Government Polytechnic, Mumbai

(Academically Autonoums Institute, Government of Maharashtra)

Name of the Programme: Diploma in Electronics Engineering

Teaching and Examination Scheme (P23) — **With Effect From Academic Year : 2023-24**

Duration of Programme: 6 Semester — **Duration : 16 WEEKS**

Semester: First — **Scheme : P 23**

Sr No	CourseTitle	Course Type	Course Code	Total IKS Hrs for Sem.	Learning Scheme					Credits	Assessment Scheme														
					Actual Contact Hrs./Week			Self-Learning (TermWork +Assignment)	Notional Learning Hrs/Week		Paper duration (hrs.)	Theory					Based on LL&TL Practical						Based OnSelf Learning		Total Marks
												FA-TH		SA-TH	Total		FA-PR		SA-PR			SLA		
					CL	TL	LL					T1	T2	Max	Max	Min	Max	Min	Max PR	Max OR	Min	Max	Min	
1	Communication Skill	AEC	HU23501	-	3	-	2	1	6	3	2.30	20	20	60	100	40	25	10	-	-		25	10	150
2	Electronic Components and Workshop	DSC	EC23101	2	1	-	4	1	6	3	-	-		-	-	-	25	10	25@	-	10	25	10	75
3	Basic Mathematics	AEC	SC23501	6	4	2	-	2	8	4	2.30	20	20	60	100	40	25	10	-	-	-	25	10	150
4	Basic Physics	DSC	SC23101	2	3	-	2	1	6	3	2.30	20	20	60	100	40	25	10	25 #	-	10	25	10	175
5	Fundamental of Electrical Engineering	DSC	EE23210	2	4	-	2	2	8	4	2.30	20	20	60	100	40			25@	-	10	25	10	150
6	LIBRE OFFICE CALC ON BOSS LINUX	SEC	SL23601	-	-	-	-	4	4	2	-	-		-	-	-	-	-	-	-	-	-	-	-
7	Universal Human Values I	VEC	UV23301	4	1	-	-	1	2	1	-	-		-	-	-	-	-	-	-	-	50	20	50
Total				**16**	**17**	**2**	**12**	**9**	**40**	**20**					**400**		**100**		**75**			**175**		**750**

Abbreviations: CL-Classroom Learning, TL-Tutorial Learning, LL-Laboratory Learning, FA-Formative Assessment, SA-Summative Assessment, IKS-Indian Knowledge System, SLA-Self Learning

Assessment **Legends** :@ Internal Assessment, # External Assessment, *# On Line Examination , @$ Internal Online Examination

Note :1. FA-TH represents marks of two class tests of 20 marks each conducted during the semester.

2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidates hall be declared as "Detained" in that semester.

3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.

4. Notional Learning hours for the semester are(CL+LL+TL+SL)hrs.*15Weeks

5. 1 credit is equivalent to 30 Notional hrs.

6.*Self learning hours shall not be reflected in the Time Table.

Course Category: Discipline Specific Course Core(DSC): 2,Discipline Specific Elective (DSE):0,Value Education Course(VEC): 1-Intern./Apprenti./Project./Community(INP):0,Ability Enhancement Course (AEC) : 2, Skill Enhancement Course (SEC) : 2, Generic Elective (GE) : 0

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CDC Co-ordinator
G.P.Mumbai

CDC Cordinator,
Electronics Department

HOD,
Electronics Department

CDC Incharge,
CDC Cell

Principal,
G.P.Mumbai

Programme : Diploma in _ CE/ME/EE/EC/IS/CO/IF/AIML/LG/LT/RT	
Course Code:HU23501	Course Title :Communication Skills (CMS)
Compulsory / Optional:	

Teaching Scheme and Credits						Examination Scheme							
CL	TL	LL	SLH	NLH	Credits	FA-TH		SA-TH (3Hrs.)	FA-PR	SA		SLA	Total
										PR	OR		
03	--	02	01	06	03	20	20	60	25	--	--	25	150

Total IKS Hrs. for course: ------

Abbreviations: CL- Class Room Learning, TL- Tutorial Learning, LL- Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, SLA- Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination, @$ Internal Online Examination

Note:
1. FA-TH represents two class tests of 20 marks each conducted during the term.
2. SA-TH represents the end term examination of 60 marks.
3. FA-PR represents practical term work of 25 marks.
4. SLA represents Self Learning Assignment of 25 marks.

I. Rationale - In this age of globalization, competition is tough. Hence effective communication skills are important. Communication skills play a vital and decisive role in career development.. It will guide and direct to develop a good personality and improve communication skills. Students will be able to utilize the skills necessary to be a competent communicator. This course will help the students to select and apply the appropriate methods of communication in various situations. Communication skills for professional purposes aim to equip the students with necessary language skills required for public speaking, presentation and negotiation. Communication skills for academic purposes will include academic writing skills and critical thinking considering the need of students to communicate in engineering domain.

II. Industry / Employer Expected Outcome

The aim of this course is to help the student to achieve the following industry identified outcome through various learning experiences: "Communicate in Verbal and Non verbal form of communication effectively at workplace".

III. Course Outcomes: Students will be able to achieve & demonstrate the following COs on completion of course based learning

CO1	Apply proper communication technique by avoiding barriers to cope up with the challenges of the modern world.
CO2	Compose paragraphs and dialogues on given situations.
CO3	Able to participate in Group Discussion and acquire the practical knowledge of an Interview.
CO4	Deliver effective presentations with apt body language by using audio visual aids.
CO5	Acquire professional writing skills for formal written business correspondence.

Course Content Details:

Unit No.		Topics / Sub-topics
1	**TLO 1.1 Define communication.** **TLO 1.2 Describe the process of Communication.** **TLO 1.3 Differentiate between types of communication.** **TLO 1.4 Identify the type of Barriers and suggest Remedies.** **TLO 1.5 Describe and apply 7 C's of effective Communication.** **TLO 1.6 Describe the non-verbal communication.**	**Unit I** **Communication Theory and Practice** **1.1 Introduction, meaning and definition and importance of communication.** **1.2 Elements/process of communication.** **1.3 Types of communication: formal , informal, verbal (oral and written), non-verbal (visual and auditory), vertical, horizontal and Diagonal communication.** **1.4 Barriers in Communication and ways to overcome** **a) Mechanical Barrier** **b) Physical Barrier** **c) Psychological Barrier** **d) Linguistic Barrier** **1.5 7 C's of effective communication (Considerate, concrete, concise, clear, complete, correct, courteous)** **1.6 Introduction to Non-verbal communication (Aspects of Body Language & Graphic Communication)** **Course Outcome : CO1** **Teaching Hours :10hrs** **Marks: 18**

2	TLO 2.1 Formulate paragraphs with synchronized sentence structure on the given situation / topic TLO 2.2 Develop dialogues to practice language skill in a structured and meaningful way.	**UNIT II Paragraph and Dialogue Writing** 2.1 Types of paragraphs: Technical ,Descriptive , Narrative 2.2 Dialogue Writing: i. Greetings ii.Development iii. Closing Sentence. Course Outcome : CO2 Teaching Hours :06hrs Marks: 08
3	TLO 3.1 Express thoughts freely during group discussion. TLO 3.2 Participate in interview confidently . TLO 3.3 Prepare Group Discussion to practice language skills and leadership qualities in a structured and meaningful way. TLO 3.4 Understand Non Verbal Communication in interview.	**UNIT III** **Group Discussion And Interview Skills** 3.1 Importance and Types of Group Discussion 3.2 Parameters of Group Discussion 3.3 Need and Types of Interview 3.4 Preparing for an Interview 3.5 Non Verbal communication during interview Course Outcome : CO3 Teaching Hours :10hrs Marks: 10
4	TLO 4.1 Prepare power point presentation TLO 4.2 Use appropriate body language for effective communication	**Unit - IV Presentation Skills** 4.1 Power Point Presentation : i. Layout ii. Font size iii. Color combination. 4.2 Kinesics : i. Facial expressions ii Eye contact iii Postures iv Gestures. Course Outcome : CO4 Teaching Hours :09hrs Marks: 08
5	TLO 5.1 Draft business letters in the given situation. TLO 5.2 Respond to given job advertisement by writing application letter with resume. TLO 5.3 Draft office correspondence in given format. TLO 5.4 Prepare reports of the given types of events.	**UNIT V PROFESSIONAL WRITING** 5.1 Business Correspondence: Enquiry, order, Complaint. 5.2 Job-Application with Resume 5.3 Office Drafting- notices, circulars, memorandum etc. 5.4 Report Writing: Accident and Fall in production Course Outcome : CO5 Teaching Hours :10hrs Marks: 16

IV. Laboratory Learning Outcome and Aligned Practical / Tutorial Experiences.

Sr No		Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
1	LLO 1.1 Enhance the understanding of word formation LLO 1.2 Enrich word power LLO 1.3 Construct words with the specific meanings	Formulate 20 words using Prefix and Suffix	2	CO1
2	LLO 2.1 Promote the development of effective communication skills LLO 2.2 .Improve non -verbal communication Skills LLO 2.3 Enhance interpersonal skills LLO 2.4 Build confidence	Enact Role Plays as per situation and context	2	CO2
3	LLO 3.1 Participate and express their tough ts confidently in group discussion. LLO 3.2 Improve speaking & listening skills	Group Discussion	2	CO3
4	LLO 4.1 Draft job application.	Job application with Resume	2	CO5
5	LLO 5 .1 Draft different types of reports on the given situation.	Report Writing	2	CO5
6	LLO 6.1 Identify different types of barriers & suggest remedies to overcome them.	Present different Types of barriers using Examples with remedies to overcome.	2	CO1
7	LLO 7.1 Face interview confidently LLO 7.2 Use appropriate body Language during interview.	Mock Interview	2	CO3
8	LLO 8.1 Identify different aspects of body language. LLO 8.2 Use appropriate body language during communication.	Mention Examples of Body Language use at Workplace with suitable pictures and images.	2	CO4
9	LLO 9.1 Express information in coherent and engaging manner LLO 9.2 Build confidence	Introduce oneself and others	2	CO4
10	LO 10.1 Develop Leasing Practice	Listening Practice	2	CO1
11	LLO 11.1 Develop Reading Practice	Reading Practice	2	CO4
12	LO 12.1 Develop Writing Practice	Writing Practice	2	CO5

Note: .Students should complete all assignments & activities of Basic & Level 1 of Online course – "Business Communication Excellence" on Infosys Springboard. At the end of term, it is mandatory to submit certificates of Basic and Level 1 of Online course –"Business Communication Excellence", on Infosys Springboard. Only after that their Term Work will be granted.

Any 10 out of 12 practicals are compulsory

V. Suggested Micro Project / Assignment/ Activities for Specific Learning / Skills Development (Self Learning):

1. **Powerpoint preparation and presentations on given topic. (Mini Project)**
2. **Describe a given picture.**
3. **Impromptu Communication on given situation**
4. **Prepare an advertisement on any product.**
5. **Suggest proper dressing & grooming for the given occasion.**

VI. Specification Table:

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Communication Theory and Practice	6	6	6	18
2	Paragraph and Dialogue Writing	2	2	4	08
3	Group Discussion and Mock Interview	4	2	4	10
4	Presentation Skills	2	2	4	08
5	Professional writing	2	6	8	16
	Total	16	18	26	**60**

VII. Assessment Methodologies/Tools

Formative assessment (Assessment for Learning)

Rubrics for continuous assessment based on process and product related performance indicators(10marks)
Note : Rubric - Each Practical Carries.

1) 02 Marks for present, 00 Marks for Absent & 01 Marks for extra practical.
2) 04 Marks for Discipline & involvement in the practical.
3) 04 Marks for Accuracy for result & Neat clean presentation.

Summative Assessment (Assessment of Learning)

End term examination, Viva-voce, Workshop performance (70marks)

VIII. Suggested COs - POs Matrix Form

Course Outcomes (COs)	Programme Outcomes (POs) ELECTRICALENGINEERING							Programme Specific Outcomes (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	2	3	1		2	2	3	1	2	3
CO2					1	2	2	2		3
CO3	1	3			2	2	2	2		3
CO4					2	3	2	1		2
CO5	2				2	3	3			

Legends: - High:03, Medium:02, Low:01, No Mapping: --

Course Outcomes (COs)	Programme Outcomes (POs) ELECTRONICS ENGINEERING							Programme Specific Outcomes (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	2	3	1		2	2	3	2	2	
CO2					1	2	2	1	2	1
CO3	1	3			2	2	2	1	1	1
CO4					2	3	2	1		
CO5	2				2	3	3	1		

Legends: - High:03, Medium:02, Low:01, No Mapping: --

Course Outcomes (COs)	Programme Outcomes (POs) CIVIL ENGINEERING							Programme Specific Outcomes (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	2	3	1		2	2	3	1	2	1
CO2					1	2	2	1	2	1
CO3	1	3			2	2	2	1	2	1
CO4					2	3	2	1	2	
CO5	2				2	3	3	1	2	
Legends: - High:03, Medium:02, Low:01, No Mapping: --										

Course Outcomes (COs)	Programme Outcomes (POs) MECHANICAL ENGINEERING								
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2
CO1	2	3	1		2	2	3		1
CO2					1	2	2		
CO3	1	3			2	2	2	2	
CO4					2	3	2	2	1
CO5	2				2	3	3	2	1

Course Outcomes (COs)	Programme Outcomes COMPUTER ENGINEERING							Programme Specific Outcomes (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	2	3	1		2	2	3	1	2	1
CO2					1	2	2	1	2	1
CO3	1	3			2	2	2	1	2	1
CO4					2	3	2		2	
CO5	2				2	3	3		2	

Legends: - High:03, Medium:02, Low:01, No Mapping: --

Course Outcomes (COs)	Programme Outcomes (POs) INFORMATION TECHNOLOGY							Programme Specific Outcomes (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	2	3	1		2	2	3	2	1	1
CO2					1	2	2	2	1	1
CO3	1	3			2	2	2	1		2
CO4					2	3	2	1		
CO5	2				2	3	3	1		

Legends: - High:03, Medium:02, Low:01, No Mapping: --

Course Outcomes (COs)	Programme Outcomes (POs) INSTRUMENTATION ENGINEERING								
	2	3	1		**2**	2	**3**	**PSO-1**	**PSO-2**
CO1					1	2	**2**	**1**	**1**
CO2	1	3			**2**	2	**2**		
CO3					**2**	3	**2**		**1**
CO4	2				**2**	3	3		**2**
CO5	3	3	3	3	3	3	3		**1**

Course Outcomes (COs)	Programme Outcomes (POs) ARTIFICIAL INTELLIGENCE & MACHINE LEARNING								
	PO-1 Basic and Discipline Specific Knowledge	**PO-2 Problem Analysis**	**PO-3 Design/ Development of Solutions**	**PO-4 Engineering Tools**	**PO-5 Engineering Practices for Society, Sustainability and Environment**	**PO-6 Project Management**	**PO-7 Life Long Learning**	**PSO - 1**	**PSO - 2**
CO1	2	3	1		**2**	2	**3**	**3**	**3**
CO2					1	2	**2**		
CO3	1	3			**2**	2	**2**	**2**	**2**
CO4					**2**	3	**2**		**2**
CO5	2				**2**	3	3	**2**	**2**

Course Outcomes (COs)	Programme Outcomes (POs) RUBBER TECHNOLOGY								
	PO-1 Basic and Discipline Specific Knowledge	**PO-2 Problem Analysis**	**PO-3 Design/ Development of Solutions**	**PO-4 Engineering Tools**	**PO-5 Engineering Practices for Society, Sustainability and Environment**	**PO-6 Project Management**	**PO-7 Life Long Learning**	**PSO- 1**	**PSO- 2**
CO1	2	3	1		**2**	2	**3**	**1**	**3**

CO2					1	2	2		
CO3	1	3			2	2	2	1	2
CO4					2	3	2	1	2
CO5	2				2	3	3		2

Course Outcomes (COs)	Programme Outcomes (POs) LEATHER GOODS & FOOTWEAR TECHNOLOGY							Programme Specific Outcomes (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	2	3	1		2	2	3	1		2
CO2					1	2	2	1		2
CO3	1	3			2	2	2	1	1	2
CO4					2	3	2	1		2
CO5	2				2	3	3	1		2
Legends: - High:03, Medium:02, Low:01, No Mapping: --										

Course Outcomes (COs)	Programme Outcomes (POs) LEATHER TECHNOLOGY							Programme Specific Outcomes (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	2	3	1		2	2	3			
CO2					1	2	2			
CO3	1	3			2	2	2			
CO4					2	3	2			
CO5	2				2	3	3			
Legends: - High:03, Medium:02, Low:01, No Mapping: --										

IX. Suggested Learning Materials / Books

Sr.No	Author	Title	Publisher
1	Communication Skills	Sanjay Kumar, PushpaLata- Oxford University Press	Oxford University Press
2	Kumar, E. Suresh, Sreehari, P Savitri	Effective English with CD	Pearson Education
3	Gnanamurli	English Grammar at a Glance	S. Chand
4	CBSE	English Communicative (class X)	Golden
5	Dr. Anjana Tiwari	Communication Skills in English	Khanna Publishers, New Delhi

X. Learning Websites & Portals

Sr.No	Link / Portal	Description
1	https://www.britishcouncil.in/english/learn-online	Website link is given to refer Unit 1
2	Vocabulary.com	Refer this website for interactive vocabulary quizzes, word lists
3	International Phonetic Association (IPA) Website	It offers audio examples and charts to help understand and transcribe sounds
4	grammarly.com/blog	For constructing effective paragraphs and improving clarity
5	www.newagegolden.com	Refer this website for speech writing, diary entry and paragraph writing
6	https://infyspringboard.onwingspan.com/	Refer this website for Course Business Communication Excellenceto complete Basic level and Level1

XI. Academic Consultation Committee/Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
1	Mrs. Sharmishta S. Kulkarni	Lecturer in English	Government Polytechnic Pune
2	Mr. B.M.Pande	Lecturer in English	Shri.BhagubaiMaftlalPolytechnic,Mumbai.

3	Mrs. K. S. Pawar	Lecturer in English	Government Polytechnic Mumbai
4	Ms. N. N. Dhake	Lecturer in English	Government Polytechnic Mumbai

K.S.Pawar

N.N.Dhake

Coordinator,
Curriculum Development,
Department of Science & Humanities

C.A.Thorat
Head of Department
Department of Science & Humanities

I/C, Curriculum Development Cell

Principal

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CDC Co-ordinator
G. P. Mumbai

Programme : Diploma in Electronics Engineering (Sandwich Pattern)												
Course Code: EC23101					**Course Title :**Electronic Components and Workshop							
Compulsory / Optional: Compulsory												
Teaching Scheme and Credits						**Examination Scheme**						
CL	**TL**	**LL**	**SLH**	**NLH**	**Credits**	**FA-TH**	**SA-TH**	**FA-PR**	**SA**		**SLA**	**Total**
									PR	**OR**		
1	-	4	1	2	3	-	-	25	25@	-	25	75

Total IKS Hrs. for course: 2

Abbreviations: CL- ClassRoom Learning, TL- Tutorial Learning, LL- Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, SLA- Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination, @$ Internal Online Examination

I. Rationale

The main objective of this course is to impart knowledge of electronics, various components used in electronics industries. This course gives proper knowledge about electronic components from point of view of their operation, testing, characteristics and specifications. Hence the students are able to select different types of electronic components according to their application.

This course is designed for developing fundamentals and motor skills in the electronics field such as testing and handling of tools, components, equipment's, cable's and connector's , soldering and de-soldering technique, PCB making etc. Also this course is helpful for students to develop basic skills of assembling, testing, and troubleshooting of PCB in their electronic projects.

II. Industry / Employer Expected Outcome:

CO1	Differentiate between faulty and working components.
CO2	Identify and handling tools, testing equipment's.
CO3	Making and testing the PCB.

III. Course Outcomes: Students will be able to achieve & demonstrate the following COs on completion of course based learning

CO1	Identify and test the different components (Resistors, capacitors, Inductors etc)
CO2	Differentiate between faulty and working components.
CO3	Identify and use testing equipment's and tools.
CO4	Make and test the PCB.

Course Content Details:

Unit No.	Learning Outcome	Topics / Sub-topics
1	1.1 Classify components on the basis of energy band theory. 1.2 List the properties of High resistive materials and High conductive materials. 1.3 Define : (a)Discrete and non-discrete (b) Active and Passive (c) Parasitic components. 1.4 Find values of resistors using color code. 1.5 Classify given resistors on the basis of material used, applications and construction. 1.6 Identify and define general specifications of resistors.	**Resistors** 1.1 Classification of component on the basis of energy band theory: (a) Insulator (b) Conductor (c) .Semiconductor. 1.2 Properties of (a) High resistive materials: Rubber, Sulfur. Carbon, Carbon alloy, metal, metal alloy. (b) High conductive materials: Copper, Gold. (**Self Learning**) 1.3 Introduction of Components: (a)Discrete and non-discrete (b) Active and Passive (c) Parasitic components. (Definition) 1.4 Concept of resistor: Definition, material used, color code method using three four and five bands. (Simple numerical) 1.5 Classification of resistor: 1.5.1 [A] Fixed resistor:- Linear Resistor: (a)Carbon film resistor (b)Metal film resistor (c) Wirewound resistor (d) Carbon composition resistor. (construction, application- **Self Learning**). Nonlinear resistor:(a) Thermistor (b) Varistor (c) LDR. (working principle, construction, application- **Self Learning**) 1.5.2 [B] Variable resistor: (a) Wire wound potentiometer (b) Preset (c) Trimmer / Padder. (construction, application- **Self Learning**) 1.6 General specification: Maximum voltage rating, power rating, temperature coefficient, tolerance, ohmic range, operating temperature. **Course Outcome:CO1 Teaching Hour:5 hrs Marks: NA**
2	2.1 Define capacitors. List dielectric materials used in capacitors. 2.2 Identify and define general specifications of capacitors. 2.3 Classify given capacitors on the basis of material used, applications and construction. 2.4 Find values of capacitors using numerals and color band system. 2.5 List the properties of dielectric materials used in capacitors.	**Capacitors** 2.1 Introduction: Definition, symbol, dielectric materials used in capacitor. 2.2 Capacitors specification and definition: Working voltage, Insulation resistance, c/v ratio, Power Factor, Capacitance reactance, frequency characteristics, E.S.R. 2.3 Classification of capacitor: 2.3.1 (A) Fixed capacitors: Electrolytic capacitor: (a) Aluminum (b) Wet type tantalum. Non-electrolytic capacitor: (a)Impregnated paper capacitor (b) Ceramic capacitor (c) Glass capacitor (d)Plastic film capacitor(Symbol and Applications) 2.3.2 (B) Variable capacitor: (a) Air-gang capacitor (b) PVC gang capacitor(c) Ceramic Trimmer / Padder. (construction, working, application- **Self Learning**) 2.4 Coding of capacitors: Using numerals, Color band system.

		2.5 Properties of Dielectric Material: (a) Paper (b) Ceramic (c) Glass (d) Plastic (e) Mica. **Course Outcome:CO1 Teaching Hours:3hrs Marks: NA**
3	3.1 Define inductors. Explain concept of self and mutual inductance, co-efficient of coupling, inductive reactance and Q factor. 3.2 Classify given inductors on the basis of material used, applications and construction.	**Inductors** 3.1 Inductors: Definition, concept of self and mutual inductance, co-efficient of coupling, inductive reactance and Q factor. 3.2 Classification of Inductor: 3.2.1 [A] Fixed inductor: (a) Air core inductor (b) Iron core inductor (c) Ferrite core inductor. (Symbol and application) 3.2.2 [B] Variable inductors (a) Tapped inductor. (Construction, working and application) (b) Slug tuned(Construction, working and application- **Self Learning**) **Course Outcome:CO1 Teaching Hours:1hr Marks: NA**
4	4.1 Identify and define general specifications of switches. State working principle of given switch. 4.2 Define relay. State working principle of given relay.	**Switches and Relays** 4.1 Introduction to Switches: 4.1.1 General specifications: voltage rating, contact current rating, contact resistance, operating time, release time, electrical life, mechanical life. 4.1.2 Types of switches: (a) Rotary (b) Push to ON (c) Push to OFF (d) Keyboard (e) Slide (f)Toggle switch. (working principle) 4.2 Introduction to Relays: Definition, NO/NC contacts. 4.2.1 Types of relays: (a) General purpose relay (b) Dry reed relay (c)Mercury wetted reed relay. (working principle) **(Self Learning)** **Course Outcome:CO1,2 Teaching Hours:1hr Marks: NA**
5	5.1 Define characteristics impedance, current carrying capacity of cables. Draw construction diagram of given cable. List applications of given cable. 5.2 Define general specifications of connectors. List applications of given connector.	**Cables and Connectors** 5.1 Introduction to Cables: Concept of characteristics impedance, current carrying capacity. 5.1.1 Types of cables: (a) Coaxial cable (b) Twisted pair cable (c) Twin core (d) Optical fiber cable (e) Communication cable. (Construction, Application) 5.2 Introduction to Connectors: General specifications: contact resistance, breakdown voltage and insulation resistance. 5.2.1 Types of connectors: (a) BNC (b) TNC (c) D type (d) Audio (e) Video (f) RJ 45. (applications) **(Self Learning)** **Course Outcome:CO1,2 Teaching Hours:1hr Marks: NA**

6	6.1 List different types of PCB. 6.2 List and explain steps for preparation of PCB. 6.3 State working principle of screen printing, photo printing methods. 6.4 State steps used in Drilling, Mounting of components. 6.5 Explain different Soldering technique. 6.6 List specifications of SMD component. List advantages and disadvantages of SMD component. List applications of SMD component. 6.7 Explain through hole technology Explain in detail SMT 6.8 State important steps in soldering of SMD. 6.9 State Protection, Safety in Soldering.	**Printed Circuit Board** 6.1 Introduction to PCB: Types of PCB, Layers of PCB, Advantages & disadvantages of PCB,. 6.2 Base & Conducting material, types of laminates, Flowchart for preparation of PCB. 6.3 Working principle of Screen printing, photo printing methods. 6.4 Drilling, Mounting of components. 6.5 Soldering technique: Methods of soldering, Dip, wave, Hand, Necessary conditions for soldering 6.6 Introduction SMD (Surface Mounted Devices) : advantages, disadvantages and applications of SMD's, specifications of: A) Resistor B) Capacitor C) Inductor. 6.7 Introduction to Through hole Technology and Surface Mount Technology (SMT) 6.8 Soldering of SMD 6.9 Protection, Safety in (ROHS and NON-ROHS) Soldering. **Course Outcome:CO4 Teaching Hours:4hrs Marks: NA**

IV. Laboratory Learning Outcome and Aligned Practical / Tutorial Experiences.

Sr No	Laboratory learning outcomes	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
1	- Identify the types of resistors. - Calculate resistance value by using color code method and multimeter.	To identify and test the resistor (fixed, variable, SMD). • Find out resistance and tolerance by color code method and multimeter.	4	CO1 CO2
2	- Identify the types of Capacitor. - Calculate capacitor value by using color code method and L-C-R meter.	To identify and test the capacitor (Electrolytic, Ceramic, Paper, Mica, SMD etc.) • Value by color code, numerical, character or printed value method.	4	CO1 CO2
3	- Identify the controls of analog and digital multimeter.	Identify and handle the controls of analog and digital multimeter.	4	CO3

4	- Identify the Square wave, Triangular wave and Sine wave generated by Function Generator. - measure their Amplitude and Frequency of waves on CRO.	Function Generator and CRO Handling: To identify the Square wave, Triangular wave and Sine wave generated by Function Generator and measure their Amplitude and Frequency on CRO.	4	CO3
5	- Use of connectors. - Understand the connection of any connectors with appropriate cable.	To demonstrate and check the use of connectors (BNC, TNC, RJ 45). • Connection of any one of the above connectors with appropriate cable.	4	CO1 CO2
6	- Draw any electronic circuit using software.	Introduction of Circuits Drawing Software: • Identify the features of Electronic Circuit drawing software like Express SCH, EAGLE PCB. • Draw circuit diagram of simple circuits. (e.g. Dual regulated power supply and single stage BJT amplifier etc)	4	CO4
7	- Design electronic circuits on PCB.	Making of PCB: • To identify and test various types of PCBs. • Draw layout on PCB base, use paint/Templates/Pen etc. for tracks. • Etching materials, Drill bits used for Drilling.(Fabricate the PCB by pattern transfer, etching, cleaning and drilling) • Mounting and Soldering of components on Drilled PCB as per circuit diagram. • Cleaning of PCB. • Testing and troubleshooting of mounted circuits on PCB. Verify circuit output.	10	CO3 CO4
8	- Prepare PCB for small electronic circuits.	Mini Project: To prepare PCB (with layout, artwork designed by the student) for small electronic circuits.	10	CO1 CO4
9	- Identify the types of inductors. - Calculate inductors value by using color code method and L-C-R meter.	To identify and test the inductors. ◦ Find the value and tolerance of inductor by color code method ◦ Find the value and tolerance of SMD inductor using codes	4	CO1 CO2
10	- Calculate the value resistance for different intensity of light.	To identify and test the performance of LDR. • Calculate the value resistance for different intensity of light.	4	CO1 CO2
11	- Determine the value of contact resistance of switches.	To identify and test the various switches (Rotary, Push to ON, Push to OFF, Toggle switch). • Determine the value of contact resistance of switches.	4	CO1 CO2

12	- Determine the contact resistance of general purpose relay	To trace the parts of relay coil and NO/NC contacts. • Determine the contact resistance of general purpose relay	4	CO1 CO2
13	- Check continuity of cables using meter	To demonstrate and check continuity of cables using meter (Twisted pair, Coaxial, Flat ribbon).	4	CO1 CO2
14	- Handle and Identify tools used in lab. - State the use of given tools.	To demonstrate electronics tools used in lab. • Handling and Identification of tools. • Applications of electronics tool. (Nose pliers, wire stripper, screwdrivers, align keys, align screw, cutter, hand Hacksaw & crimping tools (for RJ-45, RJ-11)).	4	CO3
15	- Identify different parts of Power supply.	Tracing internal parts of the power supply: Opening the power supply & identify the transformer, rectifier section, heat sink, power transistor, earth terminal, fuse.	4	CO1
16	- Know the manufacturing process of components.	Industrial visit to any Electronics Industry.	-	ALL

Note 1: Mini project group may consist of 3-4 students. Student has to demonstrate the project and submit the project report in synopsis form.

Note 2: List of experiments: Any 12 experiments out of 16(Experiment number 1 to 8 and 16 are compulsory)

V. Suggested Micro Project / Assignment/ Activities for Specific Learning / Skills Development (Self Learning):

1. Design artwork for simple Electronic circuits using any PCB making software.
2. To create YouTube channel and upload video of Mini project.
3. To create PPT and make an informative video showing importance of SMT Technology.
4. To enlist SMT technology based simple projects.

VI. Specification Table:

As per the scheme there will be no theory assessment for this course.

VII. Assessment

Methodologies/Tools

Formative assessment (Assessment for Learning)

- Rubrics for continuous assessment based on process and product related performance indicators (25 marks)

Summative Assessment (Assessment of Learning)

End term examination, Viva-voce, Workshop performance (25 marks)

VIII. Suggested COs - POs Matrix Form

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3	2	1	1			2	1	1	-
CO2	3	2	1	2			2	2	1	-
CO3	1	2	1	3			2	2	1	-
CO4			3	3	2	1	3	3	3	3

Legends: - High:03, Medium:02, Low:01, No Mapping: --

IX. Suggested Learning Materials / Books

Sr.No	Author	Title	Publisher
1	Electronic material and component.	Mrs. Madhuri Joshi , Shroff Publication	8173669007/ 9788173669002
2	Electrical and electronic measurements and instruments.	A. K. Sawhney , DhanpatRai and Son's	8177000160/ 978-8177000160
3	Electronic components and materials	S. M. Dhir, Tata McGraw Hill, Education	0-07-463082-2/ 9780074630822
4	Build your own electronic workshop	ThomosPetruzellis, Tata McGraw Hill, Education	0071447245/ 9780071447249
5	Printed Circuit Board	Walter Bosshart, Tata McGraw Hill, Education	0074515497/ 978-0074515495
6	Electronic material and component	Patil, Deshmukh, Markande ,BPB Publication	-----

X. Learning Websites & Portals

Sr.No	Link / Portal	Description
1	www.electronics-tutorials.com	Basics of Electronics
2	www.electronicsandyou.com .	Basic tutorials & SMT technology
3	https://techdocs.altium.com/display/ADOH/Tutorial+-Getting+Started+with+PCB+Design assessed on 8th October 2016. 6.	PCB making software
4	http://www.circuitstoday.com/	Electronics Mini projects

XI. Academic Consultation Committee/Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
1	Mr. Bhavesh Lalwani	Director	Precison Technologies, Bhiwandi
2	Dr. S.D.Yardi	Sel. Grade Lecturer in Electronics	Government Polytechnic, Mumbai
3	Ms. S.H. Sisodiya	Lecturer in Electronics	Government Polytechnic, Mumbai
4	Ms. S.B.Puri	Lecturer in Electronics	Government Polytechnic, Mumbai

Coordinator,
Curriculum Development,
Department of Electronics Engineering

Head of Department
Department of Electronics Engineering

I/C, Curriculum Development Cell

Principal

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CDC Co-ordinator
G. P. Mumbai

	Programme : Diploma in EE / EC / IS / CE / ME / CO / IF/AI & ML / RT		
Course Code:SC23501		Course Title :BASIC MATHEMATICS	
	Compulsory / Optional: Compulsory		

Teaching Scheme and Credits						Examination Scheme							
CL	TL	LL	SLH	NLH	Credits	FA-TH		SA-TH (3Hrs.)	FA-PR	SA		SLA	Total
						T1	T2			PR	OR		
4	2	--	2	8	4	20	20	60	25	--	--	25	150

Total IKS Hrs. for course: 06 Hrs

Abbreviations: CL- ClassRoom Learning, TL- Tutorial Learning, LL- Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, SLA- Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination, @$ Internal Online Examination

Note:

1. FA-TH represents Total of two class tests of 20 marks each conducted during the term.
2. FA-PR represents Tutorial Term work of 25 Marks
3. SLA represents self learning Assessment of 25 Marks
4. SA-TH represents the end term examination of 60 Marks

I. Rationale

Basic Mathematics plays a crucial role in diploma programmes as it fosters the development of critical thinking skills, enhances quantitative literacy, prepares students for higher education, promotes problem-solving abilities, cultivates logical and abstract thinking and fosters mathematical literacy. By engaging with Mathematics, students acquire logical reasoning, problem-solving techniques and analytical thinking, which are valuable for lifelong learning and professional growth. Calculus is a branch of Mathematics that calculates how matter, particles and heavenly bodies actually move. Derivatives are useful to find maxima and minima of the function, velocity and acceleration are also useful for many engineering optimization problems. Statistics can be defined as a type of mathematical analysis which involves the method of collecting and analyzing data and then summing up the data into a numerical form for a given set of factual data or real-world observations. It equips individuals with the ability to interpret numerical information, make informed decisions and navigate real-world situations. Moreover, Mathematics provides a foundation for further studies in various disciplines and prepares students to tackle complex challenges. By exploring abstract concepts and logical structures, students develop their ability to reason, make connections, and approach problems with clarity and precision. Furthermore, studying Mathematics helps students appreciate the historical and cultural significance of Mathematics and its applications in diverse fields, thereby fostering mathematical literacy and a deeper understanding of the world. Hence the course provides the insight to analyze engineering problems scientifically using logarithms, matrices, trigonometry, straight line, differential calculus and statistics. By incorporating these topics, students comprehend to approach engineering problems from a mathematical perspective, enabling them to devise efficient and effective solutions and this leads to preparing Diploma graduates well-rounded, adaptable and capable of making significant contributions to the branch-specific problems.

II. Industry / Employer Expected Outcome

Apply the concept of Mathematics to solve industry-based technology problems.

III. Course Outcomes: Students will be able to achieve & demonstrate the following COs on completion of course based learning.

CO1	Apply the concepts of algebra to solve engineering (discipline) related problems.
CO2	Utilize trigonometry to solve branch specific engineering problems.
CO3	Solve area specific engineering problems under given conditions of straight lines.
CO4	Apply differential calculus to solve discipline specific problems.
CO5	Use techniques and methods of statistics to crack discipline specific problems.

Course Content Details:

Unit No.	Theory Learning Outcomes (TLO's)aligned to CO's.	Topics / Sub-topics
1	TLO 1.1 Solve the given simple problem based on laws of logarithm. TLO 1.2 Solve given system of linear equations using matrix inversion method. TLO 1.3 Obtain the proper and improper partial fraction for the given simple rational function. TLO 1.4 Solve simultaneous equations by using concept given in Ancient Indian Mathematics	**Unit - I Algebra** 1.1 Logarithm: Concept and laws of logarithm. 1.2 Matrices: Matrices, algebra of matrices, transpose,value of determinant of matrix of order 3x3, adjoint and inverse of matrices. 1.3 Matrices: Solution of simultaneous equations by matrix inversion method. 1.4 Partial Fractions: Types of partial fraction based onnature of factors and related Problems. 1.5 Algebra in Indian Knowledge System: Solution ofsimultaneous equations (Indian Mathematics)..
	Course Outcome : CO1 **Teaching Hours :12 hrs** **Marks: 12**	
2	TLO 2.1 Apply the concept of Compound angle, allied angle and multiple angles to solve the given simple engineering problem(s). TLO 2.2 Apply the concept of Sub- multiple angle to solve the given simple engineering related problem(s). TLO 2.3 Apply concept of factorization and de-factorization formulae to solve the given simple engineering problem(s). TLO 2.4 Investigate given simple problems by utilizing inverse trigonometric ratios. TLO 2.5 Use concept given in Ancient Indian Mathematics for trigonometry to solve given problems.	**Unit - II Trigonometry** 2.1 Trigonometric ratios of allied angles, compound angles, multiple angles (2A, 3A), submultiples angles.(without proof) 2.2 Factorization and De factorization formulae.(without proof). 2.3 Inverse Trigonometric Ratios and relatedproblems. 2.4 Principle values and relation between trigonometric and inverse trigonometric ratios. 2.5 Trigonometry in Indian Knowledge System: TheEvolution of Sine Function in India. 2.6 Indian Trigonometry: Basic Indian Trigonometry-Introduction and Terminology (From Ancient Beginnings to Nilakantha). 2.7 Trigonometry in Indian Knowledge System:Pythagorean triples in Sulabasutras.
	Course Outcome : CO2 **Teaching Hours :16 hrs** **Marks: 12**	
3	TLO 3.1 Calculate angle between given two straight lines. TLO 3.2 Formulate equation of straight lines related to given engineering problems. TLO 3.3 Identify perpendicular distance from the given point to the line. TLO 3.4 Calculate perpendicular distance between the given two parallel lines. TLO 3.5 Use geometry given in Sulabasutras to	**Unit - III Straight Line** 3.1 Straight line and slope of straight line: Angle between two lines, Condition of parallel and perpendicular lines. 3.2 Various forms of straight lines: Slope point form, two-point form, Double intercept form, General form. 3.3 Perpendicular distance from a point on the line. 3.4 Perpendicular distance between two parallel lines. 3.5 Geometry in Sulabasutras in Indian Knowledge System (construction of square, circling the square).

	solve the given problems.	(Indian Mathematics).
	Course Outcome : CO3 **Teaching Hours :6 hrs** **Marks: 06**	
4	TLO 4.1 Solve the given simple problems based on functions. TLO 4.2 Solve the given simple problems based on rules of differentiation. TLO 4.3 Obtain the derivatives of composite, implicit, parametric, inverse, logarithmic, exponential functions. TLO 4.4 Apply the concept of differentiation to find given equation of tangent and normal. TLO 4.5 Apply the concept of differentiation to calculate maxima, minima and radius of curvature for given function. TLO 4.6 Familiar with concept of calculus givenin Indian Mathematics.	**Unit - IV Differential Calculus** 4.1 Functions and Limits: Concept of function andsimple examples. 4.2 Functions and Limits: Concept of limits withoutexamples. 4.3 Derivatives: Rules of derivatives such as sum,Product, Quotient of functions. 4.4 Derivatives: Derivative of composite functions(chain Rule), implicit and parametric functions. 4.5 Derivatives: Derivatives of inverse, logarithmicand exponential functions. 4.6 Applications of derivative: Second order derivativewithout examples, Equation of tangent and normal, Maxima and minima, Radius of curvature. 4.7 Calculus in Indian Knowledge System: The Discovery of Calculus by Indian Astronomers.(IndianMathematics).
	Course Outcome : CO4 **Teaching Hours :16 hrs** **Marks: 18**	
5	TLO 5.1 Obtain the range and coefficient of range of the given grouped and ungrouped data. TLO 5.2 Calculate mean and standard deviation of ungrouped and grouped data related to the given simple engineering problem(s). TLO 5.3 Determine the variance and coefficient of variance of given grouped and ungrouped data. TLO 5.4 Justify the consistency of given simple sets of data.	**Unit - V Statistics** 5.1 Range, coefficient of range of discrete and grouped data. 5.2 Mean deviation and standard deviation from meanof grouped and ungrouped data. 5.3Variance and coefficient of variance. 5.4 Comparison of two sets of observation.
	Course Outcome : CO5 **Teaching Hours :10 hrs** **Marks: 12**	

IV. Laboratory Learning Outcome and Aligned Practical / Tutorial Experiences.

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Solve simple problems of Logarithmsbased on given applications.	1	Solve simple problems of Logarithms based on givenapplications.	2	CO1
LLO 2.1 Solve elementary problems on Algebraof matrices for branch specific engineering related applications.	2	Solve elementary problems on Algebra of matrices forbranch specific engineering related applications.	2	CO1
LLO 3.1 Apply the concept of matrix to solveengineering problems.	3	Solve solution of Simultaneous Equation usinginversion method.	2	CO1
LLO 4.1 Apply the concept of matrix to solveengineering problems.	4	Apply Matrix Inversion method to determine currents through various branches of given electrical networks.	2	CO1
LLO 5.1 Apply the concept of matrix to solveengineering problems.	5	Determine inverse of a non-singular matrix by usingopen source software.	2	CO1
LLO 6.1 Apply the concept of partial fraction tosolve engineering problems.	6	Resolve into partial fraction using linear non-repeated,repeated, and irreducible quadratic factors.	2	CO1
LLO 7.1 Solve problems on Compound, Allied,multiple and sub multiple angles for related shapes.	7	Solve problems on Compound, Allied, multiple and submultiple angles for related shapes.	2	CO2
LLO 8.1 Utilize the concept of trigonometry tosolve engineering problems.	8	Practice problems on factorization and de factorization.	2	CO2
LLO 9.1 Utilize the concept of trigonometry tosolve engineering problems.	9	Solve problems on inverse trigonometric ratios basedon applications.	2	CO2

LLO 10.1 Solve branch specific engineeringproblems under given conditions of straight lines.	10	Practice problems on equation of straight lines usingdifferent forms.	2	CO3
LLO 11.1 Solve branch specific engineering problems under given conditions of straight lines.	11	Solve problems on perpendicular distance, distance between two parallel lines and angle between two lines.	2	CO3
LLO 12.1 Solve branch specific engineeringproblems under given conditions of straight lines.	12	Use given form of straight line to calculate the speed,distance and time of moving object.	2	CO3
LLO 13.1 Apply the concept of derivative tosolve engineering problems.	13	Solve problems to find derivatives of implicit functionand parametric function.	2	CO4
LLO 14.1 Apply the concept of derivative tosolve engineering problems.	14	Solve problems to find derivative of logarithmic andexponential functions for engineering applications.	2	CO4
LLO 15.1 Apply the concept of equation oftangent and normal to solve engineering problems.	15	Solve problems based on finding equation of tangentand normal for engineering applications.	2	CO4
LLO 16.1 Apply the concept of maxima,minima and radius of curvature to solve engineering problems.	16	Solve problems based on finding maxima, minima offunction and radius of curvature at a given point for engineering applications.	2	CO4
LLO 17.1 Apply the concept of equation oftangent and normal to solve engineering problems.	17	Use the concept of tangent and normal to solve thegiven problem of Engineering Drawing.	2	CO4
LLO 18.1 Apply the concept of Maxima andMinima to solve engineering problems.	18	Use the concept of Maxima and Minima to obtainoptimum value for given engineering problem.	2	CO4
LLO 19.1 Apply the concept of radius ofcurvature to solve engineering problems.	19	Use the concept of radius of curvature to solve givenbranch specific engineering problem.	2	CO4
LLO 20.1 Utilize the concept of derivative tosolve engineering problems.	20	Use the concept of derivative to find the slope of abending curve for given engineering problem.	2	CO4
LLO 21.1 Use concept of range and mean deviation to crack branch specific problems.	21	Solve problems on finding range, coefficient of rangeand mean deviation for given applications.	2	CO5
LLO 22.1 Use concept of standard deviation andcoefficient of variance to crack branch specific problems.	22	Solve problems on standard deviation, coefficient ofvariation and comparison of two sets.	2	CO5
LLO 23.1 Use concept of standard deviation tocrack branch specific problems.	23	Calculate the Standard Deviation for Concrete with thegiven data for given engineering applications.	2	CO5

Note: 1. Take any 10-12 tutorials out of 23 and ensured that all the units are covered. 2. Take tutorial in the batch size of 20 to 30 students. 3. Give students at least 10 problems to solve in each tutorial.

Suggested Micro Project / Assignment/ Activities for Specific Learning / Skills Development (Self Learning):

- Collect examples based on real world applications of logarithm and prepare a pdf file.
- Solve the simultaneous system of equation in two variables by Matrix Inversion Method. Write down a Mathematical programmingusing any open source software to verify the result.
- Collect an examples on coding theory using applications of matrices and prepare a pdf file.
- Represent the Graph of Trigonometric function, Logarithmic function on Geogebra and interpret the nature of graph and Make a pdffile.
- Measure height of trees in surrounding locations using trigonometry and prepare presentation.
- Find the derivative of y= x^sinx and visualize the graph of the function and its derivative using any open source software geometrically.
- Find height of room or distance between two pillars by using concept of

straight line.

- Collect at least 10 examples based on real world applications of standard deviation/variance.
- Collect at least 10 examples based on real world uses of applications of derivative.
- Attempt any 5-7 Assignment, out of the given list.

V. Specification Table:

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Algebra	2	4	6	12
2	Trigonometry	2	4	6	12
3	Straight Line	2	2	2	6
4	Differential Calculus	2	8	8	18
5	Statistics	2	4	6	12
	Total	**10**	**22**	**28**	**60**

VI. Assessment Methodologies/Tools

Formative assessment (Assessment for Learning)

- TH- Progressive /Periodic Test test each of 20 Marks
- TL - Continuous Assessment of Tutorials for 25 Marks
- SL - Continuous Assessment of Self Learning for 25 Marks

Summative Assessment (Assessment of Learning)

- **TH** - Term End examination of 60 Marks

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3	1	--	1	--	1	1			
CO2	3	1	--	--	1	1	1			
CO3	3	--	--	--	--	--	--			
CO4	3	1	1	1	--	1	--			
CO5	3	2	1	1	1	1	1			

Legends: - High:03, Medium:02, Low:01, No Mapping: --

VII. Suggested Learning Materials / Books

Sr.No	Author	Title	Publisher
1	Grewal B. S.	Higher Engineering Mathematics	Khanna publication New Delhi , 2013 ISBN:8174091955
2	Dutta. D	A text book of Engineering Mathematics	New age publication New Delhi, 2006 ISBN: 978-81-224-1689-3
3	Kreysizg, Ervin	Advance Engineering Mathematics	Wiley publication New Delhi 2016 ISBN: 978-81-265-5423-2
4	Das H.K.	Advance Engineering Mathematics	S Chand publication New Delhi 2008 ISBN:9788121903455
5	Marvin L. Bittinger David J. Ellenbogen Scott A. Surgent	Calculus and Its Applications	Addison-Wesley 10th Edition ISBN-13: 978-0-321-69433-1
6	C. S. Seshadri	Studies in the History of Indian Mathematics	Hindustan Book Agency, New Delhi 110016. ISBN978-93-80250-06-9
7	George Gheverghese Joseph	Indian Mathematics Engaging with the World from Ancient to Modern Times	World Scientific Publishing Europe Ltd. 57 ISBN978-17-86340-61-0
8	Deepak Singh	Mathematics-I	Khanna Book Publishing Co. (P) Ltd. ISBN: 978-93-91505-42-4
9	Garima Singh	Mathematics-II	Khanna Book Publishing Co. (P) Ltd. ISBN: 978-93-91505-52-3
10	Gareth James, Daniela Witten, Trevor Hastie Robert and Tibshirani	An Introduction to Statistical Learning with Applications in R	Springer New York Heidelberg Dordrecht London ISBN 978-1-4614-7137-0 ISBN 978-1-4614-7138-7 (eBook)
11	Gunakar Muley	Sansar Ke Mahan Ganitagya	First Edition, Rajkamal Prakashan, ISBN-10.8126703571, ISBN-13. 978-8126703579.
12	T.S. Bhanumurthy	A Modern introduction to Ancient Indian Mathematics	New Age International Private Limited, 1 January2008 ISBN- 10. 812242600X, ISBN-13. 978-8122426007
13	M.P. Trivedi and P.Y. Trivedi	Consider Dimension and Replace Pi	Notion Press; 1st edition (2018), ISBN-978-1644291795

VIII. Learning Websites & Portals

Sr.No	Link /Portal	Description
1	http://nptel.ac.in/courses/106102064/1	Online Learning Initiatives by IITs and IISc
2	www.scilab.org/ -SCI Lab	Signal processing, statistical analysis, imageenhancement.
3	www.mathworks.com/product/matlab/ -MATLAB	Applications of concepts of Mathematics tocoding.
4	Spreadsheet Applications	Use of Microsoft Excel, Apple Numbers, GoogleSheets.
5	https://ocw.mit.edu/	MIT Course ware
6	https://www.khanacademy.org/math?gclid=CNqHuabCys4CFdOJaddHoPig	Concept of Mathematics through video lecturesand notes
7	http://ocw.abu.edu.ng/courses/mathematics/	List of Mathematical Courses.

8	https: libguides.furman.edu/oer/subject/mathematics	Open Education Resources (OER) inMathematics.
9	https://phet.colorado.edu/en/simulations/filter?subjects=math&type=html,prototype	Phet Simulation for Mathematics.
10	https://libguides.cmich.edu/OER/mathematics	Mathematics with OER.

IX. Academic Consultation Committee/Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
1	Mrs.Sanchita Datta	Lecturer in Mathematics (Selection Grade)	St.Xavier's Institute of Technology,Mahim
2	Mr.Abhijit Sadashiv Patil	Lecturer in Mathematics	Government Polytechnic,Mumbai
3	Mr.Vinod Shantaram Patil	Lecturer in Mathematics	Government Polytechnic,Mumbai

A.S.Patil V.S.Patil

Coordinator,
Curriculum Development,
Department of Science & Humanities

S.A.Thorat (S.A.Thorat)

Head of Department
Department of Science & Humanities

I/C, Curriculum Development Cell

Principal

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CDC Co-ordinator
G. P. Mumbai

Programme: Diploma in EE/IS/EC	
Course Code: SC23101	Course Title: BASIC PHYSICS
Compulsory / Optional: Compulsory	

Teaching Scheme and Credits						Examination Scheme							
CL	TL	LL	SLH	NLH	Credits	FA-TH		SA-TH (2.30Hrs.)	FA-PR	SA		SLA	Total
										PR	OR		
3	-	2	1	6	3	20	20	60	25	25#	-	25	175

Total IKS Hrs. for course: 2hrs.

-**Abbreviations:** CL- Class Room Learning, TL- Tutorial Learning, LL- Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, SLA- Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination, @$ Internal Online Examination

Note:
1. FA-TH represents an average of two class tests of 20 marks each conducted during the term.
2. SA-TH represents the end term examination.
3. FA-PR represents the term work.
4. SA-PR represents the end term practical examination.

I. Rationale:

The subject is included under the category of science. The special feature of the subject is to develop the laboratory skill using principles of scientific phenomenon. This course will serve to satisfy the need of the technical students for their development in technical field. The course is designed by selecting the topics which will develop intellectual skills of the students and will guide students to solve broad based engineering problems. Ultimately the focus of the course is to develop psychomotor skills in the students.

II. Industry / Employer Expected Outcome

Physics is a fundamental science that plays a crucial role in various industries and has numerous outcomes that benefit society: Apply principles of physics to solve broad based relevant engineering problems.

III. Course Outcomes: Students will be able to achieve & demonstrate the following COs on completion of course based learning

CO1	Classify the different physical quantities, identify the proper unit of it and to estimate error in the measurement of physical quantities.
CO2	Apply laws of motion in various engineering applications.
CO3	Understand photoelectricity, LASER, Semiconductor and gain its significance in modern science and technology.
CO4	Apply basic properties of light to solve engineering problems.
CO5	Identify properties such as elasticity and viscosity with their engineering applications

Course Content Details:

Unit No.	Theory Learning Outcomes (TLO's)aligned to CO's	Topics / Sub-topics
1	**TLO 1a.** Explain physical quantities and its types with examples. **TLO 1b.** Differentiate between scalar and vector quantities with examples. **TLO 1c.** Apply dimensional analysis to check correctness of equation and conversion of units in different systems. **TLO 1d.** Estimate the errors in the measurement for the give problem. **TLO 1e.** Explain the working of ancient astronomical instruments to measure distance, time and hour angle	**Units and Measurements** 1.1 Fundamental Physical quantities, examples, derived physical quantities, examples. 1.2 Scalar and Vector Physical Quantities. 1.3 Definition and requirements of unit System of units, C. G. S., M. K. S. and S. I. units., Dimensions, dimensional formula, Rules to write the unit and conventions of units and Significant figures, rules to writesignificant figures 1.4 Error – Definition, types of errors and estimation of errors. 1.5 Ancient astronomical instruments: Chakra, Dhanyata , Yasti and Phalak yantra, Numerical **Course Outcome: CO1** **Teaching Hours: 5hrs** **Marks: 8**
2	**TLO2a.** Differentiate between velocity and speed. Identify changes in motion that produce acceleration. Able to calculate speed, velocity and acceleration of an object, analytically, Classify acceleration as positive, negative, and zero. **TLO2b.** Identify different periodic motion with examples such as oscillatory motion, Vibratory motion, circular motion. **TLO2c.** Explain angular motion with equation of angular motion, explain relation between linear velocity and angular Velocity, understand the concept	**Motions** 2.1 **Linear motion** –Definition – distance, displacement, velocity, acceleration, retardation,equation of motions, acceleration due to gravity and equation motion under gravity, numerical 2.2 **Periodic motions:** a) Oscillatory motion, b) Vibratory motion, c) S.H.M. d) Circular motion. (only definition and examples) , terms related to S.H.M. :Definition: Time period, frequency, amplitude, wavelength, and phase 2.3 **Angular motion:** a) Definition: angular motion, Uniform circular motion, Radius vector,linear velocity, Angular velocity, Angular acceleration, b) Relation between linear velocity and angular Velocity(derivation), Radial or centripetal acceleration, Three equations of motion (no derivations) , Centripetal and Centrifugal force,examples and

	of centripetal and centrifugal force **TLO2d.** Describe real-life situations that illustrate each of Newton's laws of motion. **TLO2e.** Explain the ancient theory of gravitation and laws of motion.	applications. 2.4. Laws of Motion and it's applications. 2.5. Ancient theory of Gravitation and laws of motion. Numerical. **Course Outcome: CO2** **Teaching Hours :10hrs** **Marks: 16**
3	**TLO3a.** Understand the concept of quantum theory of light, **TLO3b.** Describe a photoelectric-effect experiment. **TLO 3c.** Calculate KE of photoelectrons using Einstein's equation **TLO3d.** Explain characteristics of photoelectric effect **TLO3e.** Explain applications of photoelectric effect. **TLO3f.** Understand the fundamentals of lasers. **TLO3g.** Explain the properties and applications of LASER. **TLO3h.** Distinguish between conductors, semiconductors and insulators on the basis of energy bands. **TLO3i.** Explain the I-V characteristics and applications of p-n junction diode	**Modern Physics** **3.1 Photo Electricity** 3.1.1 Concept of quantum theory of light, 3.1.2 photoelectric effect 3.1.3 Einstein's Photoelectric equation 3.1.4 Characteristics of photoelectric effect, 3.1.5 Application of photo electric effect, Numerical. **3.2 LASER** 3.2.1 LASER introduction 3.2.2 Properties of laser, Applications of LASER **3.3 Semiconductor Physics** 3.3.1 Conductors, Insulators and Semiconductors 3.3.2 Energy bands, intrinsic and extrinsic semiconductors 3.3.3 Minority and majority charge carriers 3.3.4 p-n junction diode, Depletion layer I-V characteristics of p-n junction, 3.3.5 static and dynamic resistance 3.3.6 Applications of p-n junction diode **Course Outcome: CO3** **Teaching Hours :11hrs** **Marks: 14**
4	**TLO4a.** Explain refraction and reflection of light. **TLO 4b.** Estimate refractive index of material of prism. **TLO4c.** Explain the phenomenon of total internal reflection. **TLO 4d.** Describe the workings and uses of fibre optics.	**4 Optics and Optical Fiber** **4.1 Optics:** 4.1.1 Revision of reflection and refraction of light. 4.1.2 Laws of refraction, Snell's law. 4.1.3 Determination of refractive index. 4.1.4 Dispersion, dispersive power, Prism formula (derivation) 4.1.5 Total internal reflection, Numerical **4.2 Optical Fiber:** 4.2.1 Principle of propagation of light through optical fiber. 4.2.2 Structure of optical fiber. 4.2.3 Applications. 4.2.4 Difference between optical fiber cable and electric cable wire **Course Outcome: CO4** **Teaching Hours :8hrs** **Marks: 8**

5	**TLO 5a.** Calculate elastic constants and state their significance **TLO5 b.** Distinguish between elasticity, viscosity **TLO 5c.** Determine viscosity of fluid Classify types of flow of fluid **TLO 5d.**Explain the significance of Reynold's number. **TLO 5d.** Identify applications of Elasticity and viscosity	**General Properties of Matter** **5.1Elasticity:** 5.1.1 Deformation, deforming force, internal restoring force, Elastic, plastic and rigid bodies, their examples. 5.1.2 Definition of elasticity, Plasticity, rigidity, stress, strain and its types. 5.1.3 Hooke's Law and elastic limit. 5.1.4 Stress versus Strain diagram, yield point, breaking point 5.1.5 Definition Young's Modulus, bulk modulus and modulus of rigidity relation among them. 5.1.6 Factor of safety, breaking stress, ultimate stress 5.1.7 Applications of elasticity. 5.1.8 Numerical **5.2 Viscosity:** 5.2.1. Concept and Definition of viscosity, velocity gradient. 5.2.2 Newton's law of viscosity, Co-efficient of viscosity, unit of viscosity 5.2.3. Stoke's law, terminal velocity, derivation of Stoke's formula. 5.2.3 Streamline flow, turbulent flow, critical velocity, examples. 5.2.4 Reynold's number and its significance. 5.2.5 Applications of viscosity, Numerical **Course Outcome: CO5** **Teaching Hours :11hrs** **Marks: 14**

IV. Laboratory Learning Outcome and Aligned Practical / Tutorial Experiences.

Sr No	Practical / Tutorial / Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
1	**LLO a.** Use of measuring instruments **LLO b.** Find the least count and range of the instruments. **LLO c.** Interpretation of graph and use of scientific calculator.	To know your Physics laboratory and Use of Scientific Calculator	2	CO1
2	**LLO a.** Use Vernier caliper to Measure dimensions of given objects. Measure the dimensions of objects of known dimensions. **LLO b.** Estimate the errors in measurement.	To measure the dimensions of given objects and to determine their volume using Vernier caliper	2	CO1
3	**LLO a.** Identify types of motion **LLO b.** Determine the value of acceleration due to gravity.	To determine Acceleration due to gravity by simple pendulum	2	CO2
4	**LLO a.** Explain photoelectric effect **LLO b.** Demonstrate the IV characteristics of photoelectric effect.	To study IV characteristic of photoelectric cell.	2	CO3

5	**LLO a.** Explain refraction of light. **LLO b.** Determine refractive index of a given prism	To determine refractive index of a prism by pin method	2	CO4
6	**LLO a.** Explain Elastic moduli. **LLO b.** Understand te relation between Young's modulus, Bulk modulus and rigidity modulus of elasticity	To determine Elastic moduli of a given wire by using Searle's apparatus.	2	CO5
7	**LLO a.** Use Micrometer Screw gauge to: Measure dimensions of given objects. Measure the dimensions of objects of known dimensions. **LLO b.** Estimate the errors in measurement.	To measure the dimensions of given objects and to determine theirvolume using micrometer screw gauge.	2	CO1
8	**LLO a.** Identify type of motion **LLO b.** Calculate the stiffness constant	To determine stiffness constant by using helical spring	2	CO2
9	**LLO a.** Study the types of motion. **LLO b.** Use of projectile motion in sport.	To study projectile motion	2	CO2
10	**LLO a.** Use P -N junction diode to draw forward bias and reverse bias I-V characteristics **LLO b.** Find out static and dynamic resistance of given P N junction diode	Determination of static and dynamic resistance of given P-N junction diode	2	CO3
11	**LLO a.** Study properties of liquid **LLO b.** Calculate coefficient of viscosity of liquid	To determine coefficient of viscosity of liquid by Stokes' method	2	CO5
12	**LLO a.** Study the properties of light TIR **LLO b.** Determine the critical angle	To study total internal reflection and to determine the critical angle.	2	CO4
13	**LLO a.** Demonstrate on spectrometer device	Demonstration on spectrometer	2	CO4
14	**LLO a.** Identify properties of LASER	Experiments on LASER	2	CO3
15	**LLO a.** Define unit and classify into different types of units	Showing Video on different applications related to units,	2	CO1

Note: 10 to 12 experiments should be performed in a term for completion of TW

V. Suggested Micro Project / Assignment/ Activities for Specific Learning / Skills Development (Self Learning): (Minimum 10 Assignments)

1. Convert the units of a given physical quantity from one system of units to another
2. Measure room temperature of hot baths / bodies by using mercury thermometer and convert it into different units.
3. Prepare a chart to summarize units and measurements.
4. Use a digital vernier calliper and micrometre screw gauge for measurements. (Lab- based).
5. Make a paper scale of least count e.g., 0.01 cm, 0.2cm, 0.5cm.
6. What is the difference between speed and velocity?
7. What is motion? Describe Straight line motion.
8. Explain Average speed and Average velocity.
9. Write in detail about your experience of various, types of motion while riding a bicycle on a road.
10. Identify the types of motion.

a) Movement of the earth around the sun: ..... .

b) Movement of a ceiling fan: .....

c) A meteor falling from the sky: .....

d) A rocket launched from the ground: .....

e) A fish swimming in water: .....

f) The plucked string of a sitar: .....

11. For the photoelectric effect, explain what happens (and why)

a) To the photocurrent as the light intensity increases.

b) To the photocurrent as the frequency of the light is increased.

c) To the speed of the photoelectrons as the radiation intensity increases.

12. Make a ppt on applications of LASER.
13. Applications of semiconductors in civil, mechanical, electrical engineering etc.
14. Applications of optical fibers in civil, mechanical, electrical engineering etc.
15. Prepare PPT on application of Nanotechnology in Electronics, Automobile, Medical, Textile, Cosmetics, Environmental, Space and Defense.
16. To demonstrate T.I.R and working of optical fiber (lab based)
17. Compare elastic body and plastic body (lab based).
18. Write the practical applications of Elasticity.
19. Write the practical applications of Viscosity.
20. Compare streamline and turbulent flow with examples.

VI. Specification Table:

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Units and Measurements	2	4	2	8
2	Motions	4	4	8	16
3	Modern physics	4	4	6	14
4	Optics and Optical fiber	2	4	2	8
5	General properties of matter	2	4	8	14
	Total	**14**	**20**	**26**	**60**

V1I.Assessment Methodologies/Tools

Formative assessment (Assessment for Learning)

- Rubrics for continuous assessment on process and product related performance indicators (25 marks)

Summative Assessment (Assessment of Learning)

- End term examination, Viva-voce, Workshop performance (25 marks)

VIII. Suggested COs - POs Matrix Form(Electrical Engineering)

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3			2			2	1	1	1
CO2	3						1			
CO3	3				1		1	1	1	1
CO4	3			2	1		2	1	1	1
CO5	3			2			2	1		1

Legends: - High:03, Medium:02, Low:01, No Mapping: --

VIII. Suggested COs - POs Matrix Form(Instrumentation Engineering)

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3			2			2	1	1	
CO2	3						1	1		
CO3	3				1		1	1	1	
CO4	3			2	1		2	1	1	
CO5	3			2			2	1	1	

Legends: - High:03, Medium:02, Low:01, No Mapping: --

VIII. Suggested COs - POs Matrix Form(Electronics Engineering)

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3			2			2	2	1	1
CO2	3						1	1		1
CO3	3				1		1	1	1	1
CO4	3			2	1		2	2	1	1
CO5	3		2	2			2	1	1	2
Legends: - High:03, Medium:02, Low:01, No Mapping: --										

IX. Suggested Learning Materials / Books

Sr. No	Author	Title	Publisher
1	R K Gaur &; S L Gupta	Engineering Physics	Dhan pat Rai Pub.
2	Prof. Arthur Beiser	Applied Physics	Tata McGraw hill Pub.
3	D K Bhattacharya	Engineering Physics	Oxford University press
4	NCERT / MSBSHSE	Physics 1 & 2	NCERT/MSBSHSE
5	Halliday &Resnick Wiley	Physics Vol 1 & 2	Wiley India
6	Brijlal & Subrahmanyam	Principle of physics	S. CHAND & COMPANY
7	R K Gaur & S L Gupta.	Engineering Physics	Dhan pat Rai Pub.

X. Learning Websites & Portals

Sr. No	Link / Portal	Description
1	https://sunitathorat1310.wixsite.com/website-1	Unit and measurement, Motion, Modern physics, Optics and Optical fiber, Properties of materials viz Elasticity, Viscosity
2	www.physicsclassroom.com	Concept of basic physics
3	www.physics.org	Concept of basic physics
4	www.physics.brown.edu	Concept of basic physics
5	www.amazon.com/Basic-Physics	Concept of basic physics
6	http: //scienceworld.wolfram.com/physics/	Concept of basic physics
7	http: //en.wikipedia.org/wiki	Concept of basic physics
8	http: //hyperphysics.phy-astr.gsu.edu/hbase	Concept of basic physics
9	www.msu.edu/~brechtjo/physics	Concept of basic physics
10	www.answers.com/topic/list-of-basic-physics-topics	Concept of basic physics
11	www.answers.com/topic	Unit and measurement, Motion, Modern physics, Optics and Optical fiber, Properties of materials viz Elasticity, Viscosity
12	www.vlab.amrita.edu	All Experiments video
13	www.olabs.edu.in	All Experiments video
14	https: //praxilabs.com/en/	All Experiments video
15	www.phet.colorado.edu	Simulation of Topics

XI. Academic Consultation Committee/Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
1	Mr.Y.A. Mahajan	Selection grade Lecturer in physics	Bhausaheb Vartak Polytechnic, Vasai
2	Mr. S.S. Salve	Senior Lecturer in physics	S.B.M. Polytechnic, Vile -Parle
3	Mrs.B.J. Chaudhari	Lecturer in physics	Government Polytechnic, Thane
4	Mrs. S.A. Thorat	Lecturer in physics	Government Polytechnic, Mumbai

S.A. Thorat

Coordinator
Curriculum Development,
Department of Science & Humanities

S.A. Thorat

Head of Departments
Department of Science & Humanities

I/C, Curriculum Development Cell

Principal

APPROVED COPY
CDC Coordinator
G. P. Mumbai

Programme : Diploma inDiploma in Electronics Engineering (Sandwich Pattern)													
Course Code: EE23 210					Course Title : Fundamentals of Electrical Engineering								
Compulsory / Optional: Compulsory													
Teaching Scheme and Credits						Examination Scheme							
CL	TL	LL	SLH	NLH	Credits	FA-TH		SA-TH (3Hrs.)	FA-PR	SA		SLA	Total
						T1	T2			PR	OR		
04	-	02	02	08	04	20	20	60	-	25 @	--	25	150

Total IKS Hrs. for course: 2

Abbreviations: CL- Class Room Learning, TL- Tutorial Learning, LL- Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, SLA- Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination, @$ Internal Online Examination

Note:

1. FA-TH represents total of two class tests of 20 marks each conducted during the term.
2. SA-TH represents the end term examination.

I. Rationale

All the equipment related to electronics utilizes electrical energy for their operations. Diploma holders from this branch come across various types of electrical circuits. The purpose of this subject is to give fundamental knowledge of electrical engineering so that they will be able to handle electrical equipment's, electrical & electronic circuits and analyze simple DC/AC circuits.

II. Industry / Employer Expected Outcome

The aim of this course is to help the student to attain the following industry identified outcome through various teaching learning experiences:

IO1	To impart the knowledge required for the measurement of electrical engineering parameters like voltage, current, power, phase etc in industry
IO2	Capable of analyzing the problems and issues come up in basic electrical measurements.
IO3	Practice electrical safety

III. Course Outcomes: Students will be able to achieve & demonstrate the following COs on completion of course based learning

CO1	Define basic terminologies related to electrical circuit
CO2	Solve simple DC circuits
CO3	Interpret Magnetism and Electromagnetism concept
CO4	Solve simple ac series circuits
CO5	Determine performance of single-phase transformer
CO6	Practice electrical safety

Course Content Details:

Unit No.	Teaching Learning Outcome	Topics / Sub-topics
1	1.1 State and apply Basic concepts of electricity. 1.2 Define resistance and explain the factors affecting resistance 1.3 State and apply Ohm's law 1.4 State concept and measurement of Electrical work,power and Energy 1.5 Measurement of Electrical voltage ,current,power and energy 1.6 Understand the effects of electric current	**Basic Concepts:** 1.1 Electric Current: Definition, Direction of current, unit, Electric potential, Potential difference, Concept of EMF and Potential difference. 1.2 Resistance: Definition, unit, Factors on which resistance depends Effect of temperature on resistance. (simple numerical) 1.3 Conductance, Ohms Law. (simple numerical) 1.4 Electric power and energy concept and unit. (simple numerical) 1.5 Measurement of voltage, current, power and energy. 1.6 Effects of Electric Current: Heating Effect ,Magnetic Effect and Chemical Effect.(Only Introduction) **Course Outcome : CO1** **Teaching Hours :10hrs** **Marks: 12**

	2.1 Define the term related to electric circuit. 2.2Identify constant voltage/current and real voltage/current source. 2.3 State effect of open and short circuit. 2.4 Solve dc circuit using Kirchhoff's laws 2.5 Carry out star-delta transformations.	**DC Circuits:** 2.1 Definitions of terms Related to Electric Circuits, Circuit Parameters, Linear Circuit, Non-linear Circuit, Bi-lateral Circuit, Uni-lateral Circuit, Electric Network, Passive Network, Active Network, Node, Branch, Loop, Mesh. 2.2 Voltage and Current Sources: 2.2.1 Constant Voltage Source and Real Voltage Source 2.2.2 Constant Current Source and Real Current Source 2.3 Concept of Open and Short circuit 2.4 Kirchhoff's Laws - Kirchhoff's Current Law - Kirchhoff's Voltage Law (Simple Numerical with maximum two equations) 2.5 Delta-Star and Star-Delta Transformation (No Derivation and Simple Numerical) **Course Outcome : CO2** **Teaching Hours :12 hrs** **Marks: 10**
3	3.1 Define and explain various terms related to magnetism 3.2 Define and explain various terms related to magnetic circuit 3.3 Compare electric and Magnetic circuit. 3.4 Explain hysteresis loop. 3.5 State Faradays law of Electromagnetic Induction, Len's law,Flemings right hand rule. Understand the concept of self inductance and mutual inductance.	**Magnetism and Electromagnetic induction:** 3.1 Definition of Magnetic field, Magnetic flux, Magnetic flux Density, Magnetic Intensity, Absolute and Relative permeability, relation between B and H. 3.2 Magnetic effect of electric current, Right hand rule, cork screw rule, Current carrying conductor in magnetic field, Fleming's left-hand rule. 3.3 Magnetic circuit, mmf, Reluctance, Permeance, comparison between Magnetic and Electric circuit. 3.4 Magnetization curve for magnetic and non-magnetic material, Magnetic Hysteresis,Hysteresis Loop, Hysteresis Loops for Hard & Soft Magnetic Materials, residual flux, Retentivity, coercive force, Hysteresis loss. 3.5 Electromagnetic induction, Faradays laws of electromagnetic Induction, Lenz's law, Flemings right hand rule, Dynamically induced EMF, Statically induced EMF, self Inductance, mutual inductance, coefficient of coupling.(Only equations, No derivation) **Course Outcome : CO3** **Teaching Hours :10 hrs** **Marks: 10**

4	4.1 Compare AC and DC Signal 4.2 Understand the advantages of AC over DC 4.3 Concept of generation of AC voltage and current 4.4 Understand the mathematical expression of AC signal 4.5 Define terminology related ac waveform. 4.6 Learn the concept of Phase 4.7 Draw the phasor diagram 4.8 Solve the simple numerical based on RL,RC,RLC circuits 4.9 Measurement of active reactive and apparent power 4.10 Concept of Power factor and its significance	**AC Fundamentals:** 4.1 Difference between AC and DC quantity. 4.2 Advantages of AC Over DC. 4.3 Generation of A.C. Voltage and current. 4.4 Mathematical Expression of alternating quantity & its derivation. 4.5 Definition of Waveform, Instantaneous value, Cycle, Time period, Frequency, Amplitude, Peak value, Average value and RMS value, Form factor and Peak factor for sinusoidal (no derivation, simple numerical) 4.6 Phase, Phase difference, Phasor representation of sinusoidal quantities 4.7Circuit diagram, phasor diagram and wave form of a.c. circuits through pure Resistance, Pure Inductance and pure Capacitance. Concept of inductive reactance and capacitive reactance. 4.8 Circuit diagram, phasor diagram and wave form of a.c. circuits RL, RC and RLC circuit. Impedance and Impedance Triangle. (simple numerical) 4.9 Power- active, reactive and apparent, power triangle. 4.10 Power factor and its significance. **Course Outcome : CO4** **Teaching Hours :15 hrs** **Marks: 10**
5	5.1 Understand basic construction and working of Transformer 5.2 Learn EMF equation 5.3 Measure volatage ratio,current ratio and transformation ratio 5.4 Know the KVA rating of Transformer 5.5 Understand the losses in a Transformer 5.6 Define Efficiency and voltage regulation of Transformer 5.7 Know the Auto Transformer	**Single Phase Transformer:** 5.1 Construction and working of transformer. classification, brief description of each part. its function 5.2 significance of E.M.F. equation *(No derivation)* 5.3 Voltage ratio, current ratio and transformation ratio. 5.4 KVA rating of a transformer. 5.5 Losses in a transformer 5.6 Efficiency and voltage regulation (no numerical) 5.7 Auto transformer-comparison with two winding transformers and application **Course Outcome : CO5** **Teaching Hours : 6 hrs** **Marks: 10**

6	6.1Learn about the safety devices 6.2 Practice the electrical safety measures 6.3 Understand the concept of Earthing	**Electrical Safety** 6.1 Electrical hazards ,Do's and Don'ts Safety devices : Rewireable fuse (operation , types , general specifications),Cartridge fuse, MCB,ECLB 6.2 Electrical Safety precautions in electrical indoor and outdoor installations ,First Aid Treatment: Precautions if person gets an electric shock. Methods of artificial respiration 6.3 Earthing: Definition, necessity of earthing, types of earthing. **Course Outcome : CO6** **Teaching Hours : 7 hrs** **Marks: 08**

IV. Laboratory Learning Outcome and Aligned Practical / Tutorial Experiences.

Sr No	Laboratory Learning outcomes	Laboratory Experiment	Number of hrs.	Relevant COs
1	Measure AC/DC voltage, resistance, continuity	Measure voltages and currents in series resistive circuit.	2	CO1,2
2	Measure AC/DC voltage, resistance, continuity	Measure voltages and currents in parallel resistive circuit.	2	CO1,2
3	Calculate temperature coefficient of resistance	To verify the effect of temperature on resistance of copper conductor	2	CO1
4	Draw B-H curve and determine relative permeability	To plot the B-H curve for magnetic material and determine the relative Permeability	2	CO3
5	Calculate the EMF induced	Observe that EMF is induced in coil when magnetic lines of force move across winding and observe its polarity	2	CO3
6	Measure AC/DC voltage	Observe AC & DC waveform and measure AC voltage & DC voltage with oscilloscope.	2	CO1
7	Plot phasor diagram and Calculate active, reactive and apparent power	Determine impedance, phase angle of R-L series circuit, plot phasor diagram and also calculate active, reactive and apparent power consumed in R-L series circuit	2	CO4
8	Measure transformation ratio	Measure the transformation ratio of transformer.	2	CO5

9	Measure efficiency and regulation of transformer	To verify efficiency and regulation of transformer	2	CO6
10	Demonstrate method of artificial respiration	Demonstration of CPR Technique	2	CO4

Note 1: Mini project group may consist of 3-4 students. Student has to demonstrate the project and submit the project report in synopsis form.

V. Suggested Micro Project / Assignment/ Activities for Specific Learning / Skills Development (Self Learning):

1. Collect information of any 10 Inventors/ scientist in Electrical Engineering
2. Prepare simple resistor using nichrom wire and measure its resistance.
3. Write general specifications of capacitor used in domestic application.
4. Enlist examples of apparatus/machine working on self and mutual Induction principle.
5. Design simulation of a simple resistance circuit

VI. Specification Table:

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Basic Concepts	--	4	8	12
2	DC Circuits	2	--	8	10
3	Magnetism and Electromagnetic induction	4	6	--	10
4	AC Fundamentals	--	4	6	10
5	Single phase Transformer	2	6	2	10
6	Electrical Safety	4	2	2	08
	Total	**12**	**22**	**26**	**60**

VII. Assessment Methodologies/Tools

Formative assessment (Assessment for Learning)

- Rubrics for continuous assessment based on process and product related performance indicators (25 marks)

Summative Assessment (Assessment of Learning)

- End term examination, Viva-voce, Workshop performance (25 marks)

VIII. Suggested COs - POs Matrix Form

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO - 1	PSO - 2	PSO - 3
CO1	03	03	--	02	02	--	03	02	02	02
CO2	03	03	--	02	02	--	03	02	02	02
CO3	03	03	--	02	--	--	03	03	02	02
CO4	03	--	--	02	02	--	03	03	02	02
CO5	03	03	--	02	--	--	03	03	02	02
CO6	--	--	--	03	03	--	03	02	02	--
Legends: - High:03, Medium:02, Low:01, No Mapping: --										

IX. Suggested Learning Materials / Books

Sr.No	Author	Title	Publisher
1	M.N. Mittal	Fundamentals of Electrical Engineering	Everest Publishing House
2	B. L. Theraja and A. K. Theraja	Electrical Technology (Volume I)	S. Chand and Co. Ltd.
3	V. K. Mehta and Rohit Mehta	Basic Electrical Engineering	S. Chand and Co. Ltd.
4	Edward Hughes	Electrical Technology	ELBS Publications

X. Learning Websites & Portals

Sr.No	Link / Portal	Description
1	https://archive.nptel.ac.in/courses/108/105/108105112/	Videos on basic concept, DC circuit, Capacitor and ac fundamental

2	https://www.khanacademy.org	Videos on basic concept
3	https://www.elprocus.com/kirchhoffs-laws-working-formula/	Kirchoff's Laws and basic terminology of circuit.
4	https://www.electronics-tutorials.ws/electromagnetism/electromagnetic-induction.html	Laws of Electromagnetic Induction

XI. Academic Consultation Committee/Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
1	Mr. Kuldeep Singh Rajput	Deputy Executive Engineer	400KV RSOM, Kharghar Navi Mumbai
2	Mrs. S.P. Phadnaik	Lecturer in Electrical Engineering	G.P. Pune
3	Mrs. I.N.Khuspe	Lecturer in Electrical Engineering	G.P.Mumbai
4	Dr. P. N. Padghan	Lecturer in Electrical Engineering	G.P.Mumbai

Coordinator,
Curriculum Development,
Department of Electrical Engineering

Head of Department
Department of Electrical Engineering

I/C, Curriculum Development Cell

Principal

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CDC Co-ordinator
G. P. Mumbai

Programme : Diploma in ME/CE/EE/CO/IF/IS/EC/RT/LT/LG (Sandwich Pattern), AIML												
Course Code: UV23301			Course Title : Universal Human Values-I									
Compulsory / Optional: Compulsory												
Teaching Scheme and Credits						Examination Scheme						
CL	TL	LL	SLH	NLH	Credits	FA-TH	SA-TH	FA- PR	SA		SLA	Total
									PR	OR		
01	–	–	01	02	01	–	–	–	–	–	50	50

Total IKS Hrs. for course: 04

Abbreviations: CL- Classroom Learning, TL- Tutorial Learning, LL- Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, SLA- Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# Online Examination, @$ Internal Online Examination

Note:

1. FA-TH represents an average of two class tests of 30 marks each conducted during the term.
2. SA-TH represents the end term examination.

Rationale:

Human beings have materially developed to a great extent through technological development. Still the scarcity of happiness and satisfaction result in personal and social conflicts. The value system develops the frame of reference of the individual to benchmark his/ her behavioral pattern respecting the righteousness during life. The appreciation and inculcation of a value system can develop a person as a creative contributor for society, nation and by-large the world.

By inculcating universal values, not only can a person resolve the personal, social and professional situations positively but also can lead toward an enriched life. Once these values are inculcated in a student's personality, it will result in the sustainable development of a student.

This course is designed to make the student think that by observing the universally accepted human values, it is easy to become a good human being, a good citizen and make their own life goal-oriented, cladded with happiness and satisfaction. The core universal values to be inculcated: personal values, social values and professional values. The aspirations and concerns to be explored at the level of individual, at the level of family, at the level of society and at the level of nature.

Industry / Employer Expected Outcome

To demonstrate value based behavior at the workplace.

Course Outcomes:

On completion of this course,Students will be able to achieve & demonstrate the following COs on completion of course based learning

CO1	Appreciate universal human values to ensure sustained happiness and prosperity, which are the core aspirations of all human beings.
CO2	Develop a holistic approach to environment, family and society.
CO3	Develop more confidence in self .
CO4	Derive joy of giving .
CO5	Improve understanding and perform acts of kindness.

Course Content Details:

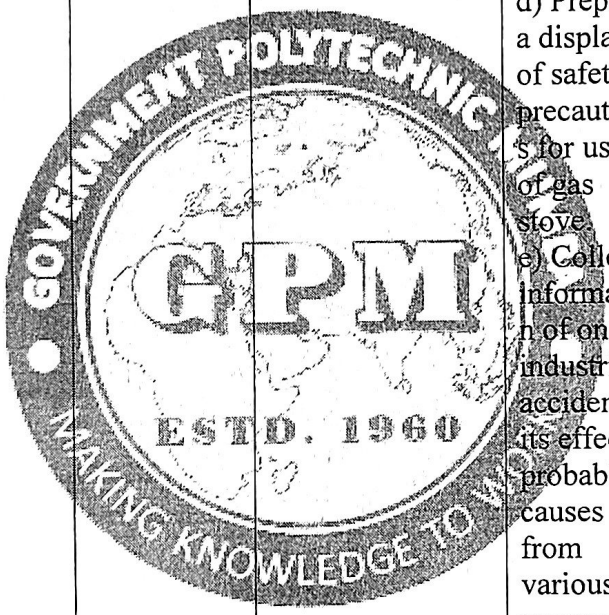
Sr. No.	CO	Activity	Related Value/s	Methodology of Implementation	Student's Role	Mentor's role	Resources Required
01	CO1 CO3	Prepare a self-introduction sheet i)Name, School passed from, achievements up to 10th standard ● What are your goals in your life? ● What are your expectations from institute, Family, Society? ● Information of family members ● Most happy moments and difficult moments in your life, Special trips. Hobbies , Sports, Music , etc	Honesty, Self-exploration	Preparing a note and presenting in front of peers'	Thoughtfully answer the questions in an honest manner.	Provide information about the institute and motivate students to honestly express themselves.	Official website of the institute

02	**CO1 CO2**	List behavioral characteristics and analyze self, friend, family members, ● Do you like these characters yes/no – why	Self-exploration , Honesty	Preparing a presentation	Honestly and sincerely analyse self and others	Create a stress-free environment and see that there will be no conflict of expression.	Provide a list of character traits by referring to various resources like internet, books, etc. For e.g. https://www.teachervision.com/writing/character-traits-list-examples
03	**CO2 CO3**	Identify your needs and desires	Honesty Self-exploration	Making a list of needs and desires	Reflect and identify needs and desires.	Stay wary of controversial subjects	list of historical personalities who set the example.
04	**CO2 CO5**	Singing a patriotic song in group ● Make group , select song, explain meaning, use music/karaoke and demonstrate to class	Patriotism	Forming group of interested students Students will rehearse the activity and will perform in groups	Diligently practice and cooperate with others.	Manage the logistics of creating groups and assigning roles.	Music system, list of patriotic songs.

05	**CO1 CO3**	Essay writing ● My dreams as an Engineer ● India a Super power in my views ● Society & I ● Indian culture and values ● My role models in life **IKS hours-** Religious and cultural history of India- Indus civilization	Self – exploration Patriotism Accountability	Selecting a topic from the list and writing an essay on it	Thoughtfully write the essay on a selected topic.	Display the best essays on the notice board.	notice board, panel of judges
06	**CO2 CO3**	Play Music instruments/ Singing/ Drawing/Any stage performance/ photography/any creative art **IKS hours -** History of Indian classical music.	Derive the joy	**Present to peers**	Pursue your creative interest	Identify and categorize students. Create groups according ly	logistical support
07	**CO2 CO4 CO5**	Visit a nature park, identify the flora & fauna, ecological factors & their role in our life. (e.g Maharashtra nature park society , Dharavi , Mumbai)	Environment Conservation	Students to arrange visit under supervision of mentor	Study various flora & fauna in a disciplined manner.	Assure safety of students and manage activities.	**https://maharashtranaturepark.org/**
08	**CO2 CO4**	Tree plantation and caring for it.	Environment Conservation	Students to arrange activity under supervision of mentor	Plant the appropriate saplings according to instructions.	Assure safety of students and provide adequate instructions.	saplings, soil, shovels, fertilizer

09	**CO3**	List the distractors which are responsible to deviate you from integrity and find out the solution	Integrity, Righteousness	Observation and identification of common distracters.	Identify distracters like TV shows, movies and bad habits	Provide historical case studies of previous students.	Case studies
10	**CO2 CO5**	Prepare the chart DOs and DONTs for different situations like local trains, travel, public place, classroom, examination, etc.	Conscientiousness, honesty, social gratitude	Preparing the chart	Identify DOs and DONTs and prepare various charts	Create groups and assign topics.	Official websites of respective administrations like railways, Municipal corporation, etc.,
11	CO4	Beach cleaning, institute cleaning	Environment conservation, Health consciousness	Organizing a visit to clean the venue.	Clean the venue as per instructions.	Assure safety and aid in organization.	**https://www.unitedwaymumbai.org/cleanshores**

12	CO4 CO5	a) To prepare a first aid box to be kept at home b) Preparation of a report on industrial accident	Care for others, accountability	Collection of information from various available sources and use it for intended purpose.	a) Prepare a list of contents for a first aid box to be kept at home b) Prepare a first aid box as per prepared list c) Prepare a list of various accidental hazards at home. d) Prepare a display of safety precautions for use of gas stove. e) Collect information of one industrial accident , its effects, probable causes from various resources and prepare a report.	To explain and monitor the task	Medicine. Box. paper



Methodology:

1. The course teacher will be the mentor.
2. In consultation and under supervision of a mentor, the student/ Group of students has to complete the activity.
3. The mentor will work as a facilitator/ advisor.
4. The strategies to learn the course is "Self- Exploratory" and "Experiential Learning"
5. The onus of responsibility for completing the activities is with students.
6. The student has to complete at least **five** no. of activities throughout the term. Each activity carries 10 marks.

Assessment methodologies/Tools:

Formative Assessment(Assessment for Learning)

The student has to complete at least **five** no. of activities throughout the term. Each activity carries 10 marks

Criterion No.	Criterion	Max. Marks	Not Satisfactory	Satisfactory	Good	Excellent
1	Attendance	02	0	1	2	2
2	Knowledge	04	1	2	3	4
3	Presentation / Performance	04	1	2	3	4
	Total	10				

Suggested CO-PO Matrix form:

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	-	-	-	-	2	1	3	-	-	-
CO2	-	1	1	-	1	1	2	-	-	1
CO3		1	-	-	1	1	2	-	-	1
CO4	-	-	-	-	1	-	2	-	-	-
CO5	-	-	-	-	1	-	2	-	-	-

Legends :- High:03, Medium:02,Low:01, No Mapping: -
*CO PSOs mapping to be formulated at department level

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	A Foundation Course in Human Values and Professional Ethics	R.R. Gaur, R. Sangal, G.P. Bagaria, Excel Books, New Delhi, 2010	978-8-174-46781-2
2	Human Values	A.N. Tripathy, New Age International Publishers, 2003	978-8-122-42589-5
3	Teacher's Manual - A Foundation Course in Human Values and Professional Ethics	R.R. Gaur, R. Sangal, G.P. Bagaria, Excel Books, New Delhi, 2010	-
4	Science and Humanism, Towards a Unified World View	PL Dhar, RR Gaur, Commonwealth Publications, 1992	978-8-171-69222-4
5	Education for values in schools- a framework	NCERT	
6	Value oriented education	E N Gawande	

E-References:

1) **https://voutu.be/kOJu1vj_BVk (The 10 MostImportant Human Values)**
2) **Dr. Prakash Baba Amte- Movie**
3) **https://voutu.be/QeogOlzG2ls (Value of Education -short film)**

E-References for mentors:

1) **https://www.edutopia.org/**

2) **https://sdgs.un.org/goals**

Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Dr. L.A. Patil	Principal (Retired)	Pratap College, Amalner
2	Dr. Nitin Deshpande	Lead Consulatnt	Dnyanpeeth Academy, Pune
3	Dr. ChandrakantShahasane	Founder Trustee	Karnala Charitable Trust, Pune
4	Mr. Sunil V. Joshi	Ex- Sr. Lecturer, Mechanical Engineering,	Government Polytechnic, Mumbai
5	Mrs. Swati D. Deshpande	Principal	Government Polytechnic, Mumbai
6	Mr. U.A. Agnihotri	Lecturer, Mechanical Engineering	Government Polytechnic, Mumbai
7	Mr. K. V. Patil	Lecturer, Mechanical Engineering	Government Polytechnic, Mumbai
8	Mrs. P. A. Khande	Lecturer, Electronics Engineering	Government Polytechnic, Mumbai

Institute Coordinator,
Curriculum Development,

Principal
Government Polytechnic, Mumbai

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(approved copy)
CDC Co-ordinator
G. P. Mumbai