,	2,3	2
		3.3	Factors affecting rate of corrosion (i)Position in galvanic series, (ii) relative areas of anode and cathode, (iii) conductance of medium 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 (Galvanisation and Tinning : principle and application only)	2,3	2

Module No	Module Name	Unit No.	Topics	Ref.	Hrs.
4	Energy Sciences	4.1	Definition and classification of fuels, Calorific value : Definition, Gross or Higher calorific value & Net or lower calorific value, Dulong" s formula & numericals for calculations of Gross and Net calorific values.	2,3	2
		4.2	Knocking, Octane number, Cetane number, Antiknock agents, unleaded petrol	2,3	1
		4.3	Combustion- Calculations for requirement of only oxygen and air (by weight and by volume only) for given solid & gaseous fuels.	2,3	1
		4.4	Disadvantages of fossil fuels, Alternative (Green) Fuels : Power alcohol , Biomass, Biogas, Biodiesel, Natural Gas and CNG (Description, Utility, advantages and disadvantages)	2,3	1
5	Batteries and Battery Technology	5.1	Introduction, Important terms, Nickel-Hydrogen(metal hydride), Rechargeable Lithium ion batteries	2,3	1
		5.2	Reserve Batteries, Fuel cells, characteristics, description, construction and working of Hydrogen-oxygen fuel cells, Types of fuel cells (in brief)	2,3	1
		5.3	Electrochemical sensors : Working principle, construction and applications	2,3,4	1
6	Green Chemistry	6.1	12 principles of green chemistry with examples, Numericals on Atom Economy, Green Solvents (Water, Supercritical Fluids),	2,3	2

7	**Engineering materials**	**7.1**	Eutectic mixtures and soft solders Advanced Ceramic materials and cermets : magnetic, electronic and electrical applications Carbon nanomaterials : Fullerenes and Carbon nanotubes, Structure, Properties and applications	2,3,4	2
		7.2	Insulators, Semiconductors and Superconductors : Thermal and electrical insulating materials and important engineering applications, Stoichiometric, defect and controlled valency semi conductors.	2,3,4	1
		7.3	Superconductors, perovskite structure and 1:2:3 compound $YBa_2Cu_3O_{7-y,}$ properties and applications	2,3,4	1
			Total		**26**

References:

[1] Peter Atkins, Physical Chemistry, XIth ed, Oxford, United Kingdom, Oxford University Press, 2017

[2] P. C. Jain & M. Jain, *Engineering Chemistry*, XVIth ed , New Delhi, India:Dhanpat Rai Publishing Co. (P) Ltd., 2014

[3] S. S. Dara & S. S. Umare, *A Textbook of Engineering Chemistry*, XIIth ed., New Delhi, India: S. Chand & Co. Ltd., 2013

[4] S. Chawla, *A Textbook of Engineering Chemistry*, IIIrd ed.,Delhi, India:Dhanpat Rai & Co. (Pvt.) Ltd., 2015

[5] S. Agarwal, *Engineering Chemistry Fundamentals and Applications*, Ist ed, Delhi, India: Cambridge Univ. Press., 2015

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
BS13/ BS23	Engineering Chemistry Lab	-	-	2	-	-	1	1
		Examination Scheme						
		ISE		MSE	ESE		TOTAL	
		40		--	--		40	

Course Outcomes	Learner will be able to	
	CO1	Make use of analytical techniques like complexometric and iodometric titrations for varied purposes like estimation of hardness of water and composition of alloys
	CO2	Use analytical instruments like conductometer, pHmeter and Orsat Apparatus
	CO3	Estimate the molecular weight of polymer.
	CO4	Estimate key properties of lubricants such as temperature dependence of viscosity, acid value and flash point.
	CO5	Analyse a sample of coal for its moisture content

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	Molecular weight determination of polymers by Oswald‟s Viscometer	2	5
4	To determine flash point of a lubricating oil	2	5
5	Determination of Viscosity of oil by Redwood Viscometer	1, 2	5
6	Determination of amount of strong acid present in a solution using a conductometer	2	5
7	Determination of strength of acid using a pH meter		
8	Estimate percentage of Copper in brass by Iodometric Titration	1, 2	5
9	Estimate moisture content in coal.	1, 2	5
10	Analyse Flue gas for its composition (by Orsat„s Apparatus).	1, 2	5
Total Marks			**40**

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

References:

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

[2] S. S. Dara, *A Text Book on Experiments and Calculations in Engineering Chemistry*", IXth ed, 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
BS21	Differential Equations and Integral Calculus	3	-	-	3	-	--	3
		Examination Scheme						
		ISE		MSE	ESE		TOTAL	
		20		20	60		100	

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

Course Outcomes:

Pre-requisite	HSC level Mathematics		
Course Outcomes	Learners will be able		Cognitive level
	CO1	To solve differential equations of first order.	Comprehension
	CO2	To solve differential equations of higher order using operators.	Comprehension
	CO3	To apply techniques of solving Differential Equations to electrical engineering problems.	Application
	CO4	To evaluate improper integrals and multiple integrals in various co-ordinate system.	Comprehension
	CO5	To calculate Area using double integration.	Application

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.		02
		1.3	Simple application of differential equation of first and second order to electrical Engineering problems.		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.	1,2,3,4,6,7	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), $x^{m,}e^{ax}V$, xV, where V is a function of x	1,2,3,6,7	07
		2.2	Cauchy's homogeneous linear differential equation and Legendre's differential equation, Method of variation of parameters.		02
3	**Integration (One variable)**	3.1	Gamma function, Beta functions $\int_0^1 x^{m-1}(1-xn-1dx,$ $\int_0^{\pi/2} \sin^p\theta \cos^q\theta d\theta$	1,2,3,6	03
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.		02
				Total	**39**

References Books:

[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
[8] Dennis G. Zill, " A First Course in Differential Equations with Modelling Applications,
[9] Cengage Learning

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
BSL21	Computational Mathematics Lab-II	-	-	02	-	-	01	01
		Examination Scheme						
		ISE		MSE	ESE		Total	
		40		--	--		40	

Course Objectives: To develop logical and problem solving skills.

Course Outcomes:

	Learners will be able
CO1	To use Scilab to solve differential equations of first order.
CO2	To Trace Curves and visualize Surfaces using Scilab.

Experiment No.	Experiment Details	Marks
1	Ordinary differential equation of first order.	08
2	Euler's and Euler modified method	08
3	Runge-Kutta method	08
4	Tracing of curves (Cartesian and Polar)	08
5	Tracing of surfaces	08
	Total Marks	40

***Note: Students have to solve 2 problems using SCILAB in practical session which will be evaluated. In alternate week, tutorials and ISE will be conducted**.

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		**Semiconductor Devices**		
	3.1	P-N Junction Diode, Zener Diode, Light Emitting Diode, Schottky Diode: Common I-V characteristics	4	02
	3.2	Bipolar Junction Transistor : PNP and NPN types, I-V characteristics in CE, CB and CC configuration, Mode of BJT operation : cut off, active and saturation	4	02
	3.3	FET, JFET and MOSFET, common characteristics, different mode of operation in Enhancement mode and Depletion type MOSFETs.	4	02
4		**Application of semiconductor devices**		
	4.1	Diode rectifier circuits, Clipper and clamper circuits, zener diode as a voltage regulator, photovoltaic solar array	4	02
	4.2	BJT in single stage CE amplifier, BJT as a switch	4	02
	4.3	Applications of MOSFET as a switch and as an amplifier	4	02
5		**Operational amplifier and Integrated Circuits**		
	5.1	Ideal characteristics of operational amplifier (OP-AMP), concept of virtual ground, OP-AMP as inverting and non inverting amplifier, adder and subtractor, integrator and differentiator, precision rectifier, OP-AMP as a comparator with different applications.	5	03
	5.2	Introduction to IC555 as a timer circuit, internal block diagram of IC555, Astable, Monostable and Bistable Multibibrator using IC 555	5	03
	5.3	Introductory concepts of Analog to digital and Digital to Analog Conversion, R-2R Ladder, DAC and Successive Approximation ADC.	5	02
			Total	**39**

Recommended Books:

[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
ESL11	Basic Electrical and Electronics Lab	--	-	2	---		1	1
		Examination Scheme						
		ISE		MSE		ESE		Total
		40		---		20		60

Pre-requisite Course Codes:		
Course Outcomes	CO1	Identify instruments to measure electrical parameters.
	CO2	Compute electrical parameters for the given circuit using network theorem.
	CO3	Verify the resonance phenomenon for a given RLC circuit.
	CO4	Create an application using BJT and IC555
	CO5	Compare astable, monostable and bistable multivibrator circuit using given IC

Exp. No.	Experiment Details	Ref.	Marks
1	Various measurement using following instruments: 1. DSO: voltage, time, frequency, FFT, wave form storage in different format 2. Function Generator: Observe different waveforms by adjusting its voltage, frequency, dc bias, symmetry. 3. Digital Multimeter: Voltage, Current, Resistance, Capacitor 4. RLC meter: Measurement of Inductor and capacitor, Q factor 5. Power and Energy meter	1,2	10
2	Verification of superposition theorem. Compare the result after implementing the circuit on breadboard with simulation software.	1,2	05
3	Verification of Thevenin and Nortons theorem with an application to maximum power transfer theorem.	1,2	05
4	Measurement of active, reactive and apparent power in RLC series circuit.	1,2	05
5	Realization of resonance phenomenon in series RLC circuit.	2	05
6	BJT and its applications.	3	05
7	Create an application using IC555 on general purpose board. *	4	05
		Total Marks	40

- **Teachers are instructed to allot application of IC555 based on three modes in a group of students and evaluate the performance on general purpose board.**

Recommended Books:

[1] B.L.Theraja "Electrical Technology" Vol-I and II, S. Chand Publications, 23rd ed. 2003.
[2] M. B. Patil, V. Ramanarayanan, V. T. Ranganathan, "Simulation of Power Electronics Circuits", Narosa publication
[3] 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
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 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	1.1	Kirchhoff 's laws, Ideal and practical voltage and current source, Source transformation, Star-delta transformation	1,2	03
	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	05
2	2.1	Basic definitions to understand concepts in magnetic circuit, ohm's law 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	03
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	Three phase and single phase induction motor, Fundamental and working principles, speed Torque characteristics	1,4	02
	5.3	Permanent magnet DC motor: Fundamental and working principle of operation, speed torque characteristics, emf equation and typical applications	1,4	02
	5.4	Stepper and BLDC motor: Working principle of stepper motor, basic types of stepper motor, common applications. BLDC motor: Working principle and construction of BLDC motor, Electronic commutation of BLDC motor and common applications	1,4	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] 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

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
ES14/ES24	Engineering Graphics	2	--	--	2	--	--	2
		Examination Scheme						
		ISE		MSE	ESE		Total	
		15		15	30		60	

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

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	4
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 and Cone) 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	12
4	4.1	**Introduction to Section of Solids and Development of Lateral Surfaces Using AutoCAD**	1,3	4
			Total	**26**

NOTE:

1. **ISE component will be evaluated on the A3 size sketch-book for the following topics as an assignment i.e. for the modules 1 to 3:**

Sr. No.	Topics
1	Engineering Curves
2	Projection of Lines
3	Projection of Solids

2. **ISE will be conducted for the module 4 on AutoCAD 2017**
3. **MSE and ESE will be conducted for the module 1 to 3 (i.e. Manual Drawing)**

Recommended Books:

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	Engineering Graphics Lab	--	--	2+2	--	--	2	2
		Examination Scheme						
		ISE		MSE		ESE		Total
		80		--		20		100

Course Outcomes:

Learners will be able to…		Cognitive level
CO1	Use CAD tool to draw and modify basic 2-dimensional objects with dimensions, line-types & layers as per IS conventions	Application
CO2	Develop the sectional view of the regular solids on the basis of the given cutting planes.	Application
CO3	Develop the lateral surface of the sectioned solids.	Application
CO4	Read the 3-dimensional view and draw orthographic projections using CAD tool	Application
CO5	Read the orthographic projections and draw the isometric view using CAD tool	Application

Module No.	Unit No.	Topics	Ref.
1	1.1	**Introduction to AutoCAD: -** Basic Drawing and Editing Commands. Knowledge of setting up layers, Dimensioning, Hatching, plotting and Printing.	
2	2.1	**Section of Solids: -** Section of Prism, Pyramid, Cylinder, Tetrahedron & Cone cut by plane perpendicular to at least one reference plane. (Exclude Curved Section Plane). Use change of position or Auxiliary plane method	1,3,4
	2.2	**Development of Lateral Surfaces of Sectioned Solids:-**Lateral surface development of Prism, Pyramid, Tetrahedron, Cylinder, and Cone **with section plane** inclined to HP or VP only. (Exclude DLS of a solid with a hole in it and Reverse Development).	1,3,4
3	3.1	**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.	2,4
4	4.1	**Isometric Views: -** Isometric View/Drawing of blocks of plain and cylindrical surfaces using plain/natural scale only. (Exclude Spherical surfaces).	2,4
5	5.1	**Introduction to 3D-AutoCAD: -** Commands for isometric snap, 3D modeling: Working in 3-dimensions, Viewing 3D Objects, Basic wireframe models, Extruding, simple revolved objects. Boolean operations.	4

Session No.	AutoCAD Session Details	Marks
1	All the draw & modify commands	
2	Layer properties manager, page setup, plotting, etc.	
3	Section of Solids (1 problem)	10
4	Development of Lateral Surfaces (1 problem)	10
5	Orthographic Projections (3 problem)	20
6	Sectional Orthographic Projections (4 problem)	20
7	Isometric view (3 problems)	20
	Total Marks	80 Marks

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
ESL25/15	Python Programming	--	-	2	---		1	1
		Examination Scheme						
		ISE		MSE		ESE		Total
		40		---		20		60

Pre-requisite Course Codes		
Course Outcomes	CO1	Solve mathematical problems using Python
	CO2	Write programs utilizing the standard library distributed with Python.
	CO3	Use different modules in Python.
	CO4	Create a software application using Python.

Laboratory Plan

Sr. No.	Topics	References	Marks
1	Variable, Expressions and Statements	1,3	05
2	Functions and modules	1,3	05
3	Case study: Interface design	1,2	05
4	Conditionals and recursion	1,2	05
5	Fruitful functions and Iterations	1,2	05
6	Strings, List, Dictionaries and Tuples	1,2	05
7	Classes and Objects	1,2	05
8	Create any software application using Python to interface any Hardware	1,2	05

*Students should refer first 150 pages from the reference book [1] Allen Downey "Think Python" Version 2.0.17, Green Tea Press, 2012 and listen the NPTEL videos on "Python Data Structures and Algorithms".

Recommended Books:

[1] Allen Downey "Think Python" Version 2.0.17, Green Tea Press, 2012.
[2] Martin C. Brown, "The Complete Reference Python" McGraw Hill Education
[3] NPTEL video lectures on "Python Data Structures and Algorithms"

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
ESL16	Workshop I	--	--	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.

Course Outcomes: Learners will be to…

1. Acquire skills in basic engineering practice.
2. Identify the hand tools and various instruments.
3. Read a drawing for the manufacturing of wooden job.
4. Demonstrate an understanding of the basic domestic wiring.
5. Demonstrate an understanding of assembling of personal computer troubleshooting and networking.
6. Model a basic 3D object and generate a.*iges* or *.step* file.

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, and wiring diagram for fluorescent tube light, Godown wiring and three phase wiring for electrical motors.	6,7	8
3	**Hardware and Networking:7** • 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	4,5	8

	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	**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

Recommended Books:

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

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
ESL26	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.

Course Outcomes: Learners will be to…

1. Acquire skills in basic engineering practice.
2. Identify the hand tools and various instruments.
3. Read a drawing for the manufacturing of sheet-metal job.
4. Demonstrate an understanding of the PCB etching, drilling and soldering technique.
5. Demonstrate an understanding of repairing of household appliances like mixer, fan, etc.
6. Print a basic 3D object from the.*stl* file.

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

Recommended Books:

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
Sheet Metal Job	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 (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
HSS11	Communication Skills	02	-	02	02	--	01	03
		Examination Scheme						
		ISE**		MSE*	ESE		Total	
		80		20	--		100	

* MSE will be evaluated on the basis of written test based on module 1 and 2.

** ISE will be evaluated on the basis of marks scored in practical's, out of 80.

Pre-requisite Course Codes: The learners 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.	Unit No.	Topics	Ref.	Hrs.
1.Vocabulary Building and Grammar	**1.1**	Concept of Word Formation & the Root words from foreign languages and their use in English	9, 1	1
	1.2	Common Errors in Writing, Redundancies, Clichés	7, 2	3
2. Writing Skills	**2.1**	Basic Writing Skills: Sentence Structures, organizing Paragraph in direct or indirect style, creating coherence:7'Cs of Communication	4	3
	2.2	Writing Practices: 2.2.1. Comprehension passage 2.2.2. Summary Writing 2.2.3. Business Letter Writing (Inquiry, Complaint)	3	6
	2.3	Review Writing: Critical analysis of a book (fiction)/movie using a specific perspective, Writing a paper on the same	6	3
3. Oral Skills	**3.1**	Listening Comprehension: Pronunciation, Intonation, Stress and Rhythm	6	2
	3.2	Speaking Practices: 3.2.1. Common Everyday Situations: Conversations and Dialogues (language lab) 3.2.2. Communication at Workplace: Meeting, notice, agenda, minutes (language lab) 3.2.3. Public Speaking: Formal Speech	3	8
			TOTAL	**26**

Activity No.	Activity Details	Ref.	Marks
1	Grammar	7, 2	10
2	Vocabulary	9, 1	10
3	Summary	3	05
4	Business letters	4	20
5	Skit based on an everyday situation	8	-
6	Meetings & Minutes	5	10
7	Critical reading	6	10
8	Speech	3	15
Total			80

Reference Books:

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.
9. Lewis, Norman. *Word Power Made Easy.* New York: Anchor Books, 1978.

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
MC21	Environmental Studies	01	-	--	Non credit			
		Examination Scheme						
		ISE1		ISE2	Attendance		Total	
		20		20	10		50	

Course Education Objective:

To create awareness about environmental issues and inculcate the habit of practising ecofriendly strategies.

Pre-requisite Course Codes		HSC Level awareness of Environmental Studies
After successful completion of the course, learner will be able to		
Course Outcomes	CO1	Make use of methods of reuse / recycling at home and workplace (Application)
	CO2	Plan awareness campaigns for various environmental issues like waste segregation, cleanliness, energy conservation and water conservation (Application)
	CO3	Experiment with basic Appropriate Technologies (Application)
	CO4	Relate to environmental concerns through field visit (Understanding)
	CO5	Illustrate role of technology and legislation in overcoming environmental problems (Understanding)

S. N.	Activity	Activity No	Actual Activity	No of hours
1	Reuse / Recycle	1.1	Introduction to concept of life cycle thinking Best out of waste activity	2
		1.2	Survey on marketing of recycled products with actual data on current scenario and suggestions for improvement	2
		1.3	Drive for segregation of waste	2
2	Slogan / Poster making	2..1	Make slogans / posters on water management, avoiding wastage of electricity, prevention of littering etc to be put up at strategic points across the campus	1
3	Plantation	3.1	Adopt a tree / Gift a tree	1
4	Cleanliness drive	4.1	Ensure cleanliness of surrounding environment	Ongoing
5	Reduction in energy consumption	5.1	Shutting down fans and ACs of the campus for an hour	1
		5.2	Suggestions for improvement in power consumption at institute	1
		5.3	Appropriate technology and its features Working model of a pot in pot refrigerator	1
6	Lecture	6.1	Role of legislation in environment, Clearance, control and authorisation mechanism	1
		6.2	Role of technology in environment protection : Green Buildings, Indoor air pollution, concept of carbon credits	1
7	Field visit			4
			Total	**17***

* 12 hours will be engaged in activities and lectures

ABL-A: Essence of Traditional Indian Knowledge

This course is path-breaking in the following respects:

1. It makes students aware of ideology of trust of national eminence Bharatiya Vidya Bhavan.
2. It explores India's intellectual, literary, artistic, scientific and technological knowledge traditions, offering a perspective on Indian civilization.
3. It provides enough time for teacher-student interaction and in the process create sense of belongingness to institute and country.
4. It makes students aware of our great leaders like Dr. K. M. Munshi, Sardar Patel and Mahatma Gandhi who made impact on human lives.
5. It teaches students about morals and values and their significance in human life
6. It teaches students about 'Unity in Diversity' and significance of working in multi-cultural environment.

A. Ideology of Bharatiya Vidya Bhavan: It is important to create sense of belongingness. For this purpose information of founding members and their messages must be shared with students. Bhavan's faith and belief. 'Vasudhaiva Kutumbakam'. "Let noble thoughts come to us from every side."

B. Value education: Value education is rooted in Indian philosophy and culture and ingrained in every tradition of Indian culture. Educational institutions play a significant role in the promotion of value. The Vedas and Upanishads form the source of inspiration for value education. In the Vedic period, In Ashram education, the Guru insists his sishya to follow certain values throughout his life. Students should be taught about Morals, Values and Ethics, Code of Ethics, Respect for Diversity, conflict resolution, justice, respect, responsibility and self-esteem.

C. Indian Culture: India is one of the ancient civilizations of the world which has stood the test of time. In fact what makes Indian culture unique among other ancient civilizations is its ability to accommodate and assimilate external influences and weave them into its own cultural fabric. This composite influence has not only enriched the cultural milieu of India, it has also made it stronger. Indian art, architecture, music, language, philosophy and religion reflect this diversity of influence that has occurred through centuries. This is the beauty of Indian Culture and Heritage. As Indian citizens not only do we need to be proud of this pluralistic and rich cultural heritage but also to study it objectively and assess it.

D. Indian Tradition in Science and Technology: Indian Mathematicians and other scientists, Introduction to Ayurveda, Introduction to Vaastushastra, Introduction to wide range of India's ancient technologies, like Harappan technologies, town planning, civil engineering, construction techniques, water structures, ceramic, metallurgy, glass, acoustics, textiles, metrology, as well as historical testimonies on such technologies. As a result, Indian civilization emerges as a dynamic, creative one which was able to adapt to very different needs and situations in the course of its long history.

Methodology of Course Conduction:

1. Guest lectures by experts shall be arranged on various topics mentioned above.
2. Videos on biographies of Indian leaders, Indian civilization etc. can be shown.
3. Case studies and group activities based on the contents of the course can be conducted.
4. Educational visits shall be arranged to historical places and museums. Some of the places recommended are:
    1. Nehru Planetarium Worli
    2. Chhatrapati Shivaji Maharaj Vastu Sangrahalaya (Formerly Prince of Wales Museum) Mumbai
    3. Places and museums related to Indian Leaders, Bharat Ratna Awardee etc.
    4. Places demonstrating Indian scientific marvels like Jaipur observatory Jantar Mantar
    5. Astronomical Observatories

Assessment:

Assessment shall be based on performance in following:

I. 25 Marks: Quiz (Compulsory for all)
II. 40 Marks: Any one of the following
    1. Prepare short video
    2. Power Point Presentation
    3. Skit Performance
III. 25 Marks: Report on Educational visit
IV. 10 Marks: Attendance

Passing marks: Minimum 40

In case of defaulter or failure in this activity students will have to repeat the activity with financial penalty and grade card will not be issued till student passes the course.

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
MC22	Constitution of India	1	-	-	Non-Credits			
		Examination Scheme						
		ISE1		ISE2	Attendance			Total
		20		20	10			50

Student will be evaluated after six sessions for 20 Marks (ISE1) and at the end of last session for 20 Marks (ISE2). Grade equivalent to 'D' (50%-59.99% Marks) or above is considered as 'Satisfactory'. If any of the tasks given is not completed/submitted/shown/evaluated then the corresponding lower grade will be given. Although the grades are given they will not mentioned in final grade card but they are necessary to declare the successful completion of the Non-Credit course.

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, Keshvanand BhartiVishakha 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