

**GOVERNMENT POLYTECHNIC, PUNE**  
**'120 – NEP' SCHEME**

<b>PROGRAMME</b>	<b>DIPLOMA IN CE/EE/ET/ME/MT/CM/IT/DDGM</b>
<b>PROGRAMME CODE</b>	<b>01/02/03/04/05/06/07/08</b>
<b>COURSE TITLE</b>	<b>FUNDAMENTALS OF ICT</b>
<b>COURSE CODE</b>	<b>CM21201</b>
<b>PREREQUISITE COURSE CODE &amp; TITLE</b>	<b>NA</b>

**I. LEARNING & ASSESSMENT SCHEME**

Course Code	Course Title	Course Type	Learning Scheme					Credits	Paper Duration	Assessment Scheme										Total Marks
			Actual Contact Hrs./Week			SLH	NLH			Theory			Based on LL & TSL				Based on SL			
			CL	TL	LL					FA-TH	SA-TH	Total		Practical		SLA				
						Max	Min					Max	Min	Max	Min	Max	Min			
CM21201	FUNDAMENTALS OF ICT	SEC	1	-	2	1	4	2	--	--	--	--	--	25	10	25@	10	25	10	75

**Total IKS Hrs for Term:** 0 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, IKS – Indian Knowledge System, SLA- Self Learning Assessment

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

**Note:**

**FA-TH** represents an average of two class tests of 30 marks each conducted during the semester.

- If a candidate is not securing minimum passing marks in **FA-PR** (Formative Assessment - Practical) of any course, then the candidate shall be declared as '**Detained**' in that semester.
- If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as '**fail**' and will have to repeat and resubmit SLA work.
- Notional learning hours** for the semester are **(CL + LL + TL + SL) hrs. \* 15 Weeks**
- 1 credit** is equivalent to **30 Notional hours**.
- \* Self-learning hours shall not be reflected in the Timetable.
- \* Self-learning includes micro-projects/assignments/other activities.

**II. RATIONALE:**

In any typical business set up to carry out routine tasks related to creating business documents, performing data analysis and its graphical representations and making electronic slide show presentations, the student needs to learn various software such as office automation tools like word processing applications, spreadsheets and presentation tools. They also need to use these tools for making their project reports and presentations. The objective of this course is to develop the basic competency in students for using these office automation tools to accomplish the job. This course also presents an overview of emerging technologies so that students of different disciplines can appraise the applications of these technologies in their respective domains.

**III. COURSE-LEVEL LEARNING OUTCOMES (CO'S)**

Students will be able to achieve & demonstrate the following CO's on completion of course-based learning

- CO1: Use a computer system and its peripherals for a given purpose.
- CO2: Prepare Business documents using a Word Processing Tool.
- CO3: Analyze Data and represent it graphically using Spreadsheet.
- CO4: Prepare professional Slide Show presentations.
- CO5: Explain the concept and application of emerging technology.

## IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
<b>UNIT-I INTRODUCTION TO COMPUTER SYSTEM (CL Hrs-2, Marks-NIL )</b>				
1.	<p><b>TLO 1.1</b> Explain the functions of components in the block diagram of the computer system.</p> <p><b>TLO 1.2</b> Classify the given type of software.</p> <p><b>TLO 1.3</b> Explain the characteristics of the given type of network.</p> <p><b>TLO 1.4</b> Describe the application of the given type of network connecting device.</p> <p><b>TLO 1.5</b> Describe the procedure to manage a file /folder in the given way.</p>	<p><b>1.1 Basics of Computer System:</b> Overview of Hardware and Software: block diagram of Computer System, Input/output unit CPU, Control Unit, Arithmetic logic Unit (ALU), Memory Unit.</p> <p><b>1.2 Internal components:</b> processor, motherboards, random access memory (RAM), read-only memory (ROM), video cards, sound cards and internal hard disk drives).</p> <p><b>1.3 External Devices:</b> Types of input/output devices, types of monitors, keyboards, mouse, and printers: Dot matrix, Inkjet and LaserJet, plotter and scanner, external storage devices CD/DVD, Hard disk and pen drive.</p> <p><b>1.4 Application Software:</b> word processing, spreadsheet, database management systems, control software, measuring software, photo-editing software, video-editing software, graphics manipulation software System Software compilers, linkers, and device drivers.</p> <p><b>1.5 Network environments:</b> network interface cards, hubs, switches, routers and modems, the concept of LAN, MAN, WAN, WLAN, Wi-Fi and Bluetooth.</p> <p><b>1.6 Working with Operating Systems:</b> Creating and managing files and folders, Copying a file, renaming and deleting files and folders, Searching files and folders, application installation, and creating shortcuts of applications on the desktop.</p>	Hands-on Demonstration Presentations	CO1

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
<b>UNIT-II WORD PROCESSING (CL Hrs-3, Marks-NIL)</b>				
2	<p><b>TLO 2.1</b> Write the steps to create the given text document.</p> <p><b>TLO 2.2</b> Explain the given feature for document editing.</p> <p><b>TLO 2.3</b> Explain the given page setup features of a document.</p> <p><b>TLO 2.4</b> Write the given table formatting feature.</p> <p><b>TLO 2.5</b> Write the steps to set the given type of document layout</p>	<p><b>2.1 Word Processing:</b> Overview of Word processor Basics of Font type, size, colour, Effects like Bold, italic, underline, Subscript and superscript, Case changing options, Previewing a document, Saving a document, Closing a document and exiting the application.</p> <p><b>2.2 Editing a Document:</b> Navigate through a document, Scroll through text, Insert and delete text, Select text, Undo and redo commands, Use drag and drop to move text, Copy, cut and paste, Use the clipboard, Clear formatting, Format and align text, Formatting.</p> <p><b>2.3 Changing the Layout of a Document:</b> Adjust page margins, Change page orientation, Create headers and footers, Set and change indentations, and Insert and clear tabs.</p> <p><b>2.4 Inserting Elements to Word Documents:</b> Insert and delete a page break, Insert page numbers, Insert the date and time, Insert special characters (symbols), Insert a picture from a file, and Resize and reposition a picture.</p> <p><b>2.5 Working with Tables:</b> Insert a table, Convert a table to text, Navigate and select text in a table, Resize table cells, Align text in a table, Format a table, Insert and delete columns and rows, Borders and shading, repeat table headings on subsequent page.</p> <p><b>2.6 Working with Columned Layouts and Section Breaks:</b> Columns, Section breaks, Creating columns, Newsletter style columns, changing part of a document layout or formatting, Remove section breaks, Adding columns to the remainder of a document, Column widths.</p>	Hands-on Demonstration Presentations	<b>CO2</b>
<b>UNIT-III SPREADSHEETS (CL Hrs-03, Marks-NIL)</b>				
3	<p><b>TLO 3.1</b> Write the steps to create the given spreadsheet.</p> <p><b>TLO 3.2</b> Explain the given formatting feature of a worksheet.</p> <p><b>TLO 3.3</b> Write steps to insert formulas and functions in the given worksheet.</p> <p><b>TLO 3.4</b> Write steps to</p>	<p><b>3.1 Working with Spreadsheets:</b> Overview of workbook and worksheet, Create Worksheet Entering sample data, Save, Copy Worksheet, Delete Worksheet, Close and open Workbook.</p> <p><b>3.2 Editing Worksheet:</b> Insert and select data, adjust row height and column width, delete, move data, insert rows and columns, Copy and Paste, Find and Replace, Spell Check, Zoom In-Out, Special Symbols, Insert Comments, Add Text Box, Undo Changes, - Freeze</p> <p><b>3.3 Formatting Cells and sheet:</b> Setting Cell</p>	Hands-on Demonstration Presentations	<b>CO3</b>

	<p>create charts for the given data set.</p> <p><b>TLO 3.5</b> Explain steps to perform data filter, sort and validation operations on the given data set.</p> <p><b>TLO 3.6</b> Write steps to set up and print a spreadsheet.</p>	<p>Type, Setting Fonts, Text options, rotating cells, Setting Colors, Text Alignments, Merge and Wrap, applying Borders and Shades, Sheet Options, Adjust Margins, Page Orientation, Header and Footer, Insert Page Breaks.</p> <p><b>3.4 Working with Formula:</b> Creating Formulas, Copying Formulas, Common spreadsheet Functions such as sum, average, min, max, date, In, And, or, mathematical functions such as sqrt, and power, applying conditions using IF.</p> <p><b>3.5 Working with Charts:</b> Introduction to charts, an overview of different types of charts, Bar, Pie, and Line charts, creating and editing charts. Use chart options: chart title, axis title, legend, data labels, Axes, grid lines, and moving chart in a separate sheet.</p> <p><b>3.6 Advanced Operations:</b> Conditional Formatting, Data Filtering, Data Sorting, Using Ranges, Data Validation, Adding Graphics, Printing Worksheets, print area, margins, header, footer and other page setup options.</p>		
<b>UNIT- IV PRESENTATION TOOL (CL Hrs-04, Marks-NIL)</b>				
4	<p><b>TLO 4.1:</b> Write the steps to create the given slide presentation.</p> <p><b>TLO 4.2:</b> Write the steps to insert multiple media in the given presentation.</p> <p><b>TLO 4.3:</b> Explain the method of including animation, and transition effects in a slide show.</p> <p><b>TLO 4.4:</b> Write steps to apply table features in the given presentation</p> <p><b>TLO 4.5:</b> Write steps to manage charts in the given presentation.</p>	<p><b>4.1 Creating a Presentation:</b> Outline an effective presentation, identify the elements of the User Interface, Create New Presentation Files, Create a Basic Presentation, Work with textboxes, Apply Character Formats, and Format Paragraphs.</p> <p><b>4.2 Inserting Media Elements:</b> Adding and Modifying Graphical Objects to a Presentation - Insert Images into a Presentation, insert audio clips, video/animation, Add Shapes, Add Visual Styles to Text in a Presentation, Edit Graphical Objects on a Slide, Format.</p> <p><b>4.3 Working with Tables:</b> Insert a Table in a Slide, Format Tables, and Import Tables from Other Office Applications.</p> <p><b>4.4 Working with Charts:</b> Insert Charts in a Slide, Modify a Chart, and Import Charts from Other Office Applications.</p>	Hands-on Demonstration Presentations	CO4

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
<b>UNIT –V BASICS OF INTERNET AND EMERGING TECHNOLOGIES (CL Hrs-04, Marks-NIL)</b>				
5	<p><b>TLO 5.1</b> Explain the use of the given setting option in browsers.</p> <p><b>TLO 5.2</b> Explain the given option used for effective searching in search engine</p> <p><b>TLO 5.3</b> Explain the features of the given web service.</p> <p><b>TLO 5.4</b> Explain concepts and applications of emerging technologies</p> <p><b>TLO 5.5</b> Use various elementary cloud-based tools</p>	<p><b>5.1 World Wide Web:</b> Introduction, Internet, Intranet, Cloud, Web Sites, web pages, URL, web servers, basic settings of web browsers- history, extension, default page, default search engine, creating and retrieving bookmarks, use search engines effectively.</p> <p><b>5.2 Web Services:</b> e-Mail, Chat, Video Conferencing, e-learning, e-shopping, e-Reservation, e-Groups, Social Networking.</p> <p><b>5.3 Emerging Technologies:</b> IoT, AI and ML, Drone Technologies, 3D Printing.</p> <p><b>5.4 Tools:</b> Docs, Drive, forms, quiz, Translate and other Apps.</p>	Hands-on Demonstration Presentations	CO5

#### V. 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	<p>LLO 1.1 Identify various Input/output devices, connections and peripherals of the computer system.</p> <p>LLO 1.2 Work with Computer systems, Input/output devices, and peripherals to manage files and folders for data storage.</p>	<p>a) Work with Computer Systems, Input/output devices, and peripherals.</p> <p>b) Work with files and folders</p>	2	CO1
2	<p>LLO 2.1 Create and manage Word document.</p> <p>LLO 2.2 Apply formatting features on text at line, paragraph and page level.</p>	<p>Work with document files:</p> <p>a) Create, edit and save documents in Word Processing.</p> <p>b) Text, lines and paragraph-level formatting</p>	2	CO2
3	LLO 3.1 Insert and edit images, and shapes in a document file.	Work with Images and Shapes in Word Processing.	2	CO2
4	LLO 4.1 Insert table and apply various table formatting features on it.	Work with tables in Word Processing.	2	CO2
5	<p>LLO 5.1 Apply page layout features in word processing.</p> <p>LLO 5.2 Print a document by applying various print options</p> <p>LLO 5.3 Use mail merge in word processing</p>	<p>Working with layout and printing a) Document page layout, Themes, and printing.</p> <p>b) Use of mail merge with options.</p>	2	CO2

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
6	LLO 6.1 Enter and format data in a worksheet. LLO 6.2 Insert and delete cells, rows and columns LLO 6.3 Apply alignment feature on cell	Create, open and edit Worksheet.	2	CO3
7	LLO 7.1 Create formula and "IF" condition on cell data LLO 7.2 Apply various functions and named ranges in the worksheet.	Formulas and functions in Worksheet.	2	CO3
8	LLO 8.1 Implement data Sorting, Filtering and Data validation features in a worksheet.	Sort, Filter and validate data in Spreadsheet.	2	CO3
9	LLO 9.1 Create charts using various chart options in a spreadsheet.	Charts for Visual Presentation in Spreadsheet.	2	CO3
10	LLO 10.1 Print the worksheet by applying various print options for the worksheet	Worksheet Printing.	2	CO3
11	LLO 11.1 Apply design themes to the given presentation. LLO 11.2 Insert pictures text/images/shapes in slide LLO 11.3 Use pictures text/images/shapes editing options.	Make Slide Show Presentation.	2	CO4
12	LLO 12.1 Add tables and charts in the slides. LLO 12.2 Run slide presentation in different modes LLO 12.3 Print slide presentation as handouts/notes	Use Tables and Charts in Slide	2	CO4
13	LLO 13.1 Apply animation effects to the text and slides LLO 13.2 Add/set audio and video files in the presentation.	a) Insert Animation effects into Text and Slides. b) Insert Audio and Video files in the presentation	2	CO4
14	LLO 14.1 Configure internet connection on a computer system LLO 14.2 Use different web services on the internet	a) Internet connection configuration b) Use Internet and Web Services.	1	CO5
15	LLO 15.1 Configure different browser settings LLO 15.2 Use browsers for the given purpose	Working with Browsers.	1	CO5
16	LLO 16.1 Create web forms for surveys using different options.	Prepare Web Forms for Survey.	1	CO5
17	LLO 17.1 Create web forms for Quiz using different options	Prepare Web Forms for Quiz	1	CO5

## VI. SUGGESTED MICRO PROJECT/ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT (SELF-LEARNING)

### Self-Learning

Following are some suggestive self-learning topics:

- 1) Use ChatGPT/any other AI tool to explore information.
- 2) Use Calendar to Schedule and edit activities.
- 3) Use the Translate app to translate the given content from one language to another.
- 4) Use a cloud-based storage drive to store and share your files.

### Micro project

The micro project has to be industry application-based, internet-based, workshop-based, laboratory-based or field-based as suggested by the Teacher.

- 1) Perform a survey on various inputs and output devices available in the market and make its report.
- 2) Prepare a table, Prepare Notes on Technical Topics, Reports, and Bio data with a cover letter (The subject teacher shall assign a document to be prepared by each student)
- 3) Prepare slides with all Presentation features such as classroom presentation, presentation about the department, and presentation of Technical Topics. (The subject teacher shall assign a presentation to be prepared by each student).
- 4) Student Mark sheet, Prepare Pay bills, tax statements, and student assessment records using a spreadsheet. (The teacher shall assign a spreadsheet to be prepared by each student).
- 5) Carry out Surveys on different web browsers.
- 6) Generate resumes for different job profiles, and survey reports of any industry using ChatGPT/any other AI tool.

### Assignment

Prepare a journal of practicals performed in the laboratory.

## VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	a) Computer System with all necessary Peripherals and Internet connectivity. b) Any Office Software c) Any Browser (Any General Purpose Computer available in the Institute )	ALL

## VIII.SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr. No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Introduction to Computer System	CO1	2	--	--	--	--
2	II	Word Processing	CO2	3	--	--	--	--
3	III	Spreadsheets	CO3	3	--	--	--	--
4	IV	Presentation Tool	CO4	4	--	--	--	--
5	V	Basics of Internet and Emerging Technologies	CO5	3	--	--	--	--
<b>Grand Total</b>				<b>15</b>	--	--	--	--

**IX. ASSESSMENT METHODOLOGIES/TOOLS**

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
Lab performance, Assignment, Self-learning and Seminar/Presentation	Lab. Performance, viva voce

**X. 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
CO1	1	-	-	-	-	-	1	2	-
CO2	-	-	-	3	-	-	1	-	-
CO3	-	2	1	3	-	-	1	-	3
CO4	-	-	-	3	-	-	1	-	-
CO5	1	-	-	3	-	-	3	2	-

**Legends:- High:03, Medium:02, Low:01, No Mapping: -**  
\*PSOs are to be formulated at the institute level

**XI.SUGGESTED LEARNING MATERIALS/BOOKS**



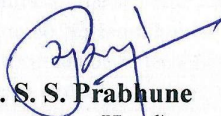

Sr.No	Author	Title	Publisher
1	Goel, Anita	Computer Fundamentals	Pearson Education, New Delhi, 2014, ISBN-13: 978-8131733097
2	Miller, Michael	Computer Basics Absolute Beginner's Guide, Windows 10	QUE Publishing; 8th edition August 2015, ISBN: 978-0789754516
3	Alvaro, Felix	Linux: Easy Linux for Beginners	CreateSpace Independent Publishing Platform- 2016, ISBN-13: 978-1533683731
4	Johnson, Steve	Microsoft Office 2010: On Demand	Pearson Education, New Delhi India, 2010. ISBN:9788131770641
5	Schwartz, Steve	Microsoft Office 2010 for Windows: Visual Quick Start	Pearson Education, New Delhi India, 2012, ISBN: 9788131766613
6	Leete, Gurdy, Finkelstein Ellen, Mary Leete	OpenOffice.org for Dummies	Wiley Publishing, New Delhi, 2003 ISBN : 978-0764542220

**XIII. LEARNING WEBSITES & PORTALS**

Sr.No	Link/Portal	Description
1.	<a href="https://www.microsoft.com/en-in/learning/office-training.aspx">https://www.microsoft.com/en-in/learning/office-training.aspx</a>	Office
2.	<a href="http://www.tutorialsforopenoffice.org/">http://www.tutorialsforopenoffice.org/</a>	Open Office



3.	<a href="https://s3-ap-southeast-1.amazonaws.com/r4ltue295xy0d/Special_Edition_Using_StarOffice_6_0.pdf">https://s3-ap-southeast-1.amazonaws.com/r4ltue295xy0d/Special_Edition_Using_StarOffice_6_0.pdf</a>	Open Office
4.	<a href="https://ashishmodi.weebly.com/uploads/1/8/9/7/18970467/computer_fundamental.pdf">https://ashishmodi.weebly.com/uploads/1/8/9/7/18970467/computer_fundamental.pdf</a>	Computer Fundamental
5.	<a href="http://www.tutorialsforopenoffice.org/">http://www.tutorialsforopenoffice.org/</a>	Open Office
6.	<a href="https://www.tutorialspoint.com/computer_fundamentals/index.htm">https://www.tutorialspoint.com/computer_fundamentals/index.htm</a>	Computer Fundamental
7.	<a href="https://www.tutorialspoint.com/word/">https://www.tutorialspoint.com/word/</a>	Word Processing
8.	<a href="https://www.javatpoint.com/ms-word-tutorial">https://www.javatpoint.com/ms-word-tutorial</a>	Word Processing
9.	<a href="https://support.microsoft.com/en-au/office/word-for-windows-training-7bcd85e6-2c3d-4c3c-a2a5-5ed8847">https://support.microsoft.com/en-au/office/word-for-windows-training-7bcd85e6-2c3d-4c3c-a2a5-5ed8847</a>	Word Processing
10.	<a href="https://www.javatpoint.com/excel-tutorial">https://www.javatpoint.com/excel-tutorial</a>	Spreadsheet
11.	<a href="https://support.microsoft.com/en-au/office/excel-video-training-9bc05390-e94c-46af-a5b3-d7c22f6990bb">https://support.microsoft.com/en-au/office/excel-video-training-9bc05390-e94c-46af-a5b3-d7c22f6990bb</a>	Spreadsheet
12.	<a href="https://www.javatpoint.com/powerpoint-tutorial">https://www.javatpoint.com/powerpoint-tutorial</a>	PowerPoint Presentation
13.	<a href="https://support.microsoft.com/en-au/office/powerpoint-for-windows-training-40e8c930-cb0b-40d8-82c4-b">https://support.microsoft.com/en-au/office/powerpoint-for-windows-training-40e8c930-cb0b-40d8-82c4-b</a>	PowerPoint Presentation
14.	<a href="https://www.geeksforgeeks.org/ms-dos-operating-system/">https://www.geeksforgeeks.org/ms-dos-operating-system/</a>	Operating System

Name & Signature:	
 <b>Mrs. Priyanka L Sonwane</b> Lecturer in Information Technology	 <b>Mrs. Aafiya A Shaikh</b> Lecturer in Computer Engineering
<b>(Course Experts)</b>	
Name & Signature:	Name & Signature:
 <b>Shri. S. S. Prabhune</b> (Programme Head)	 <b>Shri. S.B. Kulkarni</b> (CDC In-charge)

**GOVERNMENT POLYTECHNIC, PUNE**  
**'120 – NEP' SCHEME**

<b>PROGRAMME</b>	<b>DIPLOMA IN EE / ET</b>
<b>PROGRAMME CODE</b>	<b>06 / 07</b>
<b>COURSE TITLE</b>	<b>BASIC ELECTRONICS</b>
<b>COURSE CODE</b>	<b>ET11201</b>
<b>PREREQUISITE COURSE CODE &amp; TITLE</b>	<b>NA</b>

**I. LEARNING & ASSESSMENT SCHEME**

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ET11201	BASIC ELECTRONICS	DSC	3	-	2	1	6	3	3	30	70	100	40	25	10	25@	10	25	10	175	

**Total IKS Hrs for Term: 0 Hrs**

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**II. RATIONALE:**

Diploma engineers have to deal with the various electronic components while maintaining various electronic equipment. The study of basic operating principles and handling of various electronic devices will help them to troubleshoot electronic equipment. This course is developed in such a way that students will be able to apply the knowledge to solve broad electronic engineering application problems.

**III. COURSE-LEVEL LEARNING OUTCOMES (CO'S)**

Students will be able to achieve & demonstrate the following CO's on completion of course-based learning

- CO1: Use relevant passive components in Electronics circuits
- CO2: Use relevant diode in different Electronics circuits
- CO3: Use BJT in Electronics circuits
- CO4: Use FET in Electronics circuits
- CO5: Maintain DC-regulated power supply
- CO6: Use the front panel to understand various controls of the instrument

## IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

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<b>UNIT-I PASSIVE COMPONENTS (CL Hrs-05, Marks-08)</b>				
1.	<p><b>TLO 1.1:</b> Identify different types of Resistors.</p> <p><b>TLO 1.2:</b> Identify different types of Inductors.</p> <p><b>TLO 1.3:</b> Identify different types of Capacitors.</p>	<p>1.1 Resistors: Definition, Classification of Resistors, Colour coding: with three, four, five Bands. Carbon composition resistor, Metal oxide film resistor, Variable Resistor (Potentiometer): constructional diagram, working and application</p> <p>1.2 Inductors: Definition, Classification, Colour coding, Construction and working of Air Core Inductor</p> <p>1.3 Capacitors: Classification of Capacitors, Electrolytic capacitor (Aluminum), Ceramic Capacitor, Trimmer capacitor: constructional diagram, working and application.</p>	Classroom Learning, Reference books, NPTEL	<b>CO1</b>
<b>UNIT-II SEMICONDUCTOR DIODE AND ITS APPLICATION (CL Hrs-16, Marks-22)</b>				
2	<p><b>TLO 2.1:</b> Differentiate between conductor, Insulator, Semiconductor, Energy band diagram</p> <p><b>TLO 2.2:</b> Describe the construction &amp; working principle of semiconductor diode</p> <p><b>TLO 2.3:</b> Describe working principle, characteristics, and application of the given types of Diode</p> <p><b>TLO 2.4:</b> Describe the working of a given type of rectifier.</p> <p><b>TLO 2.5:</b> Calculate ripple factor, PIV and efficiency of the given type of filter.</p> <p><b>TLO 2.6:</b> Describe the need and working of the rectifier filter circuit.</p>	<p>2.1. Introduction to : conductor, semiconductors, Insulators, Energy band diagram</p> <p>2.2. Construction, Symbol, Working principle, Applications of following diodes: PN junction, Zener, LED, Photodiode.</p> <p>2.3 . Forward and Reverse Biasing and V-I Characteristics of the following diodes: PN junction, Zener, LED, Photodiode.</p> <p>2.4. Types of Rectifiers: Half Wave, Full Wave Rectifier (bridge and center tapped): circuit operation, Input and Output waveforms for voltage and current</p> <p>2.5. Parameters of rectifier: Average DC value of current and voltage, ripple factor, ripple frequency, PIV of the diode, TUF, efficiency of rectifier <b>(No derivation)</b></p> <p>2.6 Types of Filters: Shunt capacitor, Series inductor, LC and <math>\pi</math> filter. Comparison of filters.</p>	Classroom Learning, Reference books, NPTEL	<b>CO2</b>

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
<b>UNIT-III BIPOLAR JUNCTION TRANSISTOR (CL Hrs-08, Marks-12)</b>				
3	<p><b>TLO 3.1:</b> Describe the working principle of the given type of transistor.</p> <p><b>TLO 3.2:</b> Compare configuration of transistors.</p> <p><b>TLO 3.3:</b> Justify the need for a biasing method.</p> <p><b>TLO 3.4:</b> Describe the procedure to minimize the thermal runaway effect for the given type of transistor biasing circuit.</p>	<p><b>3.1</b> Introduction to transistors</p> <p><b>3.2</b> Different types of transistors: PNP, NPN and its Symbols</p> <p><b>3.3</b> Transistor configurations: CB, CE, CC. Transistor characteristics (input, output,) in different transistor configurations. Applications of Transistor</p> <p><b>3.4.</b> BJT biasing: DC load line, operating point, stabilization, thermal runaway, types of biasing, fixed biasing, base bias with emitter feedback, voltage divider. Use of heat sink</p>	Classroom Learning, Reference books, NPTEL	<b>CO3</b>
<b>UNIT- IV FIELD EFFECT TRANSISTOR (CL Hrs-07, Marks-10)</b>				
4	<p><b>TLO 4.1:</b> Explain the working of FET for a given application</p> <p><b>TLO 4.2:</b> Explain the given type of FET biasing method</p> <p><b>TLO 4.3:</b> Compare the working of a given type of MOSFET</p> <p><b>TLO 4.4:</b> Differentiate the working principle of FET and MOSFET.</p>	<p><b>4.1</b> Construction of JFET (N-channel and P-channel), symbol, working principle and characteristics (Drain and Transfer characteristics)</p> <p><b>4.2</b> FET Biasing: Source self-bias, drain to source bias</p> <p><b>4.3</b> Applications of FET</p> <p><b>4.4</b> MOSFET: Construction, working principle and characteristics of Enhancement and depletion MOSFET, MOSFET handling.</p>	Classroom Learning, Reference books, NPTEL	<b>CO4</b>
<b>UNIT –V REGULATORS AND POWER SUPPLY (CL Hrs-08, Marks-10)</b>				
5	<p><b>TLO 5.1:</b> Describe the working of the given block of the DC-regulated power supply in the block diagram.</p> <p><b>TLO 5.2:</b> Calculate the output voltage of the given zener voltage regulator circuit.</p> <p><b>TLO 5.3:</b> Calculate load and line regulation of the given transistorized regulator.</p>	<p><b>5.1</b> Basic block diagram of DC regulated power supply.</p> <p><b>5.2</b> Zener diode voltage regulator.</p> <p><b>5.3</b> Circuit diagram and working of transistorized Series and Shunt regulator. Numericals on Line and Load regulation.</p>	Classroom Learning, Reference books, NPTEL	<b>CO5</b>

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
<b>UNIT –VI INTRODUCTION TO ELECTRONIC INSTRUMENTS (CL Hrs-04, Marks-08)</b>				
6	<b>TLO 6.1:</b> Describe the working of the Instrumentation system <b>TLO 6.2:</b> Describe the working of a Digital multimeter(DMM) <b>TLO 6.3:</b> Describe the working principle of the Function generator. <b>TLO 6.4:</b> Describe the working principle of CRO.	6.1 Generalized block diagram of instrumentation system. Types of instruments. 6.2 Block diagram, operation and application of Digital multimeter(DMM). 6.3 Block diagram, operation and application of Function generator. 6.4 Block diagram, operation and application of CRO.	Classroom Learning, Reference books, NPTEL	<b>CO6</b>

#### V. 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*	Determine the value of the given resistor, using a Digital Multimeter to confirm with colour code	Determine the value of the given resistor, using a Digital Multimeter to confirm with colour code.	02	CO1
2	Use the LCR-Q meter to measure the value of the given capacitor and Inductor	Use the LCR-Q meter to measure the value of the given capacitor and Inductor	02	CO1
3*	Test the performance of PN Junction Diode	Test the performance of the PN junction diode	02	CO2
4	Test the performance of the zener diode.	Test the performance of the Zener diode.	02	CO2
5	Test the performance of the photodiode by varying the light intensity as well as the distance of the light source.	Test the performance of the photodiode by varying the light intensity as well as the distance of the light source.	02	CO2
6*	Build/ Test the half-wave rectifier on breadboard	Build/ Test the half-wave rectifier on bread board with and without a filter.	02	CO2
7	Build/ Test the half-wave rectifier on breadboard with LC filter/ $\pi$ filter.	Build/ Test the half-wave rectifier on breadboard with LC filter/ $\pi$ filter.	02	CO2
8*	Build/ Test the full wave rectifier on breadboard using two diodes	Build/ Test the full wave rectifier on breadboard using two diodes	02	CO2
9	Use LC/ $\pi$ filter with full wave rectifier to measure ripple factor.	Use LC/ $\pi$ filter with full wave rectifier to measure ripple factor.	02	CO2
10*	Identify the terminals of the PNP and NPN transistor using different methods.	Identify the terminals of the PNP and NPN transistor using different methods.	02	CO3

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
11	Test the performance of BJT working in CB/CE mode	Test the performance of BJT working in CB/CE mode	02	CO3
12	Test the assembled BJT voltage divider bias circuit for a given input	Test the assembled BJT voltage divider bias circuit for a given input	02	CO3
13*	Test the performance of FET drain characteristics, transfer characteristics and calculate transconductance	Test the performance of FET drain characteristics, transfer characteristics and calculate transconductance	02	CO4
14	Test the performance of transistorized series voltage regulator for the given load regulation.	Test the performance of transistorized series voltage regulator for the given load regulation.	02	CO5
15	Test the performance of transistorized shunt voltage regulator for the given load regulation	Test the performance of transistorized shunt voltage regulator for the given load regulation	02	CO5
16*	Study block diagram and front panel controls of CRO.	Draw the front panel of the CRO and study specifications with the help of the manual.	02	CO6
17	Study the front panel and specifications of DMM.	Draw the front panel of DMM and study specifications with the help of a manual	02	CO6
18*	Study block diagram and front panel controls of the Function generator.	Draw the front panel of the function generator and study specifications with the help of a manual	02	CO6

**Note:** A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the Cos and competency. A judicial mix of a minimum of 12 or more practical needs to be performed. Out of which, the practicals marked as ‘ \* ’ are compulsory.

## VI. SUGGESTED MICRO PROJECT /ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/ SKILLS DEVELOPMENT (SELF-LEARNING)

### Micro project

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her. In special situations where groups have to be formed for micro-projects, the number of students in the group should not exceed three.

The micro-project could be industry application-based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs.(Affective Domain Outcomes) .Each student will have to maintain an activity chart consisting of individual contributions to the project work and give a seminar presentation of it before submission. The student ought to submit a micro-project by the end of the semester to develop the industry-oriented COs.

A suggestive list of micro-projects is given here. Similar micro-projects could be added by the concerned faculty:

- Prepare a chart of different types of Resistors showing their specifications and applications
- Prepare a chart of different types of Capacitors showing their specifications and Applications

- Prepare a chart of different types of Diodes showing their specifications and Applications
- Prepare a chart of different types of Rectifiers showing their specifications and applications
- Diode: Build a circuit on general-purpose PCB to clip a positive half cycle at 1.5V of a waveform with input signal 5Vpp and prepare the report.
- Diode: Build a circuit on a general-purpose PCB to clamp a waveform at 3V using a diode and passive component.
- Rectifier: Build a half-wave rectifier for 6V,500mA output current on general-purpose PCB.
- Rectifier: Build a full wave rectifier with a capacitor filter for 6V,500mA output current on a general-purpose PCB.
- BJT: Build a circuit to switch on and off the LED by using BJT as a switching component.
- JVoltage Regulator: Build a circuit of DC-regulated power supply on a general-purpose PCB for 12V and 500mA output.

**Assignment**

- Differentiate active and Passive component
- Test different Active components on CRO.
- Give a seminar on any relevant topic.
- Collect information on passive components and prepare charts of the same.
- Make a chart of different semiconductor components.
- Analyze Data sheets of BJT, FET and MOSFET

**VII. LABORATORY EQUIPMENT/ INSTRUMENTS/ TOOLS/ SOFTWARE REQUIRED**

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Variable DC power supply 0-30V,2 Amp, SC protection, display for voltage and current	3,4,5,,6,7,8,9,10,11,12,13,14,15
2	Cathode Ray Oscilloscope Dual trace 20 MHz,1M $\Omega$ , Input Impedance	3,4,5,,6,7,8,9,10,11,12,13,14,15,16,17,18
3	Function Generator 0-2MHz with Sine, square, and triangular output	3,4,5,,6,7,8,9,10,11,12,13,14,15,16,17,18
4	Digital Multimeter:3/1/2 digit display,9999 counts digital	All

**VIII.SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS &ASSESSMENT PURPOSE  
(Specification Table)**

Sr. No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Passive Components	CO1	5	2	4	2	8
2	II	Semiconductor Diode and its Applications	CO2	16	8	10	4	22
3	III	Bipolar Junction Transistor	CO3	8	4	4	4	12
4	IV	Field Effect Transistor	CO4	7	2	6	2	10
5	V	Regulators and Power supply	CO5	8	4	4	2	10
6	VI	Introduction to Electronic Instruments.	CO6	4	4	4	--	08
<b>Grand Total</b>				<b>48</b>	<b>24</b>	<b>32</b>	<b>14</b>	<b>70</b>

**IX. ASSESSMENT METHODOLOGIES / TOOLS**

Formative assessment (Assessment for Learning)		Summative Assessment (Assessment of Learning)
1. Tests	4. Self-Learning	1. End Term Exam
2. Assignment	5. Term Work	2. Micro-project
3. Midterm Exam	6. Seminar/Presentation	

**X. 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	2	-	2	2	3	-	2
CO2	3	3	3	2	-	2	2	3	3	3
CO3	2	2	2	3	-	2	2	2	2	2
CO4	2	2	2	2	-	2	2	2	2	2
CO5	3	2	3	3	-	2	2	3	2	3

**Legends:- High:03, Medium:02, Low:01, NoMapping: -**  
\*PSOs are to be formulated at the institute level

**XI. SUGGESTED LEARNING MATERIALS / BOOKS**

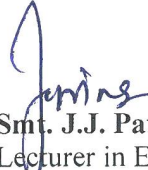
Sr.No	Author	Title	Publisher
1	Albert Malvino	Basic Electronics.	8 <sup>th</sup> Edition, Tata McGraw Hill ,2015 ISBN10:1259200116 ISBN13:9781259200113
2	B.L.Theraja, S Chand	Basic Electronics.	Publishing, 2007, ISBN 10: 8121925568 ISBN 13: 9788121925563
3	R.S.Sedha	Applied Electronics	S.Chand&company Ltd., New Delhi, ISBN:8121927833
4	P.Ramesh Babu	Electronics Devices and Circuits	Scitech Publication Pvt.Ltd 2009 , ISBN:8183711723
5	Boyestad & Nashelsky	Electronic Devices and Circuit Theory	Pearson Education India; 11 edition (2015) ISBN: 978-9332542600
6	H S Kalsi	Electronic Instrumentation	3 <sup>rd</sup> Edition, Tata McGraw Hill ISBN 978-0-07-070206-6

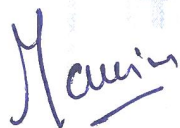


## XII. LEARNING WEBSITES &amp; PORTALS

Sr.No	Link/Portal	Description
1.	<a href="http://www.nptel.com">www.nptel.com</a>	Online Learning Initiatives by IITs
2.	<a href="http://www.electronics-tutorials">http://www.electronics-tutorials</a>	Basic Electronics Tutorials and Revision
3.	<a href="https://en.wikipedia.org/wiki/P%E2%80%93junction">https://en.wikipedia.org/wiki/P%E2%80%93junction</a>	Semiconductor diode description
4.	<a href="https://learn.sparkfun.com/tutorials/transistors">https://learn.sparkfun.com/tutorials/transistors</a>	The basics of the most common transistor around
5.	<a href="http://www.pitt.edu/~qiw4/Academic/ME2082/Transistor%20Basics.pdf">http://www.pitt.edu/~qiw4/Academic/ME2082/Transistor%20Basics.pdf</a>	Transistor Configurations
6.	<a href="http://faculty.cord.edu/luther/physics225/Handouts/transistors_handout.pdf">http://faculty.cord.edu/luther/physics225/Handouts/transistors_handout.pdf</a>	Fundamentals of Transistors
7.	<a href="http://www.khanacademy.com">www.khanacademy.com</a>	Basic Electronics Concepts
8.	<a href="http://www.datasheetscafe.com">www.datasheetscafe.com</a>	Datasheets of electronic components for a specific application.

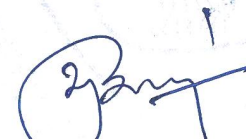
Name &amp; Signature:

  
Smt. J.J. Pathan  
Lecturer in E&TC


  
Smt. M.S. Datar  
Lecturer in E&TC

(Course Experts)

Name &amp; Signature:

  
Shri. S.S. Prabhune  
(Programme Head)

Name &amp; Signature:

  
Shri. S.B. Kulkarni  
(CDC In-charge)

**GOVERNMENT POLYTECHNIC, PUNE**  
**'120 – NEP' SCHEME**

<b>PROGRAMME</b>	<b>DIPLOMA IN CE/EE/ET/ME/MT/CM/IT/DDGM</b>
<b>PROGRAMME CODE</b>	<b>01/02/03/04/05/06/07/08</b>
<b>COURSE TITLE</b>	<b>COMMUNICATION SKILLS (ENGLISH)</b>
<b>COURSE CODE</b>	<b>HU11201</b>
<b>PREREQUISITE COURSE CODE &amp; TITLE</b>	<b>NA</b>

**I. LEARNING & ASSESSMENT SCHEME**

Course Code	Course Title	Course Type	Learning Scheme					Credits	Paper Duration	Assessment Scheme										Total Marks
			Actual Contact Hrs./Week			SL	H			NLH	Theory			Based on LL & TSL				Based on SL		
			CL	TL	LL						FA-TH	SA-TH	Total	Practical		SLA				
														FA-PR	SA-PR	Max	Min	Max	Min	
HU 11201	COMMUNICATION SKILLS (ENGLISH)	AEC	03	-	02	01	06	03	03	30	70	100	40	25	10	--	--	25	10	150

**Total IKS Hrs for Term: 0 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, IKS – Indian Knowledge System, SLA- Self Learning Assessment

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

**Note:**

FA-TH represents an average of two class tests of 30 marks each conducted during the semester.

- If a candidate is not securing minimum passing marks in FA-PR (Formative Assessment - Practical) of any course, then the candidate shall be declared as '**Detained**' in that semester.
- If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as '**fail**' and will have to repeat and resubmit SLA work.
- Notional learning hours** for the semester are (CL + LL + TL + SL) hrs. \* **15 Weeks**
- 1 credit** is equivalent to **30 Notional hours**.
- \* Self-learning hours shall not be reflected in the Timetable.
- \* Self-learning includes micro-projects/assignments/other activities.

**II. RATIONALE:**

The most commonly used medium to express oneself is language. English is a global language used in all spheres of human life i.e. personal, professional and social. English Language proficiency focuses on strong reading, writing, speaking and listening skills. It will include grammar, vocabulary, comprehension and describing skills to enhance overall language proficiency. English for professional purposes aim to equip the students with the necessary language skills required for Public Speaking, presentation and negotiation. English for academic purposes will include academic writing skills and critical thinking considering the need of students to communicate in the engineering domain.

**III. COURSE-LEVEL LEARNING OUTCOMES (COS)**

Students will be able to achieve & demonstrate the following CO's on completion of course-based learning

- CO1: Construct grammatically correct sentences in English.
- CO2: Compose paragraphs and dialogues on given situations.
- CO3: Comprehend passages correctly.
- CO4: Use contextual words in English appropriately.
- CO5: Deliver effective presentations in English using appropriate body language.

## IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
<b>UNIT 1 VOCABULARY (CL Hrs. -10, Marks-12)</b>				
1.	<p>TLO 1.1 Use transcription to pronounce words correctly.</p> <p>TLO 1.2 Use prefixes and suffixes for flexibility and precision in language.</p> <p>TLO 1.3 Employ synonyms and antonyms to express similarity and contrast between words.</p> <p>TLO 1.4 Use Homophones to expand their vocabulary.</p> <p>TLO 1.5 Make use of the collocations correctly.</p>	<p>1.1 Phonetics: Vowels (12), Consonants (24), Diphthongs (8)</p> <p>1.2 Prefix &amp; Suffix: Definition &amp; Examples, List of common prefixes and suffixes</p> <p>1.3 Synonyms &amp; Antonyms: Vocabulary expansion, context &amp; Usage</p> <p>1.4 Homophones: Identifying Homophones, Meaning &amp; Context, Vocabulary Expansion</p> <p>1.5 Collocations: Definition &amp; identification, types of collocations.</p>	<p>Language Lab Drill, Classroom learning, Reference Books &amp; NPTEL.</p>	<b>CO1</b>
<b>UNIT II PARAGRAPH AND DIALOGUE WRITING (CL Hrs. -06, Marks-12)</b>				
2.	<p>TLO 2.1 Formulate paragraphs with Synchronized sentence structure on the given situation/topic.</p> <p>TLO 2.2 Develop dialogues to practice language skills in a structured and meaningful way.</p>	<p><b>2.1 Types of paragraphs:</b> Technical, Descriptive and Narrative</p> <p><b>2.2 Dialogue Writing:</b> i. Greetings ii. Development iii. Closing Sentence.</p>	<p>Classroom learning Skit, Language Lab, YouTube &amp; videos</p>	<b>CO2</b>
<b>UNIT III COMPREHENSION - SEEN AND UNSEEN PASSAGES (CL-Hrs. - 16, Marks-24)</b>				
3.	<p>TLO 3.1 Respond to the given questions of the specified passage.</p> <p>TLO 3.2 Formulate sentences using new words</p> <p>TLO 3.3 Use correct syntax to construct meaningful sentences for the given situation.</p> <p>TLO 3.4 Interpretation of passages in written and Spoken Form.</p>	<p>3.1 Passages from MSBTE workbook</p> <p>1. Say No to Plastic bags</p> <p>2. Interview of Dr. APJ Abdul Kalam</p> <p>3. Maximum Achievements</p> <p>4. Be Remarkable</p> <p>5. Arunima Sinha: A Biography</p> <p>6. Roses of Gratitude</p> <p>3.2 Importance of Comprehension</p> <p>3.3 Unseen Passages</p> <p>3.4 Interpretation of passages in written and Spoken Form.</p>	<p>Classroom learning, interactive sessions &amp; discussion</p>	<b>CO3</b>

UNIT- IV COMMUNICATIVE LANGUAGE (CL-Hrs. -07, Marks-14)			
4.	<p>TLO 4.1 Describe technical objects with specifications.</p> <p>TLO 4.2 Explain the given picture in grammatically correct language.</p> <p>TLO 4.3 Diary Entry on situations.</p> <p>TLO 4.4 Translate from English to Marathi/Hindi- and vice versa.</p>	<p>4.1 Technical objects: i. Heading ii. Description of Technical objects.</p> <p>4.2 Picture Description: i. Situational picture. ii. Describe in your own words</p> <p>4.3 Diary Entry : i. Date ii. Content iii. Name of the writer</p> <p>4.4 Translation of paragraph from English to Marathi/Hindi-Vice versa (Question not to be asked on Translation in Theory Examination)</p>	<p>Language Lab, Pictures on situations and classroom learning.</p> <p><b>CO4</b></p>

UNIT- V PRESENTATION SKILLS (CL Hrs. - 06, Marks- 08)			
5.	<p>TLO 5.1 Cultivate/Develop the habit of being presentable</p> <p>TLO 5.2 Formulate speeches for occasions</p> <p>TLO 5.3 Prepare PowerPoint presentation</p> <p>TLO 5.4 Use appropriate body language for effective communication</p>	<p>5.1 Dressing &amp; Grooming : i. Dressing for the occasion, ii. Proper grooming</p> <p>5.2 Speech Writing: i. Situation ii. Salutations iii. Introduction of the topic iv. Description/Body v. Conclusion</p> <p>5.3 PowerPoint Presentation: i. Layout ii. Font size iii. Colour combination</p> <p>5.4 Kinesics : i. Facial expressions ii Eye contact iii Postures iv Gestures</p>	<p>Classroom Learning &amp; Language Lab.</p> <p><b>CO5</b></p>

**V. 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	<p>LLO 1.1 Use transcription in the correct form.</p> <p>LLO 1.2 Learn to differentiate vowels, diphthongs and consonants.</p>	Write 20 words using phonetic transcription.	2	CO1
2	LLO 2.1 Learn the correct pronunciation by using headphones in the language lab.	Practice pronunciation as per IPA using language lab.	2	CO1

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
3	LLO 3.1 Enhance the understanding of word formation. LLO 3.2 Enrich word power. LLO 3.3 Construct words with the specific meanings.	Formulate 20 words using Prefix and Suffix.	2	CO1
4	LLO 4.1 Use words and phrases effectively. LLO 4.2 Enrich vocabulary. LLO 4.3 Develop overall language skills.	Construct sentences using 20 collocations.	2	CO1
5	LLO 5.1 Articulate ideas clearly and effectively. LLO 5.2 Improve grammar and punctuation.	Write two paragraphs of 75 words each.	2	CO3
6	LLO 6.1 Add depth to narratives. LLO 6.2 Form grammatically correct sentences.	Compose situational dialogues. (Any Two)	2	CO3
7	LLO 7.1 Promote the development of effective communication skills. LLO 7.2. Improve non-verbal communication Skills. LLO 7.3 Enhance interpersonal skills. LLO 7.4 Build confidence.	Enact Role Plays as per situation and context.	2	CO5
8	LLO 8.1 Acquire the ability to convey complex ideas clearly and concisely. LLO 8.2 Expand technical vocabulary. LLO 8.3 Enhance the written communication Skills.	Describe any three technical objects using correct grammar.	2	CO1 CO3
9	LLO 9.1 Develop storytelling skills. LLO 9.2 Connect with the audience.	Narrate anecdotes of various situations in English.	2	CO5
10	LLO 10.1 Notice and articulate specific elements, colours, shapes, & other visual aids. LLO 10.2 Express observations & interpretations clearly and concisely. LLO 10.3 Enhance vocabulary.	Describe a given picture. (Any Two)	2	CO1 CO4
11	LLO 11.1 Express information coherently and engagingly. LLO 11.2 Build confidence.	Introduce oneself and others.	2	CO5

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
12	LLO 12.1 Present complex information in a clear & concise manner. LLO 12.2 Develop public speaking skills and presentation skills.	Prepare a PowerPoint presentation on a given topic.	2	CO5
13	LLO 13.1 Improve language skills & expand vocabulary.	Translate paragraph --English to Marathi/Hindi (vice -Versa) (Any4)	2	CO1 CO3
14	LLO 14.1 Reflect on thoughts, feelings, and experiences.	Write your experience in 50 words on ( Four) given situations (Diary Entry)	2	CO3 CO5
15	LLO 15.1 Develop language acquisition.	Respond to the questions based on the given passages.	2	CO2
16	LLO 16.1 Build confidence in public speaking. LLO 16.2 Enhance the skills in planning and prioritization.	Deliver oral presentations using correct grammar and appropriate body language.	2	CO5

**Note:** Any 12 out of 16 practical's are compulsory.

## VI. SUGGESTED MICRO PROJECT/ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT (SELF-LEARNING)

### Micro project

- Report different types of episodes/anecdotes.
- Seminar preparation and presentations.
- Make a Podcast episode based on Indian Freedom Fighters.
- Summarize the editorial columns of English newspapers.
- Summarize the content of an eminent person's biography/autobiography. Write a review on the following: Short stories, Novels and Films.
- Prepare a booklet on the contribution of eminent Indian scientists.
- Prepare a podcast referring to Bhagwat Geeta.
- Prepare blogs, podcasts, vlogs.
- Prepare a questionnaire & conduct interviews of Industry Personnel, social workers, and entrepreneurs  
Prepare and participate in debates and extempore speeches.

## VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Language Lab with relevant software and Computer system with all necessary components like; motherboard, random access memory (RAM), Read-only memory (ROM), Graphics cards, sound cards, internal hard disk drives, DVD drive, network interface card	All
2	LCD Projector with document reader	All
3	Smart Board with networking	All

**VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE  
(Specification Table)**

Sr. No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Vocabulary	CO1	10	2	4	6	12
2	II	Paragraph and Dialogue Writing	CO2	6	2	4	6	12
3	III	Comprehension (Seen and Unseen Passages)	CO3	16	5	6	13	24
4	IV	Communicative Language	CO4	7	2	4	8	14
5	V	Presentation Skills	CO5	6	2	2	4	8
<b>Grand Total</b>				<b>45</b>	<b>13</b>	<b>20</b>	<b>37</b>	<b>70</b>

**IX. ASSESSMENT METHODOLOGIES/TOOLS**

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
1. Tests 2. Rubrics for COs 3. Assignment 4. Midterm Exam 5. Self-Learning 6. Term Work 7. Seminar/Presentation	1. End Term Exam 2. Micro-project 3. Tutorial Performance

**X. 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	1	1	-	-	-	2	1			
CO2	1	1	-	-	-	2	1			
CO3	1	1	-	-	-	2	1			
CO4	1	1	-	-	-	2	1			
CO5	1	1	-	-	-	2	1			

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

\*PSOs are to be formulated at the institute level

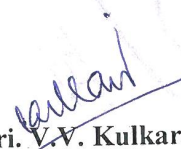
**XI.SUGGESTED LEARNING MATERIALS/BOOKS**


Sr. No	Author	Title	Publisher
1	MSBTE	Spectrum, G Scheme and I-Scheme	MSBTE
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

**XIII. LEARNING WEBSITES & PORTALS**

Sr. No	Link/Portal	Description
1.	<a href="http://nptel.ac.in/courses/106102064/1">http://nptel.ac.in/courses/106102064/1</a>	Online Learning Initiatives by IITs and IISc
2.	<a href="http://www.scilab.org/-SCILab">www.scilab.org/-SCILab</a>	Signal processing, statistical analysis, and image enhancement.
3.	<a href="http://www.mathworks.com/product/matlab/-MATLAB">www.mathworks.com/product/matlab/-MATLAB</a>	Applications of concepts of Mathematics to coding.
4.	Spreadsheet Applications	Use of Microsoft Excel, Apple Numbers, and Google Sheets.
5.	<a href="https://ocw.mit.edu/">https://ocw.mit.edu/</a>	MIT Courseware

Name &amp; Signature:

  
**Shri. V.V. Kulkarni**  
 Lecturer in English


  
**Dr. S. P. Palve**  
 Lecturer in English

(Course Experts)

Name &amp; Signature:

  
**Shri. S.S. Prabhune**  
 (Programme Head)

Name &amp; Signature:

  
**Shri. S.B. Kulkarni**  
 (CDC In-charge)



**GOVERNMENT POLYTECHNIC, PUNE**  
**'120 – NEP' SCHEME**

<b>PROGRAMME</b>	<b>DIPLOMA IN CE/EE/ET/ME/MT/CM/IT/DDGM</b>
<b>PROGRAMME CODE</b>	<b>01/02/03/04/05/06/07/08</b>
<b>COURSE TITLE</b>	<b>YOGA AND MEDITATION</b>
<b>COURSE CODE</b>	<b>HU21201</b>
<b>PREREQUISITE COURSE CODE &amp; TITLE</b>	<b>NA</b>

**I. LEARNING & ASSESSMENT SCHEME**

Course Code	Course Title	Course Type	Learning Scheme					Credits	Paper Duration	Assessment Scheme									
			Actual Contact Hrs./Week			SLH	NLH			Theory			Based on LL & TSL				Based on SL		Total Marks
			CL	TL	LL					FA-TH	SA-TH	Total	Practical				SLA		
													FA-PR	SA-PR	SLA	SLA			
Max	Max	Max/Min	Max/Min	Max/Min	Max/Min	Max/Min	Max/Min	Max/Min											
HU21201	YOGA AND MEDITATION	VEC	-	-	1	1	2	1	-	-	-	-	25	10	-	-	25	10	50

**Total IKS Hrs for Term: 1Hr**

**Abbreviations:** CL-Classroom Learning, TL-Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS – Indian Knowledge System, SLA- Self Learning Assessment

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

**Note:**

**FA-TH** represents an average of two class tests of 30 marks each conducted during the semester.

- If a candidate is not securing minimum passing marks in **FA-PR** (Formative Assessment - Practical) of any course, then the candidate shall be declared as '**Detained**' in that semester.
- If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as '**fail**' and will have to repeat and resubmit SLA work.
- Notional learning hours** for the semester are **(CL + LL + TL + SL) hrs. \* 15 Weeks**
- 1 credit** is equivalent to **30 Notional hours**.
- \* Self-learning hours shall not be reflected in the Timetable.
- \* Self-learning includes micro-projects/assignments/other activities.

**II. RATIONALE:**

Diploma Graduate needs a sound body and mind to face the challenging situations in a career as an employee or as an entrepreneur. Yoga and Meditation bring about the holistic development of an individual and equip him with the necessary balance to handle the challenges. The age of polytechnic students is appropriate to get introduced to yoga practice as this will help them in their studies as well as their professional lives. Moreover, Yoga inculcates discipline in all walks of the life of students. Pranayama practice regulates the breathing practices of the student to improve stamina and resilience.

Meditation empowers a student to focus and keep calm to get peace of mind. World Health Organization (WHO) has also emphasized the role of yoga and meditation as stress prevention measures. National Education Policy 2020 highlights the importance of yoga and meditation amongst students of all ages. Therefore, this course for Diploma students is designed for the overall well-being of the student and aims to empower students to adopt and practice "Yoga" in daily life.

**III. COURSE-LEVEL LEARNING OUTCOMES (CO'S)**

Students will be able to achieve & demonstrate the following CO's on completion of course-based learning

**CO1** - Practice basic Yoga and Pranayama in daily life to maintain physical and mental fitness.

**CO2** - Practice meditation regularly to improve concentration and better handling of stress and anxiety.

**CO3** - Follow a healthy diet and hygienic practices for maintaining good health.

**IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT**

**NOT APPLICABLE**

**V. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL/TUTORIAL EXPERIENCES.**

<b>Sr. No</b>	<b>Practical/Tutorial/Laboratory Learning Outcome (LLO)</b>	<b>Laboratory Experiment / Practical Titles /Tutorial Titles</b>	<b>Number of hrs.</b>	<b>Relevant COs</b>
1	LLO 1.1 Practice warming up for Yoga.	Introduction:- Presentations on Introduction to Yoga and its History. Lab Exp: 1. Perform warming-up exercises to prepare the body from head to toe for Yoga.	5	CO1
2	LLO 2.1 Practice Surya Namaskar	Lab Exp: 2. Perform all the postures of Surya Namaskar one by one at a very slow pace, after warm-up. Lab Exp 3. Perform multiple Surya Namaskar ( Starting with three and gradually increasing it to twelve) in one go. Experiments 2 to 4 must be followed by Shavasana for self-relaxation.	7	CO1, CO2
3	LLO 3.1 Practice basic Asanas	Lab Exp: 4 Perform Sarvangasna, Halasana, Kandharasana (setubandhasana) Lab Exp: 5 Perform Bhujangasana, Naukasana, Mandukasana Lab Exp: 6 Perform Paschimottasana, Baddhakonasana, Bharadwajasana. Lab Exp: 7 Perform Veera Bhadrasana, Vrukshasana, Trikonasana. Follow-up experiments 5 to 7 with Shavasana for self-relaxation	8	CO2
4	LLO 4.1 Practice basic Pranayama	Lab Exp: 8 Perform Bhastrika, Anulom Vilom Pranayam Kriya Lab Exp: 9 Practice Kapalbhathi Pranayam Kriya Lab Exp: 10 Practice Bhramary Pranayam.	5	CO3

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
5	LLO 5.1 Practice Meditation	Lab Exp: 11 Perform sitting in Dhyana Mudra and meditating. Start with five minutes and slowly increasing to higher durations. The trainer will explain the benefits of Meditation before practice	5	CO3

**Note :**

1. The start and end of each session can be with appropriate Yoga prayers and chanting of Omkar.
2. Trainers can add similar asanas in practical sessions.
3. Students are to be instructed to practice the experiment performed at least twice a week as part of self learning practices.
4. A live demonstration by the trainer needs to be carried out during practical hours. Yogic Videos can be used as well.

**VI. SUGGESTED MICRO PROJECT/ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT (SELF-LEARNING)**

**Micro project**

- Maintain a diary indicating date-wise practice done by the student with a photograph of self in yogic posture.

**Assignment**

- Prepare a Diet and nutrition chart for Self.

**Learning**

- Practice at least thrice a week.
- Read books on different methods to maintain health, and wellness and to enhance mood.
- Watch videos on Yoga Practices.

**VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED**

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Yoga and Meditation kits : Yoga Mats, Yoga Rollers, Yoga Blocks, Aero Yoga Clothing Blankets, Cloth Straps, Bolsters Wheels	ALL

**VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)**

**NOT APPLICABLE**

**IX.ASSESSMENT METHODOLOGIES/TOOLS**

<b>Formative assessment (Assessment for Learning)</b>	<b>Summative Assessment (Assessment of Learning)</b>
Lab performance, Self-learning and Terms work	Actual Practical Performance

**X. 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	-	-			
CO2	-	-	-	-	3	-	-			
CO3	-	-	-	-	3	-	-			
CO4	-	-	-	-	3	-	-			
CO5	-	-	-	-	3	-	-			




**Legends:- High:03, Medium:02, Low:01, No Mapping: -**  
 \*PSOs are to be formulated at the institute level

**XI.SUGGESTED LEARNING MATERIALS/BOOKS**

Sr.No.	Author	Title	Publisher
1	Swami Vivekananda	Patanjalis Yoga Sutras	Fingerprint Publishing (2019) ISBN-10 9389567351
2	Luisa Ray (Author), Angus Sutherland (Illustrator)	Yoga for Every Body: A beginner's guide to the practice of yoga postures, breathing exercises and meditation.	Vital Life Books (2022) ISBN-13: 9781739737030, ISBN-10: 1739737032
3	Swami Saradananda	Mudras for Modern Life: Boost your health, re-energize your life, enhance your yoga and deepen your meditation	Watkins Publishing ISBN: 9781780289984, Edition: 2018
4	Martha Davis, Elizabeth Robbins, Matthew McKay, Eshelman MSW	The Relaxation and Stress Reduction Workbook	A New Harbinger Self-Help Workbook (2019)
5	SWANSON, ANN	Science of Yoga: Understand the Anatomy and Physiology to Perfect Your Practice	Penguin Random House, ISBN 13 9780241341230

XIII. LEARNING WEBSITES & PORTALS

Sr.No	Link/Portal	Description
1.	<a href="https://onlinecourses.swayam2.ac.in/aic19_ed28/preview">https://onlinecourses.swayam2.ac.in/aic19_ed28/preview</a>	Introduction to Yoga and Applications of Yoga - Course (swayam2.ac.in)
2.	<a href="https://onlinecourses.swayam2.ac.in/aic23_review">https://onlinecourses.swayam2.ac.in/aic23_review</a>	Yoga for Creativity
3.	<a href="https://onlinecourses.swayam2.ac.in/aic23_ge05/preview">https://onlinecourses.swayam2.ac.in/aic23_ge05/preview</a>	Yoga for concentration
4.	<a href="https://onlinecourses.swayam2.ac.in/aic23_ge06/preview">https://onlinecourses.swayam2.ac.in/aic23_ge06/preview</a>	Yoga for Memory Development
5.	<a href="https://onlinecourses.nptel.ac.in/noc21_hs29/preview">https://onlinecourses.nptel.ac.in/noc21_hs29/preview</a>	Psychology of Stress, Health and Well-being
6.	<a href="https://onlinecourses.swayam2.ac.in/nce19_sc04/preview">https://onlinecourses.swayam2.ac.in/nce19_sc04/preview</a>	Food Nutrition for Healthy Living

Name & Signature:	
 <b>Shri. Sunil P. Date</b> Shri. Sunil P. Date (Course Expert)	
Name & Signature:	Name & Signature:
 <b>Shri. S.S. Prabhune</b> (Programme Head)	 <b>Shri. S.B. Kulkarni</b> (CDC In-charge)

**GOVERNMENT POLYTECHNIC, PUNE**  
‘120 – NEP’ SCHEME

<b>PROGRAMME</b>	<b>DIPLOMA IN ET / CM / IT</b>
<b>PROGRAMME CODE</b>	<b>03/ 06 / 07</b>
<b>COURSE TITLE</b>	<b>ENGINEERING GRAPHICS</b>
<b>COURSE CODE</b>	<b>ME11202</b>
<b>PREREQUISITE COURSE CODE &amp; TITLE</b>	<b>NA</b>

**I. LEARNING & ASSESSMENT SCHEME**

Course Code	Course Title	Course Type	Learning Scheme						Credits	Paper Duration	Assessment Scheme									
			Actual Contact Hrs./Week			SLH	NLH	Theory			Based on LL & TSL				Based on SL		Total Marks			
			CL	TL	LL			FA-TH			SA-TH	Total		Practical		SLA				
												Max	Min	Max	Min	Max		Min	Max	Min
ME11202	ENGINEERING GRAPHICS	DSC	2	-	4	-	6	3	-	-	-	-	-	50	20	50@	20	-	-	100

**Total IKS Hrs for Term: 2 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, IKS – Indian Knowledge System, SLA- Self Learning Assessment

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

**Note:**

**FA-TH** represents an average of two class tests of 30 marks each conducted during the semester.

- If a candidate is not securing minimum passing marks in **FA-PR** (Formative Assessment - Practical) of any course, then the candidate shall be declared as '**Detained**' in that semester.
- If a candidate does not secure minimum passing marks in **SLA** (Self Learning Assessment) of any course, then the candidate shall be declared as '**fail**' and will have to repeat and resubmit SLA work.
- Notional learning hours** for the semester are **(CL + LL + TL + SL) hrs. \* 15 Weeks**
- 1 credit** is equivalent to **30 Notional hours**.
- \* Self-learning hours shall not be reflected in the Timetable.
- \* Self-learning includes micro-projects/assignments/other activities.

**II. RATIONALE:**

Engineering graphics is the language of engineers. The concepts of graphical language are used in expressing the ideas and conveying the instructions, which are used in carrying out the jobs on the sites, shop floor etc. This course is useful in developing drafting and sketching skills in the student. It covers the knowledge & use of drawing instruments & also familiarizes the learner with the Bureau of Indian standards related to engineering drawing. The curriculum aims to develop the ability to draw and read various engineering curves, projections and dimensioning styles. The subject mainly focuses on the use of drawing instruments, developing imagination and translating ideas into sketches. This course also helps to develop the idea of visualizing the actual object or part based on drawings and blueprints. This preliminary course aims to build a foundation for further courses related to engineering drawing and other allied courses in the coming semesters.

**III. COURSE-LEVEL LEARNING OUTCOMES (CO'S)**

Students will be able to achieve & demonstrate the following CO's on completion of course-based learning

CO1: Draw geometrical figures and engineering curves

CO2: Apply principles of orthographic projections for drawing given pictorial views

CO3: Apply basic CAD commands for drawing different entities.

CO4: Use various drawing codes, conventions and symbols as per IS SP-46 in engineering drawing.

CO5: Draw free-hand sketches of given engineering elements.

#### IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
<b>UNIT-I BASIC ELEMENTS OF DRAWING (CL Hrs-04, Marks-04)</b>				
1.	<p>TLO 1.1 Prepare drawing using drawing instruments.</p> <p>TLO 1.2 Use IS SP-46 for dimensioning</p> <p>TLO 1.3 Use different types of lines. TLO 1.4 Draw regular geometrical figures.</p> <p>TLO 1.5 Draw figures having tangency constructions.</p>	<p>1.1 Drawing Instruments and supporting material: method to use them with applications.</p> <p>1.2 Standard sizes of drawing sheets (ISO-A series)</p> <p>1.3 I.S. codes for planning and layout.</p> <p>1.4 Letters and numbers (single stroke vertical)</p> <p>1.5 Convention of lines and their applications.</p> <p>1.6 Scale - reduced, enlarged &amp; full size</p> <p>1.7 Dimensioning techniques as per SP-46 (Latest edition) – types and applications of chain, parallel and coordinate dimensioning</p> <p>1.8 Geometrical constructions</p>	Model Demonstration	CO1, CO4
<b>UNIT-II ENGINEERING CURVES AND LOCI OF POINTS (CL Hrs-06, Marks-12)</b>				
2	<p>TLO 2.1 Explain different engineering curves with areas of application.</p> <p>TLO 2.2 Draw different conic sections.</p> <p>TLO 2.3 Draw involute and cycloidal curves.</p> <p>TLO 2.4 Draw helix and spiral curves from the given data</p> <p>TLO 2.5 Plot Loci of points from given data.</p>	<p>2.1 Concept and understanding of focus, directrix, vertex and eccentricity. Conic sections.</p> <p>2.2 Methods to draw an ellipse by Arcs of Circle method &amp; Concentric circles method.</p> <p>2.3 Methods to draw a parabola by Directrix-Focus method &amp; Rectangle method</p> <p>2.4 Methods to draw a hyperbola by Directrix-Focus method.</p> <p>2.5 Methods to draw involutes: circle &amp; pentagon</p> <p>2.6 Methods to draw Cycloidal curve: cycloid, epicycloid and hypocycloid</p> <p>2.7 Methods to draw Helix &amp; Archimedean spiral.</p> <p>2.8 Loci of points on Single slider crank mechanism with given specifications.</p>	Demonstrations	CO1, CO4

UNIT-III ORTHOGRAPHIC PROJECTIONS (CL Hrs-08, Marks-14)				
3	TLO 3.1 Explain methods of Orthographic Projections. TLO 3.2 Draw orthographic views of simple 2D entities containing lines, circles and arcs only. TLO 3.3 Draw the orthographic views from given pictorial views. TLO 3.4 Use of IS code IS SP-46 for dimensioning technique.	3.1 Introduction of projections-orthographic, perspective, isometric and oblique: concept and applications. (No question to be asked in examination) 3.2 Introduction to orthographic projection, First angle and Third angle method, and their symbols. Conversion of pictorial view into Orthographic Views – object containing plain surfaces, slanting surfaces, slots, ribs, cylindrical surfaces. (use First Angle Projection)	Model Demonstration Video Demonstrations	CO2, CO4
UNIT- IV COMPUTER AIDED DRAFTING (CL Hrs-08, Marks-14)				
4	TLO 4.1 Draw basic 2D entities in Auto CAD software TLO 4.2 Modify and edit the given commands. TLO 4.3 Prepare a 2D drawing of the given simple engineering components using Auto CAD software. TLO 4.4 Print given drawing using printer/ plotter	4.1 Basic entities: line, circle, arc, polygon, ellipse, rectangle, multiline, polyline. 4.2 Commands: trim, delete, copy, offset, array, block, layers. 4.3 Dimensioning: linear, horizontal, vertical, aligned, rotated, baseline, continuous, diameter, radius, angular dimensions. 4.4 Text: Single line, multiline. 4.5 Standard sizes of the sheet, selecting various plotting parameters such as paper size, paper units, drawing orientation, plot scale, plot offset, plot area, and print preview.	Presentations, Video Demonstrations	CO3, CO4
UNIT –V FREE HAND SKETCHES OF ENGINEERING ELEMENTS (CL Hrs-04, Marks-06)				
5	TLO 5.1 Sketch proportionate freehand sketches of given machine elements. TLO 5.2 Select proper fasteners and locking arrangement.	5.1 Free hand sketches of machine elements: Thread profiles, nuts, bolts, studs, set screws, washers, and Locking arrangements. (For branches other than mechanical Engineering, the teacher should select branch-specific elements for freehand sketching)	Model Demonstration	CO5

**V. 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 1.1 Use drawing instruments	Draw horizontal, vertical, 30-degree, 45-degree, 60- & 75-degree lines using Tee and Set squares/ drafter. (Sketch Book).	2	CO1
2	LLO 2.1 Use IS code related to dimensioning standard LLO 2.2 Draw the given types of lines	Draw different types of lines, and dimensioning styles (Sketch Book)	2	CO1



Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
3	LLO 3.1 Draw the figure as per the given sketch	Draw one figure showing dimensioning techniques, two problems on redrawing the figures and one problem on loci of points - slider crank mechanism. (Sketch Book)	2	CO1
4	LLO 4.1 Draw figures using IS Standard for drawing	Draw one figure showing dimensioning techniques, two problems on redrawing the figures and one problem on loci of points - slider crank mechanism. (01 Sheet)	4	CO1
5	LLO 5.1 Identify different Engineering curves LLO 5.2 Draw different types of curves	Draw any four Engineering Curves (Sketchbook)	2	CO1
6	LLO 6.1 Identify different Engineering curves LLO 6.2 Draw different types of curves	Draw any four Engineering Curves – (01 Sheet)	4	CO1
7	LLO 7.1 Apply the method of projection for drawing simple orthographic views	Draw two problems on orthographic projections using the first angle method of projection having plain surfaces, slanting surfaces slots etc.- (Sketchbook)	2	CO2 CO4
8	LLO 8.1 Apply the method of projection for drawing simple orthographic views	Draw two problems on orthographic projections using the first angle method of projection having plain surfaces, slanting surfaces slots etc.- (01 Sheet)	4	CO2 CO4
9	LLO 9.1 Apply the method of projection for drawing complex orthographic views.	Draw two problems on orthographic projections using the first angle method of projection having cylindrical surfaces, ribs etc. (Sketchbook)	2	CO2 CO4
10	LLO 10.1 Apply the method of projection for drawing complex orthographic views	Draw two problems on orthographic projections using the first angle method of projection having cylindrical surfaces, ribs etc.- (01 Sheet)	4	CO2 CO4
11	LLO 11.1 Apply CAD commands for drawing different entities.	Draw basic 2D entities like rectangles, rhombi, polygons, arcs, and circles using CAD. Commands.	4	CO3
12	LLO 12.1 Apply CAD commands for drawing different entities.	Draw basic 2D entities using rectangular and circular arrays.	2	CO3
13	LLO 13.1 Apply CAD commands for drawing different entities.	Draw basic branch-specific components using CAD commands	2	CO3 CO4
14	LLO 14.1 Apply CAD commands for drawing different entities.	Draw complex branch-specific components using CAD commands.	4	CO3 CO4
15	LLO 15.1 Draw Orthographic views of a given object.	Problem-Based Learning: Given the orthographic views of at least three	2	CO2

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
		objects with few missing lines, the student will try to imagine the corresponding objects, complete the views and draw these views (sketchbook).		CO4
16	LLO 16.1 Draw standard discipline-oriented components using free hand.	Draw freehand Sketches of 12 different standard components (Sketchbook)	2	CO5
17	LLO 17.1 Draw standard discipline-oriented components using free hand.	Draw freehand Sketches of 12 different standard components (1 Sheet)	2	CO5
18	LLO 18.1 Collect information on an ancient Indian culture related to engineering graphics	Correlate ancient Indian sculptures, Indian temples, Monuments, etc. with Engineering Graphics	2	CO1 CO2 CO3 CO4 CO5

#### VI. SUGGESTED MICRO PROJECT/ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT (SELF-LEARNING)

**Micro project:**

NA

**Assignment: -**

NA

#### VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Drawing Table with Drawing Board of Full Imperial/ A1 size.	All
2	Models of objects for orthographic projections	7,8,9,10
3	Models/ Charts of objects mentioned in unit no. 5	16,17
4	Set of various industrial drawings being used by industries.	All
5	A set of drawing sheets mentioned in section 6.0 could be developed by experienced teachers and made available on the MSBTE portal to be used as references/standards.	All
6	Drawing equipment and instruments for classroom teaching-large size: a. T-square or drafter (Drafting Machine). b. Set squares (450 and 300-600) c. Protector. d. Drawing instrument box (containing set of compasses and dividers). Drawing sheets, Drawing pencils, Eraser, Drawing pins/clips	All
7	CAD Workstation: 2GB RAM, 320 GB HDD, 17" screen, 1GHz (Minimum Requirement)	11,12,13,14

8	Plotter: Print Resolution up to 1200X600 Dpi, 16 MB Memory	11,12,13,14
9	Licensed Latest Network of AutoCAD Software	11,12,13,14

**VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE**  
(Specification Table)

Sr. No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	I	Basic Elements of Drawing	CO1	4	0	0	4
2	II	II	Engineering curves and loci of Points.	CO1	6	0	0	14
3	III	III	Orthographic projections	CO2, CO4	8	0	0	16
4	IV	IV	Computer Aided Drafting	CO3, CO4	8	0	0	06
5	V	V	Free Hand Sketches of Engineering Elements	CO4, CO5	4	0	0	10
<b>Grand Total</b>				<b>30</b>	<b>0</b>	<b>0</b>	<b>50</b>	<b>50</b>

**IX. ASSESSMENT METHODOLOGIES/TOOLS**

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
1. Term Work	1. End Term Practical Exam

**X. 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	-	2	-			
CO2	3	-	-	2	-	2	-			
CO3	3	-	-	2	-	2	-			
CO4	3	-	-	2	-	2	2			
CO5	3	-	-	2	-	2	-			

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

\*PSOs are to be formulated at the institute level

**XI.SUGGESTED LEARNING MATERIALS/BOOKS**

Sr.No	Author	Title	Publisher
1	Bureau of Indian Standards.	Engineering Drawing Practice for Schools and Colleges IS: SP-46	Third Reprint, October 1998 ISBN No. 81- 7061-091-2
2	Bhatt, N.D.	Engineering Drawing	Charotar Publishing House, 2010 ISBN No. 978-93-80358-17-8
3	Bhatt, N.D.; Panchal, V. M	Machine Drawing	Charotar Publishing House, 2010 ISBN No. 978-93-80358-11-6
4	Jolhe, D.A.	Engineering Drawing	Tata McGraw Hill Edu. New Delhi, 2010, ISBN No. 978-0-07-064837-1
5	Dhawan, R. K.	Engineering Drawing	S. Chand and Company New Delhi, ISBN No. 81-219-1431-0
6	Pradhan, S.K Jain, K.K	Engineering Graphics	Khanna Book Publishing CO(P) LTD, New Delhi, ISBN No. 978-93-91505-50-9
7	Jeyapooan T	Engineering Drawing and Graphics using AutoCAD	Vikas Publishing House Pvt. Ltd., First Reprint 2013, ISBN NO.978-81259-4000-5
8	Salunkhe R	AutoCAD 2013 2D & 3D for Civil and Mechanical Engineering	Aruta Publishers Chiplun, 2013, ISBN No. 978-81-902648-1-5

**XIII. LEARNING WEBSITES & PORTALS**

Sr.No	Link/Portal	Description
1.	<a href="https://www.youtube.com/watch?v=dmt6_n7Sgcg">https://www.youtube.com/watch?v=dmt6_n7Sgcg</a>	Free Hand Sketches
2.	<a href="https://www.youtube.com/watch?v=dmt6_n7Sgcg">https://www.youtube.com/watch?v=dmt6_n7Sgcg</a>	Orthographic Projection
3.	<a href="https://www.youtube.com/watch?v=3WXPanCq9LI">https://www.youtube.com/watch?v=3WXPanCq9LI</a>	Basics of Projection
4.	<a href="https://www.youtube.com/watch?v=fvjk7PlxAuo">https://www.youtube.com/watch?v=fvjk7PlxAuo</a>	Introduction to Engineering Graphics
5.	<a href="https://www.youtube.com/watch?v=cmR9cfWJRuu">https://www.youtube.com/watch?v=cmR9cfWJRuu</a>	Basics of AutoCAD

Name &amp; Signature:

  
**Mr. M. R. Mundhe**

Lecturer in Mechanical Engineering

(Course Experts)

  
**Mr. R. S. Solanke**

Lecturer in Mechanical Engineering

Name &amp; Signature:

  
**Shri. S.S. Prabhune**  
 (Programme Head)

Name &amp; Signature:

  
**Shri. S.B. Kulkarni**  
 (CDC In-charge)

## GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

<b>PROGRAMME</b>	<b>DIPLOMA IN EE/ET/CM/IT</b>
<b>PROGRAMME CODE</b>	<b>02/03/06/07</b>
<b>COURSE TITLE</b>	<b>ENGINEERING PHYSICS</b>
<b>COURSE CODE</b>	<b>SC11203</b>
<b>PREREQUISITE COURSE CODE &amp; TITLE</b>	<b>NA</b>

## I. LEARNING &amp; ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Paper Duration	Assessment Scheme										
			Actual Contact Hrs./Week			SLH	NLH			Theory	Based on LL & TSL				Based on SL		Total Marks			
			CL	TL	LL						Practical				SLA					
						FA-TH	SA-TH			Total		FA-PR	SA-PR	SLA						
Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min									
SC11203	ENGINEERING PHYSICS	DSC	3	-	2	1	6	3	2	30	70*#	100	40	25	10	25@	10	25	10	175

Total IKS Hrs for Term: 2 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, IKS – Indian Knowledge System, SLA- Self Learning Assessment

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

**Note:**

FA-TH represents an average of two class tests of 30 marks each conducted during the semester.

1. If a candidate is not securing minimum passing marks in FA-PR (Formative Assessment - Practical) of any course, then the candidate shall be declared as '**Detained**' in that semester.
2. If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as '**fail**' and will have to repeat and resubmit SLA work.
3. **Notional learning hours** for the semester are (CL + LL + TL + SL) hrs. \* 15 Weeks
4. **1 credit** is equivalent to **30 Notional hours**.
5. \* Self-learning hours shall not be reflected in the Timetable.
- 6.\* Self-learning includes micro-projects/assignments/other activities.

## II. RATIONALE:

This course is designed in a way by which fundamental information will help the diploma engineers to apply the basic principles and concepts of physics to solve broad-based engineering problems. The study of basic principles and concepts of motion, light, electricity, and modern physics will help in understanding the technology courses where the emphasis is on the applications of these in different technology applications.

## III. COURSE-LEVEL LEARNING OUTCOMES (CO'S)

Students will be able to achieve & demonstrate the following CO's on completion of course-based learning

- CO1: Estimate errors in measurement and Apply laws of motion in various applications.
- CO2: Use basic principles of electrostatics in the engineering field
- CO3: Apply basic principles of electricity to solve engineering problems.
- CO4: Apply basic principles of magnetism to solve engineering problems
- CO5: Use basic principles of light in the technical field
- CO6: Apply principles of X-rays and Photoelectricity in Engineering.

## IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
<b>UNIT-I GENERAL PHYSICS (CL Hrs-07, Marks-10)</b>				
1.	<p><b>TLO 1.1:</b> . List fundamental and derived quantities with their unit. Explain the procedure of measuring the dimensions of a given object by using Vernier Calipers and Screw Gauge.</p>	<p><b>1.1. Units and Measurement</b> Introduction, Definition of unit, Fundamental and derived units, Different System of units, Errors in measurements. Dimensions and its Application Application of Vernier Caliper and Screw Gauge.</p> <p><b>1.2 Types of Motion</b> Displacement, Velocity, Acceleration and retardation Angular displacement, Angular velocity, Angular acceleration and Units. Three equations of angular motion. SHM and its application.</p>	<p>Chalk and board Improved lecture, Tutorial Assignment, and Demonstration</p>	<b>CO1</b>
<b>UNIT-II ELECTROSTATICS (CL Hrs-09, Marks-14)</b>				
2	<p><b>TLO 2.1</b> Describe properties of electric lines of force.</p> <p><b>TLO 2.2</b> Calculate electrostatic force, electric field and electric potential difference of the given static charge.</p> <p><b>TLO 2.3</b> Calculate the equivalent capacity and energy stored in the combination of the capacitors.</p>	<p><b>2.1 Electric charge,</b> Coulomb's law in Electrostatics, a unit of charge, electric field, intensity of electric field, electric lines of forces (Properties), electric flux, flux density, analytical treatment.</p> <p><b>2.2 Electric potential:</b> Explanation, Definition, Potential due to a point charge, potential due to a charged sphere, potential of the earth, absolute electric potential, analytical treatment.</p> <p><b>2.3 Electric Capacitor:</b> Capacitance Introduction of conductor, unit, principle of condenser, parallel plate condenser, capacitances in series and parallel, Super Capacitors and Application, analytical treatment.</p>	<p>Chalk and board, Improved lecture, Tutorial Assignment, Demonstration</p>	<b>CO2</b>

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
<b>UNIT-III CURRENT ELECTRICITY (CL Hrs-09, Marks-14)</b>				
3	<p><b>TLO 3.1.</b> State and Explain Ohm's law.</p> <p><b>TLO 3.2.</b> Explain the principle of the potentiometer and its application.</p>	<p><b>3.1 Current,</b> Resistance and its unit, Law of Parallel and Series combination of resistance, Dependence of resistance-length, area of cross-section, temperature, Ohms law, specific resistance and its unit, Whetstone's network construction and principle, Meter bridge, Balancing condition of meter bridge, Measurement of unknown resistance using meter bridge, analytical treatment.</p> <p><b>3.2 Potentiometer,</b> Principle of the potentiometer, Potential gradient, Construction of potentiometer, Applications of potentiometer, E.M.F., Comparison of E.M.F. using potentiometer.</p>	Chalk and board, Improved lecture, Tutorial Assignment, Demonstration	CO3
<b>UNIT- IV MAGNETISM (CL Hrs-05, Marks-08)</b>				
4	<p><b>TLO.4.1.</b> Calculate Magnetic induction for the given conductor.</p> <p><b>TLO 4.2</b> Explain Electromagnetism with its applications.</p>	<p><b>4.1 Magnetic effect of electric current,</b> Magnetism, Intensity of magnetic field, Magnetic induction, Magnetic Flux, Magnetic lines of force and its Properties, Analytical treatment.</p> <p><b>4.2 Electromagnetism</b> and its application.</p>	Simulation, Model Display, Demonstration Chalk and board, Presentations.	CO4
<b>UNIT –V OPTICS AND LASER (CL Hrs-07, Marks-12)</b>				
5	<p><b>TLO 5.1.</b> State laws of reflection and refraction. Describe the phenomenon of total internal reflection.</p> <p><b>TLO 5.2</b> Distinguish between optical fibre communication systems and ordinary systems.</p> <p><b>TLO 5.3</b> Differentiate between properties of ordinary light and laser light. State applications of laser in different fields</p>	<p><b>5.1 Light:</b> Introduction to reflection and refraction of light, Laws of reflection and refraction, Snell's law, Refractive index, Physical significance of refractive index, Critical angle, Total internal refraction of light, analytical treatment.</p> <p><b>5.2 Fiber optics:</b> Propagation of light through optical fibre, Structure of optical fibre, Numerical aperture, Acceptance angle, Acceptance cone, Types of optical fibres, Applications of optical fibre, Comparison of optical fibre communication with electrical cable communication.</p>	Simulation, Demonstration, Flipped Classroom, Collaborative Learning, Case Study, chalk and board etc.	CO5

		<b>5.3 Laser:</b> Definition, Properties of LASER, Spontaneous and Stimulated emission, Population inversion, Metastable state, Pumping, Lifetime, He-Ne laser construction and working with energy level diagram, Engineering applications of laser.		
<b>UNIT –VI MODERN PHYSICS (CL Hrs-08, Marks-12)</b>				
6	<p><b>TLO 6.1.</b> Explain the production of X-rays. Describe the properties and applications of X-rays in different fields.</p> <p><b>TLO 6.2.</b> Describe properties of photon Derive Einstein's photoelectric equation. Explain the working of a given photoelectric device.</p>	<p><b>6.1 X-ray:</b> principle, production of X-rays using Coolidge tube, origin of X-rays, types of X-rays, properties of X-rays, engineering applications of X-rays, analytical treatment.</p> <p><b>6.2 Photo electricity:</b> photoelectric effect, Plank's quantum theory, the concept of the photon, properties of the photon, threshold frequency, threshold wavelength, stopping potential, photoelectric work function, Einstein's photoelectric equation, photocell (circuit diagram and working), applications of photoelectric cell, analytical treatment.</p>	Chalk and board, Improved lecture, Tutorial Assignment, Demonstration	CO6

#### V. 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	LLO1.1 Use of given instrument and i) Mention name and range of the given instrument. ii) Calculate the least count of the given instrument. iii) List the uses of the given instrument.	Identify the given instrument and i) Mention the name and range of the given instrument. ii) Calculate the least count of the given instrument. iii) List the uses of the given instrument.	2	CO1
2	LLO2.1 Use a Vernier caliper to Measure the dimensions of given objects. Measure the dimensions of objects of known dimensions. LLO 2.2 Estimate the errors in measurement.	Measurements of dimensions of the given object by Vernier caliper.	2	CO 1
3	LLO3.1 Use a Micrometer Screw gauge to Measure the dimensions of given objects. Measure the dimensions of objects of known dimensions.	Measurements of dimensions of given objects by micrometre screw gauge.	2	CO1



	LLO 3.2 Estimate the measurement errors.			
4	LLO 4.1 Use a simple pendulum to determine acceleration due to gravity.	Determination of Acceleration due to Gravity by Simple Pendulum.	2	CO1
5	LLO5.1 Apply Ohm's law to solve circuit problems	Determination of resistance by Ohm's law.	2	CO2
6	LLO6.1 Determine the specific resistance of a given wire.	Determination of specific resistance of a given wire.	2	CO2
7	LLO7.1 Verify the law of the series connection of resistors /capacitors.	Determination of equivalent resistance in the series connection of resistors /capacitors.	2	CO2
8	LLO 8.1 Verify the law of the parallel connection of resistors /capacitors	Determination of equivalent resistance in parallel connection of resistors /capacitors.	2	CO2
9	LLO 9.1 Use meter bridge to: i) Determine the resistance of the given material of the wire. ii) Calculate the specific resistance of the given material of the wire.	Determination of i) resistance of given material of wire. ii) Calculate the specific resistance of the given material of wire by using a meter bridge.	2	CO3
10	LLO 10.1 Use a potentiometer to : i) Determine the potential gradient of the given cell (Principle of potentiometer). ii) Calibrate the given voltmeter	Calibrate the given voltmeter using a Potentiometer.	2	CO3
11	LLO 11.1 Use a potentiometer to : i) Compare the emf of two cells	Compare the emf of two cells using a Potentiometer.	2	CO3
12	LLO 12.1 Use a potentiometer to: i) Find the internal resistance of a cell.	Find the internal resistance of a cell by using a Potentiometer.	2	CO3
13	LLO 13.1 Use a magnetic compass to draw the magnetic lines of forces of magnets of different shapes and determine neutral points.	Determination of neutral points by magnetic compass.	2	CO4
14	LLO 14.1 Determine the refractive index of the glass slab using the Refraction phenomenon.	Determination of the refractive index of the glass slab.	2	CO5
15	LLO 15.1 Use of He-Ne laser beam.	Study the properties and working of the laser using a He-Ne laser beam.	2	CO5
16	LLO 16.1 Use photoelectric cells to study the effect of : i) Intensity of light on photoelectric current. ii) Applied potential on photoelectric current.	Study effect of i) Intensity of light on photoelectric current. ii) Applied potential on photoelectric current. using Photoelectric cell	2	CO6

**VI. SUGGESTED MICRO PROJECT/ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT (SELF-LEARNING)**

Only one Micro Project is planned to be undertaken by a student assigned to him/her at the beginning of the semester. She/He ought to submit it by the end of the semester to develop industry-oriented COs. Each micro-project should encompass two or more COs. The Micro-Project could be industry application-based, internet-based, workshop-based, laboratory-based or field-based. The assessment of the micro-project is to be done under Practical (PA) Assessment. The Micro Project is preferably assigned to a group of (4-6) students or an individual taking into consideration the capabilities and circumstances at the time.

A suggested list is given here. A similar micro-project/ Assignment could be added by the concerned faculty.

**Micro project:**

- Series and parallel resistances: Prepare models for a combination of series and parallel resistances
- Series and parallel capacitors: Prepare models for a combination of series and parallel capacitors
- Magnetic flux: Prepare models to demonstrate magnetic lines of lines of forces
- Vernier Calipers: Prepare prototype vernier caliper of desired least count using card sheet
- Conductivity: Collect different materials such as metal, plastics, glass etc. and prepare models
- Carbon resistors: Determine the resistance and tolerance of carbon resistors using color codes
- Mobile applications: Use mobile applications for measurements of different physical quantities Optical Fiber and TIR: Prepare model to demonstrate total internal reflection
- Physical quantities: Prepare a Chart on comparison of systems of units for different physical quantities.
- Magnetism: Prepare a chart on magnetic lines of force of bar magnet.
- LASER: Prepare a chart to study Total Internal Reflection/LASER.
- X-rays/Photoelectric cell. Prepare a chart showing the properties of X-rays/Photoelectric cells.
- Ohm's Law: Prepare Chart to Study Ohm's Law.

**Assignment**

- Convert the units of a given physical quantity from one system of units to another.
- Prepare a chart to summarize units and measurements.
- Give details about the explanation of concepts like electrostatics, and magnetic domain. Demonstrate the variation of the angle of refraction with respect to the refractive index.
- Use a digital vernier caliper and micrometer screw gauge for measurements. (lab-based).
- Applications of optical fibres in, engineering etc.
- Applications of X-ray in engineering etc.
- Applications of LASER in, engineering etc.
- Applications of Photoelectricity in, engineering etc

**VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED**

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Vernier Calliper : Range: 0-15 cm, Resolution 0.01 cm.	1
2	Micrometer screw gauge: Range 0-25 mm, Resolution 0.01 mm.	2
3	Simple pendulum, Stop Watch.	3
4	Glass Slab 75x50x12mm.	4
5	He-Ne laser kit	14
6	Battery eliminator (0-12 V, 2 A)	4,5,6,7,8,9
7	Voltmeter(0-10 V), ammeter (0-5 A)	1,4,5
8	Meter Bridge (100 cm), Galvanometer (30-0-30) and jockey.	8
9	Potentiometer (400 cm).	9,10,11
10	Potentiometer, Daniell cell, Leclanche cell.	9,10,11
11	Bar Magnet, Magnetic Needle.	12
12	Photoelectric cell.	15
13	Parallel/Series Resistance /Capacitor Kit	6,7

**VIII.SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)**

Sr. No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	General Physics	CO1	7	2	4	4	10
2	II	Electrostatics	CO2	9	2	6	6	14
3	III	Current Electricity	CO3	9	4	4	6	14
4	IV	Magnetism	CO4	5	2	3	3	8
5	V	Optics and Laser	CO5	7	4	4	4	12
6	VI	Modern Physics	CO6	8	4	4	4	12
<b>Grand Total</b>				<b>45</b>	<b>18</b>	<b>25</b>	<b>27</b>	<b>70</b>

**IX.ASSESSMENT METHODOLOGIES/TOOLS**

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
1. Tests 2. Rubrics for COs 3. Assignment 4. Midterm Exam 5. Self-Learning 6. Term Work 7. Seminar/Presentation	1. End Term Exam 2. Micro-project 3. Tutorial Performance

## X. 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	1		2	1	1	1			
CO2	3	1	1	2	1	1	1			
CO3	3	1	1	2	1	1	1			
CO4	3	1	1	1	1	1	1			
CO5	3	1	1	2	1	1	1			
CO6	3	1	1	2	1	1	1			

**Legends:- High:03, Medium:02, Low:01, NoMapping: -**  
 \*PSOs are to be formulated at the institute level

## XI.SUGGESTED LEARNING MATERIALS/BOOKS


Sr.No	Author	Title	Publisher
1	Narlikar J. V. ;Joshi , A. W.; Mathur , Anuradha ; et al	Physics Textbook Part I - Class XI	National Council of Education Research and Training, New Delhi, 2010, ISBN: 8174505083
2	Narlikar, J.V.;Joshi , A. W.; Mathur , Anuradha ; et al	Physics Textbook Part II - Class XI	National Council of Education Research and Training, New Delhi, 2015, ISBN: 8174505660
3	Narlikar J.V.;Joshi , A. W.; Ghatak A.K. et al	Physics Textbook Part I - Class XII	National Council of Education Research and Training, New Delhi, 2013, ISBN: 8174506314
4	Narlikar, J.V.;Joshi , A. W.; Ghatak A.K. et al	Physics Textbook Part II - Class XII	National Council of Education Research and Training, New Delhi, 2013, ISBN: 8174506713
5	Haliday, David; Resnik, Robert and Walker, Jearl	Fundamentals of Physics	John Wiley & Sons, Hoboken, USA, 2014 ISBN: 812650823X
6	Dr. Hussain Jeevakhan	Applied Physics - II	Khanna Book Publishing, (2021), ISBN: 978-93-91505-57-8


## XIII. LEARNING WEBSITES &amp; PORTALS


Sr.No	Link/Portal	Description
1.	<a href="http://www.sciencejoywagon.com/physicszone">www.sciencejoywagon.com/physicszone</a>	Electricity, Magnetism and Semiconductors, basic fiber optics
2.	<a href="https://phet.colorado.edu">https://phet.colorado.edu</a>	Electricity, Magnetism and Semiconductors, Thermometry and basic fiber optics
3.	<a href="http://www.physicsclassroom.com">www.physicsclassroom.com</a>	Concepts of basic physics

Sr.No	Link/Portal	Description
4.	<a href="http://nptel.ac.in/course.php?disciplineId=104">http://nptel.ac.in/course.php?disciplineId=104</a>	Concepts of basic physics
5.	<a href="http://hperphysics.phy-astr.gsu.edu/hbase/hph.html">http://hperphysics.phy-astr.gsu.edu/hbase/hph.html</a>	Concepts of basic physics
6.	<a href="https://www.youtube.com/results?search_query=amruta+university+physics+expts">https://www.youtube.com/results?search_query=amruta+university+physics+expts</a>	Concepts of basic physics
7.	k. <a href="https://www.youtube.com/results?search_query=physics+class+11+chapter+1">https://www.youtube.com/results?search_query=physics+class+11+chapter+1</a>	Concepts of basic physics
8.	l. <a href="https://www.youtube.com/watch?v=zRGh9_a1J7s">https://www.youtube.com/watch?v=zRGh9_a1J7s</a>	Concepts of basic physics
9.	<a href="https://iksindia.org">https://iksindia.org</a>	IKS physics
10.	<a href="https://www.ancient-origins.net/history-famous-people/indian-sageacharya-kanad-001399">https://www.ancient-origins.net/history-famous-people/indian-sageacharya-kanad-001399</a>	IKS Philosophy of atom by Acharya Kanad.

Name &amp; Signature:

  
Smt. D.V. Saurkar  
Lecturer in Physics

  
Shri. N.S. Salave  
Lecturer in Physics


  
Shri. A.D. Ghorpade  
Lecturer in Physics

(Course Experts)

Name &amp; Signature:

  
Shri. S.S. Prabhune  
(Programme Head)

Name &amp; Signature:

  
Shri. S.B. Kulkarni  
(CDC In-charge)

**GOVERNMENT POLYTECHNIC, PUNE**  
**'120 – NEP' SCHEME**

<b>PROGRAMME</b>	<b>DIPLOMA IN CE/EE/ET/ME/MT</b>
<b>PROGRAMME CODE</b>	<b>01/02/03/04/05</b>
<b>COURSE TITLE</b>	<b>BASIC MATHEMATICS</b>
<b>COURSE CODE</b>	<b>SC11205</b>
<b>PREREQUISITE COURSE CODE &amp; TITLE</b>	<b>NA</b>

**I. LEARNING & ASSESSMENT SCHEME**

Course Code	Course Title	Course Type	Learning Scheme						Credits	Paper Duration	Assessment Scheme								Total Marks	
			Actual Contact Hrs./Week			SL	LH	NLH			Theory			Based on LL & TSL				Based on SL		
			CL	TL	LL						FA-TH	SA-TH	Total	Practical		SLA				
						Max	Min	Max						Min	Max	Min	Max	Min		
SC11205	BASIC MATHEMATICS	AEC	4	2	-	-	6	3	3	30	70	100	40	-	-	-	-	-	-	100

**Total IKS Hrs for Term:** 6 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, IKS – Indian Knowledge System, SLA- Self Learning Assessment

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

**Note:**

**FA-TH** represents an average of two class tests of 30 marks each conducted during the semester.

- If a candidate is not securing minimum passing marks in **FA-PR** (Formative Assessment - Practical) of any course, then the candidate shall be declared as '**Detained**' in that semester.
- If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as '**fail**' and will have to repeat and resubmit SLA work.
- Notional learning hours** for the semester are **(CL + LL + TL + SL) hrs. \* 15 Weeks**
- 1 credit** is equivalent to **30 Notional hours**.
- \* Self-learning hours shall not be reflected in the Timetable.
- \*Self-learning includes micro-projects/assignments/other activities.

**II. 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 move. Derivatives are useful for finding 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.

### III. COURSE-LEVEL LEARNING OUTCOMES(CO'S)

Students will be able to achieve & demonstrate the following CO's on completion of course-based learning

CO1 - Apply the concepts of algebra to solve engineering (discipline) related problems.

CO2 - Utilize trigonometry to solve programme-specific engineering problems.

CO3 - Solve programme-specific engineering problems under given conditions of straight lines.

CO4 - Apply differential calculus to solve programme-specific problems.

CO5 - Use techniques and methods of statistics to crack programme-specific problems.

### IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
<b>UNIT-I ALGEBRA (CL Hrs-12, Marks-14)</b>				
1.	TLO 1.1 Solve the given simple problem based on laws of logarithm. TLO 1.2 Solve the given system of linear equations using the 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 concepts given in Ancient Indian Mathematics.	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 fractions based on the nature of factors and related Problems. 1.5 Algebra in Indian Knowledge System: Solution of simultaneous equations.	Improved Lecture Tutorial Assignment Demonstration Simulation	CO1

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
<b>UNIT-II TRIGONOMETRY (CL Hrs-16, Marks-14)</b>				
2	<p>TLO 2.1: Apply the concept of Compound angle, allied angle, and multiple angles to solve the given simple engineering problem(s).</p> <p>TLO 2.2: Apply the concept of Sub-multiple angle to solve the given simple engineering-related problem(s).</p> <p>TLO 2.3: Apply the concept of factorization and de-factorization formulae to solve the given simple engineering problem(s).</p> <p>TLO 2.4: Investigate given simple problems by utilizing inverse trigonometric ratios.</p> <p>TLO 2.5: Use concepts given in Ancient Indian Mathematics for trigonometry to solve given problems.</p>	<p>2.1 Trigonometric ratios of allied angles, compound angles, multiple angles (2A, 3A), and submultiples angles (without proof).</p> <p>2.2 Factorization and De factorization formulae (without proof).</p> <p>2.3 Inverse Trigonometric Ratios and related problems.</p> <p>2.4 Principal values and the relation between trigonometric and inverse trigonometric ratios.</p> <p>2.5 Trigonometry in Indian Knowledge System: The Evolution of Sine Function in India.</p> <p>2.6 Indian Trigonometry: Basic Indian Trigonometry - Introduction and Terminology (From Ancient Beginnings to Nilakantha).</p> <p>2.7 Trigonometry in Indian Knowledge System: Pythagorean triples in Sulabasutras.</p>	<p>Improved Lecture Tutorial Assignment Demonstration Simulation</p>	<b>CO2</b>
<b>UNIT-III STRAIGHT LINE (CL Hrs-06, Marks-08)</b>				
3	<p>TLO 3.1 Calculate the angle between given two straight lines.</p> <p>TLO 3.2 Formulate equation of straight lines related to given engineering problems.</p> <p>TLO 3.3 Identify the perpendicular distance from the given point to the line.</p> <p>TLO 3.4 Calculate the perpendicular distance between the given two parallel lines.</p> <p>TLO 3.5 Use geometry given in Sulabasutras to solve the given problems.</p>	<p>3.1 Straight line and slope of a straight line:</p> <ol style="list-style-type: none"> <li>The angle between two lines</li> <li>Condition of parallel and perpendicular lines</li> </ol> <p>3.2 Various forms of straight lines:</p> <ol style="list-style-type: none"> <li>General form</li> <li>Slope-point form</li> <li>Slope-intercept form</li> <li>Two-point form</li> <li>Double intercept form</li> </ol> <p>3.3 Perpendicular distance from a point on the line</p> <p>3.4 Perpendicular distance between two parallel lines</p> <p>3.5 Geometry in Sulabasutras in Indian Knowledge System:</p> <ol style="list-style-type: none"> <li>Construction of square</li> <li>Circling the square</li> </ol>	<p>Improved Lecture Tutorial Assignment Demonstration Simulation</p>	<b>CO3</b>



Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
<b>UNIT- IV DIFFERENTIAL CALCULUS (CL Hrs-16, Marks-20)</b>				
<b>4</b>	<p>TLO 4.1: Solve the given simple problems based on functions.</p> <p>TLO 4.2: Solve the given simple problems based on rules of differentiation.</p> <p>TLO 4.3: Obtain the derivatives of composite, implicit, parametric, inverse, logarithmic, and exponential functions.</p> <p>TLO 4.4: Apply the concept of differentiation to find the given equation of tangent and normal.</p> <p>TLO 4.5: Apply the concept of differentiation to calculate maxima, minima, and radius of curvature for a given function.</p> <p>TLO 4.6: Familiar with the concept of calculus given in Indian Mathematics.</p>	<p>4.1 Functions and Limits: Concept of function and simple examples.</p> <p>4.2 Functions and Limits: Concept of limits without examples.</p> <p>4.3 Derivatives: Rules of derivatives such as sum, product, and quotient of functions.</p> <p>4.4 Derivatives: Derivative of composite functions (chain rule), implicit and parametric functions.</p> <p>4.5 Derivatives: Derivatives of inverse, logarithmic, and exponential functions.</p> <p>4.6 Applications of derivative: Second-order derivative without examples, equation of tangent and normal, maxima and minima, radius of curvature.</p> <p>4.7 Calculus in Indian Knowledge System: The Discovery of Calculus by Indian Astronomers.</p>	<p>Improved Lecture Tutorial Assignment Demonstration Simulation</p>	<b>CO4</b>
<b>UNIT –V STATISTICS (CL Hrs-10, Marks-14)</b>				
<b>5</b>	<p>TLO 5.1: Obtain the range and coefficient of range of the given grouped and ungrouped data.</p> <p>TLO 5.2: Calculate the mean and standard deviation of ungrouped and grouped data related to the given simple engineering problem(s).</p> <p>TLO 5.3: Determine the variance and coefficient of variance of given grouped and ungrouped data.</p> <p>TLO 5.4: Justify the consistency of given simple sets of data.</p>	<p>5.1 Range, coefficient of range of discrete and grouped data.</p> <p>5.2 Mean deviation and standard deviation from the mean of grouped and ungrouped data.</p> <p>5.3 Variance and coefficient of variance.</p> <p>5.4 Comparison of two sets of observation.</p>	<p>Improved Lecture Tutorial Assignment Demonstration Simulation</p>	<b>CO5</b>

## V. 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 1.1: Solve simple problems of Logarithms based on given applications.	Logarithm and applications.	2	CO1
2	LLO 2.1: Solve elementary problems on Algebra of matrices for branch-specific engineering-related applications.	Algebra of matrices	2	CO1
3	LLO 3.1: Apply the concept of matrix to solve engineering problems.	Simultaneous Equations using the inversion method.	2	CO1
4	LLO 4.1: Apply the concept of matrix to solve engineering problems.	Matrix Inversion method to determine currents.	2	CO1
5	LLO 5.1: Apply the concept of matrix to solve engineering problems.	Inverse of a non-singular matrix.	2	CO1
6	LLO 6.1: Apply the concept of partial fractions to solve engineering problems.	Partial fractions.	2	CO1
7	LLO 7.1: Solve problems on Compound, Allied, multiple and sub-multiple angles for related shapes.	Compound, Allied, multiple, and sub-multiple angles.	2	CO2
8	LLO 8.1: Utilize the concept of trigonometry to solve engineering problems.	Factorization and de-factorization formulae.	2	CO2
9	LLO 9.1: Utilize the concept of trigonometry to solve engineering problems.	Inverse trigonometric ratios.	2	CO2
10	LLO 10.1: Solve branch-specific engineering problems under given conditions of straight lines.	Equation of straight lines using different forms.	2	CO3
11	LLO 11.1: Solve branch-specific engineering problems under given conditions of straight lines.	Perpendicular distance, distance between two parallel lines, and angle between two lines.	2	CO3
12	LLO 12.1: Solve branch-specific engineering problems under given conditions of straight lines.	Use of a straight line to calculate the speed, distance, and time of a moving object.	2	CO3
13	LLO 13.1: Apply the concept of derivative to solve engineering problems.	Derivatives of implicit functions and parametric functions.	2	CO4
14	LLO 14.1 - Apply the concept of derivatives to solve engineering problems.	Derivative of logarithmic and exponential functions.	2	CO4
15	LLO 15.1 - Apply the concept of the equation of tangent and normal to solve engineering problems.	Equation of tangent and normal.	2	CO4

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
16	LLO 16.1 - Apply the concept of maxima, minima, and radius of curvature to solve engineering problems.	Maxima, minima of function and radius of curvature.	2	CO4
17	LLO 17.1 - Apply the concept of the equation of tangent and normal to solve engineering problems.	Concept of tangent and normal to solve the given problems of Engineering Drawing.	2	CO4
18	LLO 18.1 - Apply the concept of maxima and minima to solve engineering problems.	Maxima and Minima to obtain optimum value.	2	CO4
19	LLO 19.1 - Apply the concept of the radius of curvature to solve engineering problems.	Radius of curvature.	2	CO4
20	LLO 20.1 - Utilize the concept of derivatives to solve engineering problems.	Use of derivative to find the slope of a bending curve.	2	CO4
21	LLO 21.1 - Use the concept of range and mean deviation to crack branch-specific problems.	Range, coefficient of range and mean deviation.	2	CO5
22	LLO 22.1 - Use the concept of standard deviation and coefficient of variance to crack branch-specific problems.	Standard deviation, coefficient of variation and comparison of two sets.	2	CO5
23	LLO 23.1 - Use the concept of standard deviation to crack branch-specific problems.	Standard Deviation for Concrete with the given data.	2	CO5
Note: 1.Take any15 tutorials out of 23 and ensure that all the units are covered. 2.Take the tutorial in a batch size of 20 to 30 students. 3.Give students at least 10 problems to solve in each tutorial.				

#### VI. SUGGESTED MICROPROJECT/ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT (SELF-LEARNING)

##### Micro-project

NA

##### Assignment

NA

#### VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr. No	EquipmentNamewithBroadSpecifications	Relevant LLO Number
1	Open-source software like SageMaths, MATHS3D, GeoGebra, Graph, DPLOT and Graphing Calculator (GraphEq2.13), ORANGE can be used for Algebra, Calculus, Trigonometry and Statistics respectively.	All

### VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr. No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Algebra	CO1	12	2	6	6	14
2	II	Trigonometry	CO2	16	2	6	6	14
3	III	StraightLine	CO3	6	2	2	4	8
4	IV	DifferentialCalculus	CO4	16	2	8	10	20
5	V	Statistics	CO5	10	2	6	6	14
<b>Grand Total</b>				<b>60</b>	<b>10</b>	<b>28</b>	<b>32</b>	<b>70</b>

### IX. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
1. Tests	1. End Term Exam

### X. 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	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:-**  
\*PSOs are to be formulated at the institute level.

### XI. 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 textbook of Engineering Mathematics	New Age publication New Delhi, 2006 ISBN: 978-81-224-1689-3
3	Kreyszig, 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. Sargent	Calculus and Its Applications	Addison-Wesley 10th Edition ISBN-13: 978-0-321-69433-1

Sr. No	Author	Title	Publisher
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 ISBN 978-17-86340-61-0
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 ISBN978-1-4614-7138-7 (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 January 2008 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

### XIII. LEARNING WEBSITES & PORTALS

Sr. No	Link/Portal	Description
1.	<a href="http://nptel.ac.in/courses/106102064/1">http://nptel.ac.in/courses/106102064/1</a>	Online Learning Initiatives by IITs and IISc
2.	<a href="http://www.scilab.org/-SCILab">www.scilab.org/-SCILab</a>	Signal processing, statistical analysis and image enhancement.
3.	<a href="http://www.mathworks.com/product/matlab/-MATLAB">www.mathworks.com/product/matlab/-MATLAB</a>	Applications of concepts of Mathematics to coding.
4.	Spreadsheet Applications	Use of Microsoft Excel, Apple Numbers and Google Sheets.
5.	<a href="https://ocw.mit.edu/">https://ocw.mit.edu/</a>	MIT Courseware
6.	<a href="https://www.khanacademy.org/math?gclid=CNqHuabCys4CFdOJaddHoPig">https://www.khanacademy.org/math?gclid=CNqHuabCys4CFdOJaddHoPig</a>	Concept of Mathematics through video lectures and notes
7.	<a href="http://ocw.abu.edu.ng/courses/mathematics/">http://ocw.abu.edu.ng/courses/mathematics/</a>	List of Mathematical Courses.
8.	<a href="https://libguides.furman.edu/oer/subject/mathematics">https://libguides.furman.edu/oer/subject/mathematics</a>	Open Education Resources (OER) in Mathematics.
9.	<a href="https://phet.colorado.edu/en/simulations/filter?subjects=math&amp;type=html,prototype">https://phet.colorado.edu/en/simulations/filter?subjects=math&amp;type=html,prototype</a>	Phet Simulation for Mathematics.
10.	<a href="https://libguides.cmich.edu/OER/mathematics">https://libguides.cmich.edu/OER/mathematics</a>	Mathematics with OER.

Name & Signature:



**Shri. Vitthal B. Shinde**  
Lecturer in Mathematics



**Shri. Sachin B. Yede**  
Lecturer in Mathematics

(Course Experts)

Name & Signature:



**Shri. S. S. Prabhune**  
(Programme Head)

Name & Signature:



**Shri. S. B. Kulkarni**  
(CDC In-charge)



**GOVERNMENT POLYTECHNIC, PUNE**  
**'120 – NEP' SCHEME**

<b>PROGRAMME</b>	<b>DIPLOMA IN ET</b>
<b>PROGRAMME CODE</b>	<b>03</b>
<b>COURSE TITLE</b>	<b>ENGINEERING WORKSHOP PRACTICE</b>
<b>COURSE CODE</b>	<b>WS11203</b>
<b>PREREQUISITE COURSE CODE &amp; TITLE</b>	<b>NA</b>

**I. LEARNING & ASSESSMENT SCHEME**

Course Code	Course Title	Course Type	Learning Scheme				Credits	Paper Duration	Assessment Scheme								Total Marks				
			Actual Contact Hrs./Week			SLH			NLH	Theory			Based on LL & TSL		Based on SL						
			CL	TL	LL					FA-TH	SA-TH	Total		Practical		SLA					
												Max	Min	Max	Min	Max		Min	Max	Min	
WS11203	ENGINEERING WORKSHOP PRACTICE)	SEC	-	-	4	-	4	2	-	CW	-	-	-	-	25	10	25@	10	-	-	100
										ET	-	-	-	-	25	10	25@	10	-	-	

**Abbreviations:** CL-Classroom Learning, TL-Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS – Indian Knowledge System, SLA- Self Learning Assessment

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

**Note:**

**FA-TH** represents an average of two class tests of 30 marks each conducted during the semester.

- If a candidate is not securing minimum passing marks in **FA-PR** (Formative Assessment - Practical) of any course, then the candidate shall be declared as '**Detained**' in that semester.
- If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as '**fail**' and will have to repeat and resubmit SLA work.
- Notional learning hours** for the semester are **(CL + LL + TL + SL) hrs. \* 15 Weeks**
- 1 credit** is equivalent to **30 Notional hours**.
- \*Self-learning hours shall not be reflected in the Timetable.
- \*Self-learning includes micro-projects/assignments/other activities.
- Candidate is detained in any one part of Engineering Workshop Practice course i.e. Central Workshop ,Electronics workshop will be declared as Detained in Engineering Workshop Practice course .
- Candidate remaining absent in practical examination of any one part of Engineering Workshop Practice course i.e. Central Workshop , Electronics workshop will be declare as Absent in Mark List and has to appear for examination. The marks of the part for which candidate was present will not be processed or carried forward.

**II. RATIONALE:**

Engineering diploma holders specializing in electronics and allied disciplines are expected to handle various mechanical, electrical and electronics tools in the workshop in any industry in which they are employed. This course provides a simulated industrial environment and enables students to perform a variety of operations in various shops using relevant mechanical, electrical and electronic materials as well as appropriate hand tools, equipment, tools and machinery. Through this course, students will develop practical skills in sheet metal work, fitting, soldering, de-soldering, assembly, testing etc. of electronic components and circuits, which will also be very useful for projects and other courses that he or she will undertake during the diploma programme as well as in the world of work.

**III. COURSE-LEVEL LEARNING OUTCOMES (CO'S)**

Students will be able to achieve & demonstrate the following CO's on completion of course-based learning

CO1- Use firefighting equipment and other safety-related accessories.

CO2- Use fitting and sheet metal tools in the workshop.

CO3- Test active and passive electronic components.

CO4- Perform soldering and de-soldering using soldering tools.

CO5- Build simple circuits on PCB.

**IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT**

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
<b>CENTRAL WORKSHOP</b>				
<b>UNIT-I GENERAL WORKSHOP PRACTICE(CL Hrs.-NIL, Marks-NIL)</b>				
1.	TLO 1.1: Follow safety practices. TLO 1.2: Explain the procedure for extinguishing fire. TLO1.3: Use firefighting equipment. TLO 1.4: Locate various machines and equipment in the workshop. TLO1.5: Follow good housekeeping	1.1 Safety practices, causes of accidents, general safety rules, safety signs and symbols. 1.2 First aid. 1.3 Fire, causes of fire, basic ways of extinguishing the fire, classification of fire, class A, B, C, D, firefighting equipment, fire extinguishers and their types. 1.4 Workshop layout. 1.5 Issue and return system of tools, equipment and Consumables.	Demonstrate operation of available extinguisher in workshop Show first aid box Practice by students for handling a fire extinguisher	CO1
<b>UNIT-II FITTING (CL Hrs.-NIL, Marks-NIL)</b>				
2	TLO 2.1: Identify fitting tools. TLO 2.2: Explain the operation of fitting shop machines. TLO 2.3: Use fitting tools. TLO 2.4: Operate machinery related to the workshop. TLO 2.5: Perform fitting operations. TLO 2.6: Maintain tools, equipment and machinery.	2.1 Fitting hand tools - bench vice, hammers, chisels, files, hacksaw, surface plate, punch, V - V-block, angle plate, try square, marking block, steel rule, twist drills, reamers, tap set, die set and their specifications. 2.2 Operation of fitting shops machinery - Drilling machine, power saw, grinder their specifications and maintenance 2.3 Basic process - chipping, filing, scraping, grinding, marking, sawing, drilling, tapping, reaming etc.	Demonstrate various types of tools available in the fitting shop with their utility	CO2



**ELECTRONICS WORKSHOP****UNIT-III IDENTIFICATION OF ELECTRONIC COMPONENTS (CL Hrs.-NIL, Marks-NIL)**

3	<p>TLO 3.1: Identify the given type of active, passive and SMD electronic components.</p> <p>TLO 3.2: Locate various components such as LED, switch, relay, 7-segment display, transformer on a given circuit.</p> <p>TLO 3.3: Describe steps to use the given type of multimeter.</p> <p>TLO 3.4: Describe the steps to test the given electronic components using the multimeter.</p>	<p>3.1 Electronic components - Passive components like resistors, capacitors and inductors.</p> <p>3.2 Active components like diode, transistor, IC. Identify SMD components Switches, relays, LEDs, 7-segment display, step-down transformer.</p> <p>3.3 Connectors and cables used in electronic circuits.</p> <p>3.4 Datasheet and the catalogue of electronics components, multimeter.</p> <p>3.5 Tools required for electronic workshop - specifications, cost and other important characteristics (Catalogs of multimeter, power supply, to collect the latest information of tools).</p>	Hands-on practice	CO3
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**UNIT-IV SOLDERING DESOLDERING PRACTICES (CL Hrs.-NIL, Marks-NIL)**

4	<p>TLO 4.1: Select the soldering and de-soldering tools for the given job.</p> <p>TLO 4.2: Describe the procedure for using the given soldering-related component.</p> <p>TLO 4.3: Explain the function of the given type of de-soldering device.</p> <p>TLO 4.4: Describe problems of a given type of soldering.</p>	<p>4.1 Soldering and de-soldering tools like a normal soldering gun, temperature-controlled soldering gun, soldering metals, soldering flux, de-soldering gun, de-soldering pump, de-soldering mesh</p> <p>4.2 Soldering techniques like hand Soldering, wave soldering and dip soldering</p> <p>4.3 Soldering of simple electronics components like resistors, capacitors, diode, switches, and LEDs on a general-purpose PCB</p> <p>4.4 Dry soldering, problems of dry and loose soldering</p> <p>4.5 De-soldering of the components from PCB.</p>	Hands-on practice demonstration video on the use of a soldering station	CO4
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**UNIT-V HANDS ON SKILLS (CL Hrs.-NIL, Marks-NIL)**

5	<p>TLO 5.1: Describe the procedure to build a given type of simple electronic circuit on a breadboard.</p> <p>TLO 5.2: Explain the process of etching, and drilling.</p> <p>TLO 5.3: Explain the procedure of assembling a given simple electronic circuit on a general-purpose PCB.</p> <p>TLO 5.4: Explain the procedure to test the continuity of the given circuit using the given type of digital multimeter.</p> <p>TLO 5.5: Test a simple circuit using simulation software.</p>	<p>5.1 Continuity testing using a multimeter.</p> <p>5.2 Breadboard specifications and testing.</p> <p>5.3 PCB layout drawing, etching, drilling, soldering.</p> <p>5.4 Measurement of series and parallel combination of resistors and capacitors</p> <p>5.5 Basic simulation software</p>	Hands-on skills	CO5
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**V. 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 1.1: Use standard safety symbols for a given situation.	Safety symbols	2	CO1
2	LLO 2.1: Perform mock drill sessions for firefighting using various classes of fire extinguishers and related accessories.	Fire extinguishers and accessories	2	CO1
3	LLO 3.1: Select hand tools and equipment used in the fitting shop.	Fitting shop hand tools and equipment	2	CO2
4	LLO 4.1: Select machine tools and equipment used in the fitting shop.	Fitting shop machine tools and equipment	2	CO2
5	LLO 5.1: Identify various fitting tools based on a given situation.	Identification of fitting tools for given specifications	2	CO2
6	LLO 6.1: Identify various sheet metal tools based on a given situation.	Identification of sheet metal tools for given specifications	2	CO2
7	LLO 7.1: Prepare the fitting job as per the given drawings Part-I. LLO 7.2: Prepare the fitting job as per the given drawings Part-II. LLO 7.3: Prepare the fitting job as per the given drawings Part-III. LLO 7.4: Prepare the fitting job as per the given drawings Part-IV LLO 7.5: Prepare the fitting job as per the given drawings Part-V.	Fitting job preparation	8	CO2
8	LLO 8.1: Identify the given hand tools, machine tools and equipment used in the sheet metal shop along with its' sketch, applications and specifications Part-I. LLO 8.2: Identify the given hand tools, machine tools and equipment used in the sheet metal shop along with its' sketch, applications and specifications Part-II.	Identification of tools and equipment in sheet metal shop	4	CO2
9	LLO 9.1: Prepare two simple sheet metal jobs as per the given drawings Part-I. LLO 9.2: Prepare two simple sheet metal jobs as per the given drawings Part-II. LLO 9.3: Prepare two simple sheet metal jobs as per the given drawings Part-III. LLO 9.4: Prepare two simple sheet metal jobs as per the given drawings Part-IV.	Preparation of sheet metal jobs	6	CO2
10	LLO 10.1: Perform sheet metal and fitting operation for the given utility job.	Job preparation using sheet metal and fitting operation	2	CO2
11	LLO 11.1: Identify the different controls of the electronic lab. equipment's (Analog multimeter, Digital multimeter, CRO, Function generator and IC Tester)	Study the front panel of different controls of the electronics lab.	2	CO3

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
12	LLO 12.1: Observe the square wave, triangular wave and sine wave generated by the function generator and measure their amplitude and frequencies	Observe various waveforms on CRO and measure their amplitude and frequency.	2	CO3
13	LLO 13.1: Identify various: (a) Passive electronic components in the given circuit. LLO 13.2: Identify various: (b) Active electronic components in the given circuit. LLO 13.3: Identify various: (c) SMD electronic components in the given circuit.	Identify various electronic components by physical observation.	4	CO3
14	LLO 14.1: Determine the value of the given resistor And Capacitor by colour codes and confirm with a digital multimeter.	Verify values of resistors and capacitors by colour codes and compare with actual values.	2	CO3
15	LLO 15.1: Test the semiconductor diodes using a digital multimeter. LLO 15.2 Test the LEDs and 7-segment display using a digital multimeter.	Test various electronic components using a digital multimeter	2	CO3
16	LLO 16.1: Identify the primary and secondary winding of the step-down transformer using a multimeter.	Study of transformer	2	CO3
17	LLO 17.1: Identify relay terminals (coil, common, normally open and close).	Study of Relay	2	CO3
18	LLO 18.1:Practice PCB layout drawing using software and manually.	PCB layout designing.	2	CO5
19	LLO 19.1: Practice of Etching and Drilling.	PCB Designing of a simple electronic circuit.	4	CO5
20	LLO 20.2: Solder and Desolder the component on the Printed Circuit Board (PCB).	Soldering and Desoldering Of electronic components on PCB.	2	CO4, CO5
21	LLO 21.1: Connect resistors and capacitors in series and parallel combinations on a breadboard and measure their value using a digital multimeter.	Build and Test simple circuit using resistor and capacitor in series and parallel combination on breadboard.	2	CO5
22	LLO 22.1: Test simple circuits using testing equipment.	Building and testing of circuits on PCB	2	CO5
23	LLO 23.1: Identify the components and the virtual instruments available in any basic simulation software. LLO 24.1: Build a simple circuit using basic simulation software. LLO 23.2: Test the built circuit using basic simulation software.	Building and Testing of circuit using basic simulation software	2	CO5
24	LLO 24.1: Collect information about ancient tools for understanding the Indian knowledge system.	Draw sketches of various ancient tools	2	CO1, CO2

**VI. SUGGESTED MICRO PROJECT/ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT (SELF-LEARNING)****NOT APPLICABLE****VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED**

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Mechanical foam type Fire Extinguisher with ISI mark ( 9 litre, B and C type Fire Extinguisher)	1,2
2	A, B, C portable type Fire Extinguisher with ISI mark	1,2
3	Fitting tools: Hammers, Chisels, Files, Hacksaw, Surface Plate, Punch, V Block, Angle Plate, Try Square, Marking Block, Steel Rule,	3,4,5,7
4	Bench Drilling machine (up to 13 mm drill cap.) with ½ H.P. Motor 1000 mm. height	3,4,5
5	Power Saw machine: 350 mm mechanical with 1 HP Motor & all Accessories	3,4,5
6	Bench Grinder: 200 mm Grinding Disc diameter 200 mm. with 25 mm. bore	3,4,5
7	Work Benches: 1800mm*1900mm*750mm	3,4,5,6,7,8,9,10
8	Sheet Metal Hand Tools: Snip, Shears Sheet Gauge, Straight Edge, L Square, Scriber, Divider, Trammel, Punches, Pliers, Stakes, Groovers, Limit Set	6,8,9,10
9	Consumable Components: Resistors, Capacitors, Diodes, Transistors, Transformer, ICs, IC Sockets, Breadboard, General Purpose PCBs, LEDs, Relays, Switches, Connectors, Connecting Wires, Soldering Metal, Soldering Flux, De-soldering Mesh	13,14,15,16,17,20,21
10	Magnifying Lens with Lamp	11
11	Multimeter: 3 and ½ digits with Component Tester	11,13,14,15,16,17,21,22
12	Wire Cutter	13,14,21,22
13	Soldering Gun: 40 Watts, Holding Stand, Temperature Control, Power Cord	20,22
14	De-soldering Gun: 80 Watts	20
15	PCB Drilling Machine	19
16	Open-source Simulation Software	24

**VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)****NOT APPLICABLE**

**IX.ASSESSMENT METHODOLOGIES/TOOLS**

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
Rubrics for continuous assessment based on process and product-related performance indicators	End of the term examination, Viva-voce, Workshop performance

**X. 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	1	2	-	3	-	1	2	-	-	-
CO2	1	2	-	2	2	2	1	-	-	-
CO3	2	2	2	2	2	-	1	3	3	2
CO4	1	-	-	2	-	2	-	3	3	3
CO5	2	1	3	2	3	-	1	3	3	3

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

\*PSOs are to be formulated at the institute level

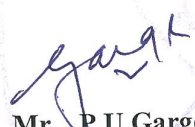
**XI.SUGGESTED LEARNING MATERIALS / BOOKS**

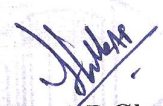
Sr.No	Author	Title	Publisher
1	Raghuwanshi B.S.	A Course in Workshop Technology	Dhanpat Rai & Sons, New Delhi, 2017 or latest edition
2	Sarathe A.K.	Engineering Workshop Practice	Khanna Book Publishing Co.(P) Ltd. , New Delhi; 2021 or latest edition ISBN: 978-9391505516
3	Gupta J.K., Khurmi R.S.	A Textbook of Manufacturing Process (Workshop Technology)	S.Chand and Co., New Delhi, 2021 or latest edition, ISBN: 978-8121908689
4	Jones, Thomas H.	Electronic Components Handbook	Reston Publishing, Virginia, US, latest edition, ISBN: 978-0879092221
5	Mehta V.K., Mehta Rohit	Principles of Electronics	S. Chand and Co., New Delhi-110 055, 2014, ISBN: 978-8121924504
6	Dr. Madhuri A.Joshi	Electronic Component And Materials	Shroff Publishers ISBN:978-8173669002
7	Glory Priyadarshini J., RaniK.S.S., Maheswari M.P., Gomathy S.	Engineering Workshop practice Electrical & Electronics Engineering	Notion Press, Mumbai, 2021 or latest edition, ISBN: 978-1639203819


**XIII. LEARNING WEBSITES & PORTALS**

Sr.No	Link/Portal	Description
1.	<a href="http://fireextinguishertraining.com/">http://fireextinguishertraining.com/</a>	Fire extinguisher
2.	<a href="http://www.youtube.com/watch?v=WE-SislzSMY">www.youtube.com/watch?v=WE-SislzSMY</a>	Fire extinguisher
3.	<a href="https://www.youtube.com/watch?v=IUojO1HvC8c">https://www.youtube.com/watch?v=IUojO1HvC8c</a>	Fire extinguisher
4.	<a href="https://www.youtube.com/watch?v=0jbFC8dvTVY">https://www.youtube.com/watch?v=0jbFC8dvTVY</a>	Electrical tools
5.	<a href="https://www.electroschematics.com/tools/">https://www.electroschematics.com/tools/</a>	Electronic tools
6.	<a href="https://www.youtube.com/watch?v=Fwj_d3uO5g8">https://www.youtube.com/watch?v=Fwj_d3uO5g8</a>	Diodes
7.	<a href="http://www.eleccircuit.com">http://www.eleccircuit.com</a>	Electronic circuit
8.	<a href="https://mightyohm.com/files/soldercomic/FullSolderComic_EN.pdf">https://mightyohm.com/files/soldercomic/FullSolderComic_EN.pdf</a>	Soldering
9.	<a href="https://www.tinkercad.com/">https://www.tinkercad.com/</a>	3D modeling software
10.	Multisim online	Simulation software

Name &amp; Signature:

  
**Mr. P.U. Garge**  
 Lecturer in Mechanical Engineering  
 & I/C Workshop Superintendent

  
**Smt. A.P. Ghode**  
 Lecturer in E&TC


  
**Smt. R.S. Deulkar**  
 Lecturer in E&TC

**(Course Experts)**

Name &amp; Signature:

  
**Shri. S.S. Prabhune**  
 (Programme Head)

Name &amp; Signature:

  
**Shri. S.B. Kulkarni**  
 (CDC In-charge)

— EDUCATION FOR SELF

## GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMA IN EE/ET
PROGRAMME CODE	02/03
COURSE TITLE	APPLIED CHEMISTRY
COURSE CODE	SC11202
PREREQUISITE COURSE CODE & TITLE	--

## I. LEARNING &amp; ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme						Credits	Assessment Scheme										
			Actual Contact Hrs./Week			SLH	NLH	Paper Duration Hrs.		Theory			Based on LL & TSL		Based on SL		Total Marks			
			CL	TL	LL					FA-TH	SA-TH	Total	Practical		SLA					
													Max	Min	Max	Min		Max	Min	
SC11202	APPLIED CHEMISTRY	DSC	3	0	2	1	6	3	2	30	70*#	100	40	25	10	25@	10	25	10	175

Total IKS Hrs for Term: 02 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, IKS – Indian Knowledge System, SLA- Self Learning Assessment

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

**Note:**

**FA-TH** represents an average of two class tests of 30 marks each conducted during the semester.

- If a candidate is not securing minimum passing marks in **FA-PR** (Formative Assessment - Practical) of any course, then the candidate shall be declared as '**Detained**' in that semester.
- If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as '**fail**' and will have to repeat and resubmit SLA work.
- Notional learning hours** for the semester are (CL + LL + TL + SL) hrs. \* 15 Weeks
- 1 credit** is equivalent to **30 Notional hours**.
- \* Self-learning hours shall not be reflected in the Timetable.
- \*Self-learning includes micro-projects/assignments/other activities.

## II. RATIONALE:

Applications of Material Science and Chemical Principles have resulted in the development of new materials used in modern medicines and automobiles, synthetic fibers, polymers, alloys, new energy sources and many other important products and processes. Material Science is an important and expanding branch in the scientific engineering and economic field of our society.

The topic of atomic structure includes the basic structure of matter, which governs the Mechanical, Electrical and Magnetic properties of matter. Corrosion and methods of prevention will make students realize the importance of care and maintenance of machines and equipment. The study of different polymers, insulators, and adhesives and their chemical behaviour will be useful in their applications in electrical appliances and electronics industries. The study of impurities and hardness in water and methods for water softening will help the students make proper use of water.

Nanomaterials are widely used in the engineering field. It will help to understand the need for nanomaterials in different engineering fields.

**III. COURSE-LEVEL LEARNING OUTCOMES (CO'S)**

Students will be able to achieve and demonstrate the following CO's on completion of course-based learning

CO1: Distinguish materials based on atomic structure.

CO2: Apply the concepts of electrochemistry to solve engineering problems

CO3: Select metals and non-metals for given applications.

CO4: Select the relevant insulating material for various engineering problems.

CO5: Use corrosion preventive measures in the industry.

CO6: Use the appropriate engineering material in various engineering applications.

**IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT:**

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
<b>UNIT-I ATOMIC STRUCTURE (CL Hrs-6, Marks-12)</b>				
1.	<p><b>TLO 1.1</b> Explain the Characteristics of fundamental particles of an atom.</p> <p><b>TLO 1.2</b> Distinguish between atomic number and atomic mass number</p> <p><b>TLO1.3</b> Distinguish between orbit and orbital.</p> <p><b>TLO 1.4</b> Explain the significance of quantum numbers.</p> <p><b>TLO 1.5</b> Explain the formation of a given molecule</p> <p><b>TLO 1.6</b> State Aufbau's principle and Hund's rule.</p> <p><b>TLO 1.7</b> Define Electrovalent and covalent bonds with examples.</p>	<p>1.1. <b>Indian Chemistry:</b> -Philosophy of atom by Acharya Kanad.</p> <p>1.2. Definition of an atom, structure of atom, Characteristics of fundamental particles of an atom, definition of atomic number, atomic mass number and their difference</p> <p>1.3. Orbits: Bohr's energy levels, sub-energy levels, s, p, d, f orbital, shapes and description of s and p orbital. Definition and significance of quantum numbers</p> <p>1.4. Aufbau's principle, Hund's rule, orbital electronic configurations (s, p, d, f) of elements having atomic numbers 1 to 30.</p> <p>1.5. Definitions of valence electrons, valency, types of valencies, Definition of electrovalency, positive and negative electrovalency</p> <p>1.6. Formation of Electrovalent compounds-NaCl AlCl<sub>3</sub> Definition of covalency, single, double and triple covalent bonds, formation of Covalent compounds H<sub>2</sub>O, CO<sub>2</sub>, N<sub>2</sub></p>	Chalk and board Improved lecture, Tutorial Assignment Demonstration	CO1
<b>UNIT-II ELECTROCHEMISTRY (CL Hrs -8, Marks-14)</b>				
2	<p><b>TLO 2.1</b> Explain the assumptions of Arrhenius's theory of electrolytic dissociation.</p> <p><b>TLO 2.2.</b> Describe the process of electroplating taking a suitable example</p> <p><b>TLO 2.3</b> Explain the mechanism of electrolysis for the given electrolyte.</p> <p><b>TLO 2.4</b> Calculate CE, ECE, the</p>	<p>2.1. Definition of electrolyte, electrolysis, ionization, Arrhenius theory, Difference between atom and ion</p> <p>2.2. Activity series, mechanism of electrolysis of CuSO<sub>4</sub> using Pt electrode and Cu electrode</p> <p>2.3. Applications of electrolysis: electroplating, electro-refining,</p> <p>2.4. Faraday's laws of electrolysis and numerical.</p> <p>2.5. Types of conductors: metallic conductors, electrolytic Conductors (definition and</p>	Chalk and board Improved lecture, Tutorial Assignment Demonstration	CO2



Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
	weight of substance deposited or liberated, and time in the given numerical. <b>TLO 2.5</b> Distinguish between metallic conductor and electrolytic conductor. <b>TLO 2.6</b> Describe the construction and working of cells. <b>TLO 2.7</b> Explain applications of Cells <b>TLO 2.8</b> Explain the care and maintenance of a battery	difference)2.6. Conductance in metals, conductance in electrolytes, Factors affecting conductance: nature of solute, nature of the solvent, temperature, concentration of solution. 2.7. Primary and secondary cell: Difference between primary cell and secondary cell, Construction, working and applications of Daniel cell (porous vessel and salt bridge), Dry cell, lead acid cell, Ni-Cd cell, Lithium-ion battery Maintenance of battery		
<b>UNIT-III METALS AND ALLOYS (CL Hrs-08, Marks-10)</b>				
3	<b>TLO 3.1</b> Draw the flow chart showing different processes in metallurgy. <b>TLO 3.2</b> Classify carbon steel giving properties and application of each <b>TLO 3.3.</b> Explain the purposes of heat treatment methods. <b>TLO 3.4</b> Explain the purposes of making alloys. <b>TLO 3.5</b> Classify alloys with suitable examples of each. <b>TLO 3.6</b> Write the composition, properties and uses of alloys. .	3.1. Occurrence of metals, definitions of mineral, ore, flux, matrix, slag and metallurgy, mechanical properties of metal. 3.2. Flow chart showing different processes in metallurgy, classification, properties and application of carbon steel, heat treatment (definition, purposes and methods) 3.3. Definition of alloy, purposes of making alloys with examples, classification of alloys(ferrous and non-ferrous), 3.4 Composition properties application of copper-zinc alloy, cadmium copper alloy, chromium copper alloy, brass, bronze, duralumin, wood's metal, and babbitt metal.	Chalk and board Improved lecture, Tutorial Assignment Demonstration	CO3
<b>UNIT- IV INSULATING MATERIALS (CL Hrs-8, Marks-12)</b>				
4	<b>TLO 4.1</b> Describe the formation of a given polymer <b>TLO4.2.</b> Distinguish between thermo-softening and thermosetting plastics. <b>TLO 4.3.</b> Explain the applications of Plastic based on its properties <b>TLO 4.4</b> Explain the vulcanization process of natural rubber. <b>TLO 4.5</b> Distinguish between synthetic and natural rubber. <b>TLO 4.6</b> Explain the preparation, properties and applications of given synthetic rubber <b>TLO 4.7</b> Explain the properties and application of thermal insulators <b>TLO 4.8</b> Explain the properties and application of electrical insulators	<b>Plastic</b> 4.1. Definition of monomer and polymer, polymerization, classification of plastic based on monomer, based on thermal behaviour, on basis of monomer structure, 4.2. Types of polymerization (Addition, and Condensation) applications of Plastic based on its properties. 4.3. Synthesis, properties and applications of-polythene,PVC,Teflon, Bakelite, and polystyrene. <b>Rubber:</b> 4.4. Types of rubber, processing of natural rubber, properties of rubber, drawbacks of natural rubber, vulcanization of rubber. <b>4.5.</b> Synthetic rubber – preparation, properties and application of BUNA-S, BUNA-N, neoprene, Thiokol. <b>Thermal insulators :</b> 4.6. Properties and application of thermocol and glass wool. <b>Electrical insulators:</b> 4.7. Properties and applications of Ceramics, silicon fluid, nitrogen gas.	Chalk and board Improved lecture, Tutorial Assignment Demonstration	CO4

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
<b>UNIT –V CORROSION (CL Hrs-7, Marks-10)</b>				
5	<p><b>TLO 5.1</b> Explain different types of oxide films.</p> <p><b>TLO 5.2</b> Explain the mechanism of electrochemical corrosion</p> <p><b>TLO 5.3</b> Explain the factors affecting the rate of atmospheric corrosion and electrochemical corrosion.</p> <p><b>TLO 5.4</b> Describe the galvanization process of protection of metal from corrosion.</p> <p><b>TLO 5.5</b> Distinguish between galvanizing and tinning</p> <p><b>TLO 5.6</b> Describe the given process of protection of metal from corrosion.</p>	<p>5.1. Definition, causes of corrosion types of corrosion definition (atmospheric and electrochemical) Types of oxide films</p> <p>5.2. Mechanism of atmospheric and electrochemical corrosion (evolution of hydrogen, absorption of oxygen).</p> <p>5.3. Factors affecting the rate of atmospheric corrosion and electrochemical corrosion.</p> <p>5.4. Protection Methods-anodic and cathodic protection, galvanizing and tinning process, sherardizing process.</p>	Chalk and board Improved lecture, Tutorial Assignment Demonstration	CO5
<b>UNIT - VI ENGINEERING MATERIALS (CL Hrs-8, Marks-12)</b>				
	<p><b>TLO 6.1</b> Explain the properties and applications of nanomaterials.</p> <p><b>TLO6.2</b> Explain the properties and applications of Magnetic Material.</p> <p><b>TLO 6.3</b> Distinguish between diamagnetic and paramagnetic materials.</p> <p><b>TLO 6.4</b> Explain the properties and applications of semiconducting materials.</p> <p><b>TLO 6.5</b> Differentiate between N-type and P-type semiconductors.</p> <p><b>TLO 6.6</b> Describe the properties of three groups of resistor materials.</p> <p><b>TLO 6.7</b> Describe the properties and applications of Resistor material</p>	<p>6.1. <b>Nanomaterials-</b> properties and application of fullerene, graphene.</p> <p>6.2. <b>Magnetic Material:</b> properties and applications of diamagnetic materials, paramagnetic materials and ferromagnetic materials.</p> <p>6.3. <b>Semiconducting materials:</b> Definition, Applications of Semiconducting materials, Examples of Semiconductors commonly used, Intrinsic and extrinsic semiconductors, N-type and P-type semiconductors, Difference between N-type and P-type semiconductors,</p> <p><b>6.4 Resistor material:</b> Definition, Properties of three groups of resistor materials, Properties and applications of resistor materials: Tungsten, Carbon, Nichrome, Manganin, Eureka, and Platinum.</p>	Chalk and board Improved lecture, Tutorial Assignment Demonstration	CO6

## V. 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 1 Write the electronic configuration of atoms from Z=1 to Z=30	Write the electronic configuration of atoms from Z=1 to Z=30	2	CO1
2	LLO 2 Write the formation of compounds NaCl, AlCl <sub>3</sub> , H <sub>2</sub> O, CO <sub>2</sub> , N <sub>2</sub>	Write the formation of compounds NaCl, AlCl <sub>3</sub> , H <sub>2</sub> O, CO <sub>2</sub> , N <sub>2</sub>	2	CO 1
3	LLO 3 Determine basic radicals from given ionic solutions by performing a selective test	Determination of basic radical from given ionic solution	2	CO 1
4	LLO 4 Determine acidic radicals given ionic solutions by performing a selective test	Determination of acidic radical from given ionic solution.	2	CO 1
5	LLO 5 Determine the electrochemical equivalent of copper metal using Faraday's first law and Faraday's second law.	Determination of electrochemical equivalent of copper metal using Faraday's first law and Faraday's second law.	2	CO 2
6	LLO 6 Use a Hydrometer for testing the Battery	Use a Hydrometer for testing Battery	2	CO 2
7	LLO 7 Measure the voltage developed due to chemical reactions by setting up of Daniel cell	Measurement of the voltage developed due to chemical reactions by setting up of Daniel cell	2	CO 2
8	LLO 8 Determine the percentage of iron in a given steel sample by redox titration.	Determination of the percentage of iron in a given steel sample by redox titration.	2	CO3
9	LLO 9 Prepare phenol formaldehyde resin.	Preparation of phenol formaldehyde resin.	2	CO 4
10	LLO 10 Determine the acid value of the given resin	Determination of acid value of given resin	2	CO4
11	LLO 11 Determine the electrode potential of various metals to study their tendency to corrosion.	Determination of electrode potential of various metals to study their tendency to corrosion.	2	CO 5
12	LLO 12 Determine the rate of corrosion of Aluminium in acidic and basic medium.	Determination of the rate of corrosion of Aluminium in acidic and basic medium.	2	CO 5

**Note:** A suggestive list of practical LLOs is given in the table, more such practical LLOs can be added to attain the COs and competency. A Compulsory 12 experiments or more for chemistry practicals for LLOs needs to be performed so that the student reaches the 'Precision Level' of Dave's 'Psychomotor Domain Taxonomy' as

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
<p>generally required by the industry. ii. Hence, the 'Process' and 'Product' related skills associated with each LLOs of the laboratory work are to be assessed according to a suggested sample of Performance Indicators (Weightage in %) as follows:</p> <ol style="list-style-type: none"> <li>1) Preparation of experimental set up 20%</li> <li>2) Setting and operation 20%</li> <li>3) Safety measures 10%</li> <li>4) Observations and Recording 10%</li> <li>5) Interpretation of result and Conclusion 20%</li> <li>6) Answer to sample questions 10%</li> <li>7) Submission of the report in time 10%.</li> </ol>				

#### VI. SUGGESTED MICROPROJECT/ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT(SELF-LEARNING)

Micro Project /Assignment/Activity is planned to be undertaken by a student assigned to him/her at the beginning of the semester. She/He ought to submit it by the end of the semester to develop industry-oriented COs. Each micro-project should encompass two or more COs. The Micro-Project could be industry application-based, internet-based, workshop-based, laboratory-based or field-based. The assessment of the micro-project is to be done under Practical (FA-PR) Assessment. The Micro Project is preferably assigned to a group of (4-6) students or an individual taking into consideration the capabilities and circumstances at the time.

A suggested list is given here. A similar micro-project/ Assignment could be added by the concerned faculty.

##### Micro project:

- Types of bonds: Prepare a chart and models displaying different types of bonds with examples.
- Metals and Alloys: Prepare a chart showing the composition, properties application of Ferrous Alloys & non ferrous alloys.
- Insulating materials: Prepare a chart including different synthetic materials Plastic and Rubber and list their uses.
- Cells & batteries: Prepare a chart including the mechanism of different cells & batteries.
- Batteries: Collect and analyse different types of batteries.
- Corrosion: Prepare a Chart displaying images of observed corrosion processes in the surrounding
- Materials: Collect information by library survey regarding engineering materials used in various industries.
- Engineering material: Collect information by library survey regarding engineering materials used in various industries.

##### Assignment:

1. Explain covalent bonds and ionic bonds with examples
2. Distinguish between plastic and rubber.
3. Write the electronic configuration of atoms
4. Write the formation of compounds NaCl, AlCl<sub>3</sub>, H<sub>2</sub>O, CO<sub>2</sub>, N<sub>2</sub>
5. Compare between Thermoplastics and Thermosetting
6. State properties and applications of thermocol and glass wool.
- 7 Explain types of alloys with examples.
8. Demonstrate the Mechanism of the Hydrogen Evolution process.
9. Write properties and applications of engineering materials.
10. Write properties and applications of insulating materials.

**VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED**

Sr. No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Hydrometer	6
2	Electronic balance with the scale range of 0.001 gm to 500 gm	All

**VIII. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS AND ASSESSMENT PURPOSE (Specification Table)**

Sr. No	Unit	Unit Title	Aligned COs	Learning Hours	R - Level	U - Level	A - Level	Total Marks
1	I	Atomic structure	CO 1	06	04	06	02	12
2	II	Electrochemistry	CO 2	08	04	04	06	14
3	III	Metals and alloys	CO 3	08	02	02	06	10
4	IV	Insulating materials	CO 4	08	04	02	06	12
5	V	Corrosion	CO 5	07	04	02	04	10
6	VI	Engineering Materials	CO 6	08	02	04	06	12
<b>Grand Total</b>				<b>45</b>	<b>20</b>	<b>20</b>	<b>30</b>	<b>70</b>

**IX. ASSESSMENT METHODOLOGIES/TOOLS**

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
Two Unit Tests of 30 marks and the average of two unit tests. For Laboratory Learning 25 Marks.  SLA assessment of 25 marks.	End Semester assessment of 25 marks for laboratory learning. End Semester assessment of 70 marks (Online)

**X. 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	-	-	-	1	-	2			
CO2	3	2	-	-	1	1	2			
CO3	3	-	-	2	-	-	1			
CO4	3	2	-	2	1	1	1			
CO5	3	-	-	1	1	1	1			
CO6	3	2	-	3	1	1	1			

**Legends:-High:03,Medium:02,Low:01,NoMapping:-**

\*PSOs are to be formulated at the institute level


## XI.SUGGESTED LEARNING MATERIALS/BOOKS

Sr.No.	Author	Title	Publisher with ISBN Number
1	Dara S.S. Umare S.S.	Engineering Chemistry	S. Chand and Co publication, New Delhi, 201, ISBN: 8121997658
2	Jain and Jain	Engineering Chemistry	Dhanpat Rai and Sons, New Delhi, 2015, ISBN: 9352160002
3	Vairam. S	Engineering Chemistry	Wiley Indian Pvt. Ltd, New Delhi, 2013 ISBN: 9788126543342
4	Agnihotri, Rajesh	Chemistry for Engineers	Wiley Indian Ptd. Ltd, New Delhi, 2014, ISBN: 9788126550784
5	Agrawal Shikha	Engineering Chemistry	Cambridge University Press, New Delhi, 2015 ISBN: 97811074764
6	V. P. Mehta	Polytechnic Chemistry	Jain brothers, New Delhi. 2012818360093X


## XII. LEARNING WEBSITES &amp; PORTALS

Sr.No	Link/Portal	Description
1	<a href="http://www.chemistryteaching.com">www.chemistryteaching.com</a>	Physical, inorganic and organic chemistry.
2	<a href="http://www.chemcollective.org">www.chemcollective.org</a>	Virtual Labs, simulation
3	<a href="http://www.chem1.com">www.chem1.com</a>	Chemistry instruction and education
4	<a href="http://www.onlinelibrary.wiley.com">www.onlinelibrary.wiley.com</a>	Materials and corrosion
Sr.No	Link/Portal	Description
5	<a href="http://www.chemcollective.org">www.chemcollective.org</a>	Collection of virtual labs, scenario-based learning activities
6	<a href="https://www.ancient-origins.net/history-famous-people/indian-sage-acharya-Kanad-001399">https://www.ancient-origins.net/history-famous-people/indian-sage-acharya-Kanad-001399</a>	IKS Philosophy of atom by Acharya Kanad.


Name &amp; Signature:

  
**Smt. Rupali S. Patil**  
 Lecturer in Chemistry  
 (Course Experts)

Name &amp; Signature:

  
**Shri. S.S. Prabhune**  
 (Programme Head)

Name &amp; Signature:

  
**Shri. S.B. Kulkarni**  
 (CDC In-charge)

**GOVERNMENT POLYTECHNIC, PUNE**  
**'120 – NEP' SCHEME**

<b>PROGRAMME</b>	<b>DIPLOMA IN CE/EE/ET/ME/MT/CM/IT</b>
<b>PROGRAMME CODE</b>	<b>01/02/03/04/05/06/07</b>
<b>COURSE TITLE</b>	<b>APPLIED MATHEMATICS</b>
<b>COURSE CODE</b>	<b>SC11207</b>
<b>PREREQUISITE COURSE CODE &amp; TITLE</b>	<b>BASIC MATHEMATICS (SC11205/SC11206)</b>

**I. LEARNING & ASSESSMENT SCHEME**

Course Code	Course Title	Course Type	Learning Scheme					Credits	Paper Duration	Assessment Scheme										Total Marks
			Actual Contact Hrs./Week			SLH	NLH			Theory			Based on LL & TSL				Based on SL			
			CL	TL	LL					FA-TH	SA-TH	Total	Practical		SLA					
						Max	Min						Max	Min	Max	Min				
	<b>APPLIED MATHEMATICS</b>	<b>AEC</b>	<b>3</b>	<b>1</b>	<b>-</b>	<b>-</b>	<b>4</b>	<b>2</b>	<b>3</b>	<b>30</b>	<b>70</b>	<b>100</b>	<b>40</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>100</b>

**Total IKS Hrs for Term:** 6 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, IKS – Indian Knowledge System, SLA- Self Learning Assessment

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

**Note:**

**FA-TH** represents an average of two class tests of 30 marks each conducted during the semester.

- If a candidate is not securing minimum passing marks in **FA-PR** (Formative Assessment - Practical) of any course, then the candidate shall be declared as '**Detained**' in that semester.
- If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as '**fail**' and will have to repeat and resubmit SLA work.
- Notional learning hours** for the semester are **(CL + LL + TL + SL) hrs. \* 15 Weeks**
- 1 credit** is equivalent to **30 Notional hours**.
- \* Self-learning hours shall not be reflected in the Timetable.
- \*Self-learning includes micro-projects/assignments/other activities.

**II. RATIONALE:**

An Applied Mathematics course, covering integration, definite integration, differential equations, numerical methods, and probability distribution, equips engineering students with essential problem-solving tools. It enables them to model and analyze complex systems, make informed decisions and address real-world engineering challenges effectively.

**III. COURSE-LEVEL LEARNING OUTCOMES(CO'S)**

Students will be able to achieve & demonstrate the following CO's on completion of course-based learning

- CO1 - Apply Solve the broad-based engineering problems of integration using suitable methods.
- CO2 - Use definite integration to solve given engineering related problems.
- CO3 - Apply the concept of differential equation to find the solutions of given engineering problems.
- CO4 - Employ numerical methods to solve programme specific problems.
- CO5 - Use probability distributions to solve elementary engineering problems.

## IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
<b>UNIT-I Indefinite Integration (CL Hrs-15, Marks-20)</b>				
1.	TLO1.1 Solve the given simple problem(s) based on rules of integration. TLO1.2 Evaluate the given simple integral(s) using substitution method. TLO1.3 Integrate given simple functions using the integration by parts TLO1.4 Solve the given simple integral by partial fractions	<b>Unit - I Indefinite Integration</b> 1.1 Simple Integration: Rules of integration and integration of standard functions 1.2 Integration by substitution. 1.3 Integration by parts. 1.4 Integration by partial fractions (only linear non repeated factors at denominator of proper fraction).	Improved Lecture Demonstration Chalk-Board Presentations Video Demonstrations	<b>CO1</b>
<b>Unit - II Definite Integration (CL Hrs-08, Marks-12)</b>				
2.	TLO2.1 Solve given examples based on Definite Integration. TLO2.2 Use properties of definite integration to solve given problems	<b>Unit - II Definite Integration</b> 2.1 Definite Integration: Definition, rules of definite integration with simple examples. 2.2 Properties of definite integral (without proof) and simple examples	Video Simulation Chalk-Board Improved Lecture Presentations	<b>CO2</b>
<b>Unit - III Differential Equation (CL Hrs-08, Marks-12)</b>				
3.	TLO3.1 Find the order and degree of given differential equations. TLO3.2 Form simple differential equation for given elementary engineering problems. TLO3.3 Solve given differential equations using the methods of Variable separable and Exact Differential Equation (Introduce the concept of partial differential equation). TLO3.4 Solve given Linear Differential Equation.	<b>Unit - III Differential Equation</b> 3.1 Concept of Differential Equation. 3.2 Order, degree and formation of Differential equations <b>3.3</b> Methods of solving differential equations: Variable separable form, Exact Differential Equation, Linear Differential Equation.	Video Demonstrations Presentations Chalk-Board Improved Lecture Flipped Classroom	<b>CO3</b>



Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
<b>Unit - IV Numerical Methods (CL Hrs-06, Marks-14)</b>				
4.	TLO4.1 Find roots of algebraic equations by using appropriate methods. TLO4.2 Solve the system of equations in three unknowns by iterative methods TLO4.3 Solve problems using Bakhshali iterative method for finding approximate squareroot. (IKS)	<b>Unit - IV Numerical Methods</b> 4.1 Solution of algebraic equations: Bisection method, Regula falsi method and Newton –Raphson method. 4.2 Solution of simultaneous equations containing three Unknowns by iterative methods: Gauss Seidal and Jacobi's method. 4.3 Bakhshali iterative method for finding approximate square root. (IKS)		<b>CO4</b>
<b>Unit - V Probability Distribution (CL Hrs-08, Marks-12)</b>				
5.	TLO5.1 Solve given problems based on repeated trials using Binomial distribution TLO5.2 Solve given problems when number of trials are large and probability is very small. TLO5.3 Utilize the concept of normal distribution to solve related engineering problems	<b>Unit - V Probability Distribution</b> 5.1 Binomial distribution. 5.2 Poisson's distribution. 5.3 Normal distribution.		<b>CO5</b>

#### V. 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 1.1 Solve simple problems of Integration by substitution	*Integration by substitution	1	CO1
2	LLO 2.1 Solve integration using by parts	*Integration by parts	1	CO1
3	LLO 3.1 Solve integration by partial fractions(only linear non repeated factors at denominator of proper fraction).	Integration by partial fractions.	1	CO1
4	LLO 4.1 Solve examples on Definite Integral based on given methods.	Definite Integral based on given methods.	1	CO2
5	LLO 5.1 Solve problems on properties of definite integral.	*Properties of definite integral	1	CO2
6	LLO 6.1 Solve given problems for finding the area under the curve and volume of revolution.	* #Area under the curve and volume of revolution.(Only for Civil, Mechanical Metallurgical Engineering)	1	CO2

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
7	LLO 7.1 Solve examples on meanvalue and root mean square value.	* #Mean value and root mean square value. (Only for Information Technology, Computer, Electrical and Electronics Engineering)	1	CO2
8	LLO 8.1 Solve examples on order, degree and formation of differential equation.	Order, degree and formation of differential equation.	1	CO3
9	LLO 9.1 Solve first order first degree differential equation using variable separable method.	Variable separable method.	1	CO3
10	LLO 10.1 Solve first order first degree differential equation using exact differential equation and linear differential equation.	*Exact differential equation and linear differential equation.	1	CO3
11	LLO 11.1 Solve engineering application problems using differentialequation.	*Applications of differential equations.(Take programme specific problems)	1	CO3
12	LLO 12.1 Solve problems on Bisection method and Regula falsimethod.	*Bisection method and Regula falsi method.	1	CO4
13	LLO 13.1 Solve problems on Newton-Raphson method.	Newton- Raphson method.	1	CO4
14	LLO 14.1 Solve problems on Jacobi's method and Gauss Seidal Method.	Jacobi's method and Gauss Seidal Method.	1	CO4
15	LLO 15.1 Use Bakhshali iterative methods for finding approximate value of square root. (IKS)	*Bakhshali iterative methods for finding approximate value of square root. (IKS)	1	CO4
16	LLO 16.1 Solve engineering problems using Binomial distribution.	*Binomial Distribution	1	CO5
17	LLO 17.1 Solve engineering problems using Poisson distribution.	*Poisson Distribution	1	CO5
18	LLO 18.1 Solve engineering problems using Normal distribution.	Normal Distribution	1	CO5
19	LLO 19.1 Solve problems on Laplace transform and properties of Laplace transform.	* # Laplace transform and properties of Laplacetransform.(Only for Electrical and Electronics Engineering)	1	CO2
20	LLO 20.1 Solve problems on Inverse Laplace transform and properties of Inverse Laplace transform.	* # Inverse Laplace transform and properties ofInverse Laplace transform.(Only for Electrical and Electronics Engineering)	1	CO2

**Note : Out of above suggestive LLOs –**

1. '\*' Marked Practicals (LLOs) Are mandatory.
2. Minimum 80% of above list of lab experiment are to be performed.
3. Judicial mix of LLOs are to be performed to achieve desired outcomes

**VI. SUGGESTED MICROPROJECT/ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT (SELF-LEARNING)**

Micro-project

NA

Assignment

NA

**VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED**

Sr. No	EquipmentNamewithBroadSpecifications	Relevant LLO Number
1	Open-source software like SageMaths, MATHS3D, GeoGebra, Graph, DPLOT and Graphing Calculator (GraphEq2.13), ORANGE can be used for Algebra, Calculus, Trigonometry and Statistics respectively.	All

**VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)**

Sr. No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Indefinite Integration	CO1	15	2	6	12	20
2	II	Definite Integration	CO2	8	2	4	6	12
3	III	Differential Equation	CO3	8	2	4	6	12
4	IV	Numerical Methods	CO4	6	2	4	8	14
5	V	Probability Distribution	CO5	8	2	4	6	12
<b>Grand Total</b>				<b>45</b>	<b>10</b>	<b>22</b>	<b>38</b>	<b>70</b>

**IX. ASSESSMENT METHODOLOGIES/TOOLS**

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
1. Tests	1. End Term Exam

**X. 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	1	-	-	1	-	1			
CO2	3	1	-	-	1	-	1			
CO3	3	2	1	1	1	1	1			
CO4	2	3	2	2	1	1	1			
CO5	2	2	1	1	2	1	2			

**Legends:-High:03, Medium:02, Low:01, No Mapping:-** \*PSOs are to be formulated at the institute level.

**XI.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	S. S. Sastry	Introductory Methods of Numerical Analysis	PHI Learning Private Limited, New Delhi. ISBN-978-81-203-4592-8
6	C. S. Seshadri	Studies in the History of Indian Mathematics	Hindustan Book Agency (India) P 19 Green Park Extension New Delhi. ISBN 978-93-80250-06-9
7	Marvin L. Bittinger DavidJ.Ellenbogen Scott A. Sargent	Calculus and Its Applications	Addison-Wesley 10th Edition ISBN-13: 978-0-321-69433-1
8	Gareth James, Daniela Witten,Trevor Hastie RobertandTibshirani	An Introduction to StatisticalLearning with Applications in R	Springer New York Heidelberg Dordrecht LondonISBN 978-1-4614-7137-0 ISBN 978-1-4614-7138-7 (eBook)

**XIII. LEARNING WEBSITES & PORTALS**

Sr. No	Link/Portal	Description
1	<a href="http://nptel.ac.in/courses/106102064/1">http://nptel.ac.in/courses/106102064/1</a>	Online Learning Initiatives by IITs and IISc
2	<a href="https://www.khanacademy.org/math?gclid=CNqHuabCys4CFdOJaddHoPig">https://www.khanacademy.org/math?gclid=CNqHuabCys4CFdOJaddHoPig</a>	Concept of Mathematics through video lectures and notes
3	<a href="https://www.wolframalpha.com/">https://www.wolframalpha.com/</a>	Solving mathematical problems, performing calculations, and visualizing mathematical concepts.
4	<a href="http://www.sosmath.com/">http://www.sosmath.com/</a>	Free resources and tutorials
5	<a href="http://mathworld.wolfram.com/">http://mathworld.wolfram.com/</a>	Extensive math encyclopedia with detailed explanation of mathematical concepts
6	<a href="https://www.mathsisfun.com/">https://www.mathsisfun.com/</a>	Explanations and interactive lessons covering various math topics, from basic arithmetic to advanced
7	<a href="http://tutorial.math.lamar.edu/">http://tutorial.math.lamar.edu/</a>	Comprehensive set of notes and tutorials covering a wide range of mathematics topics.
8	<a href="https://www.purplemath.com/">https://www.purplemath.com/</a>	Purplemath is a great resource for students seeking help with algebra and other foundational mathematics to improve learning.
9	<a href="https://www.brilliant.org/">https://www.brilliant.org/</a>	Interactive learning in Mathematics

Sr. No	Link/Portal	Description
10	<a href="https://www.edx.org/">https://www.edx.org/</a>	Offers a variety of courses
11	<a href="https://www.coursera.org/">https://www.coursera.org/</a>	Coursera offers online courses in applied mathematics from universities and institutions around the globe.
12	<a href="https://ocw.mit.edu/index.htm">https://ocw.mit.edu/index.htm</a>	The Massachusetts Institute of Technology (MIT) offers free access to course materials for a wide range of mathematical courses.

Name & Signature:



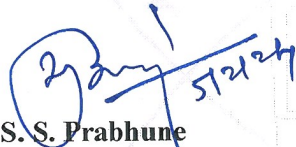
**Shri. Vitthal B. Shinde**  
Lecturer in Mathematics



**Shri. Sachin B. Yede**  
Lecturer in Mathematics

(Course Experts)

Name & Signature:



**Shri. S. S. Prabhune**  
(Programme Head)

Name & Signature:



**Shri. S. B. Kulkarni**  
(CDC In-charge)

**GOVERNMENT POLYTECHNIC, PUNE**  
**'120 – NEP' SCHEME**

<b>PROGRAMME</b>	<b>DIPLOMA IN ET</b>
<b>PROGRAMME CODE</b>	<b>03</b>
<b>COURSE TITLE</b>	<b>ELEMENTS OF ELECTRICAL ENGINEERING</b>
<b>COURSE CODE</b>	<b>EE21202</b>
<b>PREREQUISITE COURSE CODE &amp; TITLE</b>	<b>NA</b>

**I. LEARNING & ASSESSMENT SCHEME**

Course Code	Course Title	Course Type	Learning Scheme						Credits	Paper Duration	Assessment Scheme										Total Marks
			Actual Contact Hrs./Week			SLH	NLH	Theory			Based on LL & TSL				Based on SL						
			CL	TL	LL			FA-TH			SA-TH	Total		Practical		SLA					
						Max	Min					Max	Min	Max	Min	Max	Min				
EE21202	ELEMENTS OF ELECTRICAL ENGINEERING	SEC	3	1	2	0	6	3	3	30	70	100	40	25	10	25@	10			150	

**Total IKS Hrs for Term: 2 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, **IKS** – Indian Knowledge System, **SLA**- Self Learning Assessment

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

**Note:**

**FA-TH** represents an average of two class tests of 30 marks each conducted during the semester.

- If a candidate is not securing minimum passing marks in **FA-PR** (Formative Assessment - Practical) of any course, then the candidate shall be declared as '**Detained**' in that semester.
- If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as '**fail**' and will have to repeat and resubmit SLA work.
- Notional learning hours** for the semester are **(CL + LL + TL + SL) hrs. \* 15 Weeks**
- 1 credit** is equivalent to **30 Notional hours**.
- \* Self-learning hours shall not be reflected in the Timetable.
- \* Self-learning includes micro-projects/assignments/other activities.

**II. RATIONALE:**

Technical person has to deal with the various electrical machines, equipment, and protective devices. In order to increase the technical proficiency, a technician should possess essential knowledge of electrical engineering parameters, basic concepts, and laws of electrical engineering.

**III. COMPETENCY :**

Use electrical equipment efficiently for different electronic engineering application.

**IV. COURSE-LEVEL LEARNING OUTCOMES (CO'S)**

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

- CO1 - Interpret the magnetic field parameters for the particular magnetic circuits.
- CO2 - Analyze A.C. circuits for single phase and polyphase supply.
- CO3 - Select the transformer and DC motor for the given application.
- CO4 - Select the fractional horse power motor for the given application.
- CO5 - Choose the protective devices for the electrical protection.

## V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
<b>UNIT – I ELECTROMAGNETIC INDUCTION (CL HRS-8 ,MARKS-12)</b>				
	<p>TLO 1.1 Describe the terms related to Magnetic circuit.</p> <p>TLO 1.2 Distinguish between electric and magnetic circuit.</p> <p>TLO 1.3 Interpret magneto motive force in series magnetic circuit.</p> <p>TLO 1.4 Solve numerical on Magnetic flux, Flux density, MMF, Magnetic field strength, Permeability</p> <p>TLO 1.5 Describe laws related to magnetic circuit.</p> <p>TLO 1.6 Classify the types of induced emf.</p>	<p>1.1 Define and state units of Magnetic flux, Flux density, Magneto motive force, Magnetic field strength, Permeability.</p> <p>1.2 Electric circuit and magnetic circuit analogy and differences.</p> <p>1.3 Series magnetic circuit.</p> <p>1.4 Faraday's laws of electro-magnetic induction, Lenz's law, Fleming right hand and left hand rule.</p> <p>1.5 Dynamically and statically induced emf, self and mutual induced emf .</p> <p>1.6 Self and mutual inductance.</p> <p>1.7 Coefficient of coupling.</p>	<p>Presentations</p> <p>Chalk-Board</p> <p>Video</p> <p>Demonstrations</p> <p>Model</p> <p>Demonstration</p>	<b>CO1</b>
<b>UNIT - II A.C FUNDAMENTALS FOR SINGLE PHASE AND POLYPHASE CIRCUITS(CL HRS-11,MARKS-18)</b>				
	<p>TLO 2.1 Compare AC quantities with DC quantities.</p> <p>TLO 2.2 Describe terminology related to A.C. fundamentals.</p> <p>TLO 2.3 Solve numerical on instantaneous value, cycle, amplitude, time period, frequency, angular frequency, R.M.S. value, average value form factor, peak factor for sinusoidal waveform</p> <p>TLO 2.4 Describe different forms of representation for electrical quantity.</p> <p>TLO 2.5 Analyze A.C. circuits for different types of load.</p> <p>TLO 2.6 Solve numerical on power in 1 phase.</p> <p>TLO 2.7 Explain generation of three phase induced emf.</p> <p>TLO 2.8 Analyze three phase circuit for star and delta connection.</p> <p>TLO 2.9 Solve numerical on power, power factor in 3 phase balanced system.</p>	<p>2.1 Define A.C. and D.C. quantities, advantages of A.C. over D.C.</p> <p>2.2 Single phase sinusoidal A.C. wave: instantaneous value, cycle, amplitude, time period, frequency, angular frequency, R.M.S. value, average value ,form factor, peak factor for sinusoidal waveform.</p> <p>2.3 rectangular and polar forms representation of an ac quantity, phase angle, phase difference concept of lagging and leading.</p> <p>2.4 A.C through pure resistance, inductance and capacitance. Its equation, phasor diagram and waveform, power.</p> <p>2.5 Define polyphase system and advantages of three phase system over single phase system.</p> <p>2.6 Generation of three phase induced emf and its waveform.</p> <p>2.7 Phase and line currents, phase and line voltages in star connected and delta connected balanced load system.</p> <p>current, power, power factor in 3 phase balanced system.</p>	<p>Video</p> <p>Demonstrations</p> <p>Presentations</p> <p>Chalk-Board</p>	<b>CO2</b>

<b>UNIT - III TRANSFORMERS AND INDUCTION MOTORS(CL HRS-8 ,MARKS-14)</b>			
<p>TLO 3.1 Explain construction and working principle of given type of transformer.</p> <p>TLO 3.2 Solve numerical on emf equation, voltage ratio, transformation ratio, losses, efficiency, regulation</p> <p>TLO 3.3 Select different types of transformer for the particular application.</p> <p>TLO 3.4 Describe construction and the working of Induction motor.</p> <p>TLO 3.5 Select the type of Induction motor for given application.</p>	<p>3.1 Transformer construction and working principle, emf equation, voltage ratio, transformation ratio, losses, efficiency, regulation.</p> <p>3.2 Auto-transformer, Pulse transformer and Isolation transformer construction, working principle and applications.</p> <p>3.3 construction and working of three phase induction motor.</p> <p>3.4 Types of induction motor, application.</p>	<p>Chalk-Board</p> <p>Model</p> <p>Demonstration</p> <p>Video</p> <p>Demonstrations</p> <p>Presentations</p>	<b>CO3</b>
<b>UNIT - IV FRACTIONAL HORSE POWER MOTORS(CL HRS-10 ,MARKS-14)</b>			
<p>TLO 4.1 Explain the construction and working principle of the given type of FHP motor.</p> <p>TLO 4.2 Select relevant FHP motor for the respective application</p> <p>TLO 4.3 Describe the procedure to connect given motor for the given application.</p>	<p>4.1 Construction, working principle and application of capacitor start, capacitor start and run single phase AC induction motors.</p> <p>4.2 Construction, working principle and application of universal motor and reversal of direction of rotation.</p> <p>4.3 Construction, working principle and application of stepper motor. Only concept of speed control, stepper motor's reversal of direction of rotation</p> <p>4.4 Construction, working principle, specification and application of BLDC motor.</p>	<p>Model</p> <p>Demonstration</p> <p>Presentations</p> <p>Chalk-Board</p>	<b>CO4</b>
<b>UNIT - V ELECTRICAL PROTECTIVE DEVICES(CL HRS-8 ,MARKS-12)</b>			
<p>TLO 5.1 Explain general safety rule of electrical system.</p> <p>TLO 5.2 Explain and select the different types of protective devices.</p> <p>TLO 5.3 Draw circuit connection diagram of protective devices.</p> <p>TLO 5.4 Describe earthing system and related terms.</p>	<p>5.1 Electrical general safety rules, Personal Protective Equipment (PPE), Selection of wires and cable as per application.</p> <p>5.2 Type of fuses, operation, connection diagram and application of fuses, Miniature Circuit Breaker (MCB), Molded Case Circuit Breaker (MCCB), Earth Leakage Circuit Breaker(ELCB)operation, connection diagram and general specification</p> <p>5.3 Draw circuit connection diagram of Protective devices.</p> <p>5.4 Need of Earthing, methods of Earthing, types of earthing and factors affecting earthing as per Indian Electricity rule.</p>	<p>Model</p> <p>Demonstration</p> <p>Video</p> <p>Demonstrations</p> <p>Presentations</p> <p>Chalk-Board</p>	<b>CO5</b>



**VI. 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 Use Faraday's law of electro-magnetic induction. LLO 1.2 Classify types of induced emf.	Demonstration of Faraday's law of electro-magnetic induction for statically and dynamically induced emf.	2	CO1
2	LLO 2.1 Use Faraday's law of electro-magnetic induction. LLO 2.2 Observe mutual induced emf in transformer.	Demonstration of Mutually induced EMF by using single-phase transformers.	2	CO1
3	LLO 3.1 Use cathode ray oscilloscope. LLO 3.2 Identify different parameters on CRO.	Measure, Time period, Peak value, and calculate RMS value of sinusoidal AC waveform using CRO.	2	CO2
4	LLO 4.1 Identify phase angle and phase difference of given quantities. LLO 4.2 Identify the nature of power factor for the respective circuit	Observe the phase difference between voltage and current on CRO for resistive, inductive, and capacitive load and comment on the nature of the power factor (Lagging, Leading, Unity).	2	CO2
5	LLO 5.1 Connect star connected three phase load. LLO 5.2 verify relationship between line and phase quantities.	Connect three phase star connected balanced load and verify the relationship between line voltage and phase voltage, line current and phase current.	2	CO2
6	LLO 6.1 Connect delta connected three phase load. LLO 6.2 verify relationship between line and phase quantities.	Connect three phase delta connected balanced load and verify the relationship between line voltage and phase voltage, line current and phase current.	2	CO2
7	LLO 7.1 Calculate transformation ratio of transformer. LLO 7.2 Connect transformer to given load.	Determine the transformation ratio, current ratio of single phase transformer.	2	CO3
8	LLO 8.1 Calculate efficiency and regulation of transformer. LLO 8.2 Connect transformer to given load.	Calculate efficiency and regulation of single phase transformer	2	CO3
9.	LLO 9.1 Identify pin configuration of pulse transformer. LLO 9.2 Check electrical isolation between input and output of pulse transformer.	Demonstration of working of pulse transformer by observing input pulse and output pulse of pulse transformer on CRO.	2	CO3
10	LLO 10.1 Identify different parts 3 $\Phi$ Induction motor. LLO 10.2 Identify different types of 3 $\Phi$ Induction motor.	Identify different types of 3 $\Phi$ Induction motor by observing terminal connections and also identify different parts of 3 $\Phi$ Induction motor.	2	CO3

11	LLO 11.1 Connect 3 $\Phi$ Induction to AC supply. LLO 11.2 Select particular starter for particular motor starting.	Reverse the direction of rotation 3 $\Phi$ Induction motor.	2	CO3
12	LLO 12.1 Connect single phase induction motor to the supply. LLO 12.2 Change the direction of rotation of single phase induction.	Start single phase induction motor /universal motor/stepper motor. And reverse the direction of rotation of it.	2	CO4
13	LLO 13.1 Select fuse for particular application. LLO 13.2 Select circuit breaker for particular application.	Identify different types of fuses and circuit breakers. State their specification for suitable application.	2	CO5
14	LLO 14.1 Explain connection of Earthing for domestic's application. LLO 14.2 Test available of Earthing for given switch board.	Testing of Earthing using a test lamp and earth tester .comment on it.	2	CO5

**VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED**

Sr. No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Single Phase 230/115 V, 50Hz, 1 kVA Transformer	2,7,8
2	Single Phase 0-270V, 50Hz, 10A Auto-transformer	2,7,8,11
3	Cathode Ray Oscilloscope (CRO) 20MHz, Dual channel	3,4
4	Single phase 230V, 10A Resistive Load bank	4,5,6
5	Single phase 230V, 50Hz, 2A Inductive Load bank	4
6	Single phase 230V, 50Hz, 2A Capacitive Load bank	4
7	Pulse transformer 1:1:1 4503 or 1:1 4502	9
8	Different types of 3 $\Phi$ Induction motor	10,11
9	Single phase 230V, 50Hz, 1Hp Induction motor	12
10	Single phase 230V, 50Hz, 1/4Hp Universal motor	12

**VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE  
(Specification Table)**

Sr. No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Magnetic circuits	CO1	8	4	4	4	12
2	II	A.C fundamentals for single phase and polyphase circuits	CO2	11	4	6	8	18
3	III	Transformers and DC motors	CO3	8	6	4	4	14
4	IV	Fractional horse power motors	CO4	10	4	4	6	14
5	V	Electrical protective devices	CO5	8	4	4	4	12
<b>Grand Total</b>				<b>45</b>	<b>22</b>	<b>22</b>	<b>26</b>	<b>70</b>

**IX. ASSESSMENT METHODOLOGIES/TOOLS****Formative assessment (Assessment for Learning)**

Each practical will be assessed considering - - 60% weightage to process and - 40% weightage to product  
Continuous assessment based on process and product related performance indicators, laboratory experience.

**Summative Assessment (Assessment of Learning)**

End of semester exam based on observations and recording of the particular experiments.

**X. 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	2	3	3	1	2	-	2			
CO2	2	3	2	-	2	3	2			
CO3	3	2	3	2	2	-	2			
CO4	2	2	3	3	2	2	2			
CO5	3	3	2	2	3	2	3			

**Legends:- High:03, Medium:02, Low:01, No Mapping: -**  
\*PSOs are to be formulated at the institute level

**XI. SUGGESTED LEARNING MATERIALS/BOOKS**

Sr. No	Author	Title	Publisher
1	Theraja B.L.	Electrical Technology Vol-I	S.Chand and Co., new Delhi, ISBN:9788121924405
2	Theraja B.L.	Electrical Technology Vol-II	S.Chand and Co., new Delhi, ISBN:9788121924375
3	V. N. Mittle and Arvind Mittal	Basic Electrical Engineering	McGraw Hill, New Delhi, ISBN:978-0070593572
4	U.A.Bakshi	Basic Electrical Engineering	Technical Publications, ISBN:9789333220392
5	DP Kothari and I J Nagrath	Basic Electrical Engineering	Mc Graw Hill, New Delhi, ISBN: 978-9353165727

## XII. LEARNING WEBSITES &amp; PORTALS

Sr. No	Link/Portal	Description
1.	<a href="https://nptel.ac.in/courses/108105112">https://nptel.ac.in/courses/108105112</a>	NPTEL study materials
2.	<a href="https://www.electrical4U.com">https://www.electrical4U.com</a>	All about electrical circuits
3.	<a href="https://instrumentationtools.com/category/electrical-animation/">https://instrumentationtools.com/category/electrical-animation/</a>	Animation of basic electrical engineering quantities
4.	<a href="https://www.udemy.com/course/crash-course-electric-circuits-for-electrical-engineering/">https://www.udemy.com/course/crash-course-electric-circuits-for-electrical-engineering/</a>	Flip classroom learning material
5.	<a href="http://www.ece.umn.edu/users/riaz/animations/listanimations.html">http://www.ece.umn.edu/users/riaz/animations/listanimations.html</a>	Animation of electrical machines
6.	<a href="https://www.services.bis.gov.in/php/BIS_2.0/bisconnect/get_is_list_by_category_id/5">https://www.services.bis.gov.in/php/BIS_2.0/bisconnect/get_is_list_by_category_id/5</a>	IS standard

Name &amp; Signature:



**Smt. N. V. Devarkar**  
Lecturer in Electrical Engineering



**Smt. A. A. Patole**  
Lecturer in Electrical Engineering

(Course Experts)

Name &amp; Signature:



**Shri. S. S. Prabhune**  
(Programme Head)

Name &amp; Signature:



**Shri. S. B. Kulkarni**  
(CDC In-charge)

**GOVERNMENT POLYTECHNIC, PUNE**  
**'120 – NEP' SCHEME**

<b>PROGRAMME</b>	<b>DIPLOMA IN ET</b>
<b>PROGRAMME CODE</b>	<b>03</b>
<b>COURSE TITLE</b>	<b>APPLIED ELECTRONICS</b>
<b>COURSE CODE</b>	<b>ET21202</b>
<b>PREREQUISITE COURSE CODE &amp; TITLE</b>	<b>ET11201 BASIC ELECTRONICS</b>

**I. LEARNING & ASSESSMENT SCHEME**

Course Code	Course Title	Course Type	Learning Scheme						Credits	Paper Duration	Assessment Scheme										Total Marks
			Actual Contact Hrs./Week			SLH	NLH	Theory			Based on LL & TSL				Based on SL						
			CL	TL	LL						Practical				SLA						
						FA-TH	SA-TH	Total			FA-PR		SA-PR		Max	Min					
Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min										
ET21202	APPLIED ELECTRONICS	DSC	4	-	2	2	8	4	3	30	70	100	40	25	10	25@	10	25	10	175	

**Total IKS Hrs for Term: 0 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, IKS – Indian Knowledge System, SLA- Self Learning Assessment

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

**Note:**

**FA-TH** represents an average of two class tests of 30 marks each conducted during the semester.

- If a candidate is not securing minimum passing marks in **FA-PR** (Formative Assessment - Practical) of any course, then the candidate shall be declared as '**Detained**' in that semester.
- If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as '**fail**' and will have to repeat and resubmit SLA work.
- Notional learning hours** for the semester are **(CL + LL + TL + SL) hrs. \* 15 Weeks**
- 1 credit** is equivalent to **30 Notional hours**.
- \* Self-learning hours shall not be reflected in the Timetable.
- \* Self-learning includes micro-projects/assignments/other activities.

**II. RATIONALE:**

Diploma engineers have to deal with the various types of electronic circuits while maintaining various electronic equipment. The study of basic operating principles and handling of various electronic devices will help them to troubleshoot electronic equipment. This course is developed in such a way that students will be able to apply the knowledge to solve broad electronic engineering application problems. Understanding of the subject will provide skill to the students for troubleshooting and testing of some of circuits & devices.

**III. COURSE-LEVEL LEARNING OUTCOMES (CO'S)**

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

- CO1: Select/Use wave shaping circuits.
- CO2: Use transistor as low power amplifier.
- CO3: Use BJT as tuned amplifier.
- CO4: Use BJT as high-power amplifier.
- CO5: Interpret working of feedback amplifier and oscillator.
- CO6: Use BJT as waveform generator.

## IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
<b>UNIT-I WAVESHAPING CIRCUITS (CL Hrs-08, Marks-10)</b>				
1.	<p><b>TLO 1.1:</b> Select clipper for obtaining the given waveform.</p> <p><b>TLO 1.2:</b> Select clamper for obtaining the given waveform.</p> <p><b>TLO 1.3:</b> Describe need and working principle of given RC filter.</p>	<p>1.1 Diode clipper: Positive, negative, biased, and combinational clipper.</p> <p>1.2 Diode clamper: Positive, negative.</p> <p>1.3 Applications of clipper and clamper.</p> <p>1.4 Passive filters: Concept of RC high pass, low pass, band pass, band stop filter and frequency response.</p> <p>Circuit diagram, input/output waveforms and applications of RC integrator and RC differentiator.</p>	Classroom Learning, Reference books, NPTEL	<b>CO1</b>
<b>UNIT-II LOW POWER AMPLIFIERS (CL Hrs-12, Marks-14)</b>				
2	<p><b>TLO 2.1:</b> Explain with circuit diagram the operation of given type of amplifier.</p> <p><b>TLO 2.2:</b> Calculate gain and bandwidth of given low power amplifier.</p> <p><b>TLO 2.3:</b> Compare performance parameters of given types of amplifier coupling.</p> <p><b>TLO 2.4:</b> Explain with sketches the working principle of FET amplifier.</p>	<p>2.1 Introduction, Classification of amplifiers, BJT as an amplifier. Single stage CE amplifier, frequency response, voltage gain, bandwidth.</p> <p>2.2 Multistage amplifier: General BJT based multistage amplifier. Types of amplifier coupling: Circuit diagram, operation, frequency response and applications of RC coupling, Transformer coupling and Direct coupling.</p> <p>2.3 FET amplifier: Common Source amplifier, working principle and applications.</p>	Classroom Learning, Reference books, NPTEL	<b>CO2</b>
<b>UNIT-III TUNED AMPLIFIERS (CL Hrs-08, Marks-08)</b>				
3	<p><b>TLO 3.1:</b> Explain with sketches working principle of given tuned circuit.</p> <p><b>TLO 3.2:</b> Select relevant tuned amplifier for the given frequency band with justification.</p> <p><b>TLO 3.3:</b> Compare performance of different types of tuned amplifier.</p>	<p>3.1 Tuned Amplifier: Introduction &amp; necessity of tuned amplifier, Basic tuned circuit.</p> <p>3.2 Circuit diagram &amp; operating principle of single &amp; double tuned amplifier, Stagger tuned amplifier.</p> <p>3.3 Applications of all three types.</p>	Classroom Learning, Reference books, NPTEL	<b>CO3</b>

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
<b>UNIT- IV POWER AMPLIFIERS (CL Hrs-12, Marks-12)</b>				
4	<p><b>TLO 4.1:</b> Explain with sketches working of given type of power amplifier.</p> <p><b>TLO 4.2:</b> Calculate the efficiency of given type of power amplifier.</p> <p><b>TLO 4.3:</b> Compare the performance parameters of given type of power amplifier.</p> <p><b>TLO 4.4:</b> Select the relevant power amplifier for the given applications.</p>	<p>4.1 Introduction, Comparison between small signal amplifier and power amplifier, Performance parameters, Operating point, load line.</p> <p>4.2 Classification: Class A, Class B, Class AB &amp; Class C with respect to operating point on load line, efficiency,</p> <p>4.3 Circuit Operation, input/output waveforms, efficiency and Power equation of Single stage class A, Class B push-pull amplifier, Class C amplifier. Advantages, disadvantages, and applications of power amplifier.</p>	Classroom Learning, Reference books, NPTEL	CO4
<b>UNIT –V FEEDBACK AMPLIFIERS AND OSCILLATORS (CL Hrs-14, Marks-14)</b>				
5	<p><b>TLO 5.1:</b> Explain effect of negative feedback on the given type of amplifier.</p> <p><b>TLO 5.2:</b> Compare the performance of given type of negative feedback amplifier.</p> <p><b>TLO 5.3:</b> Explain with sketches working of given type of oscillator.</p> <p><b>TLO 5.4:</b> Calculate the frequency of oscillation for given type of oscillator.</p>	<p><b>5.1 Feedback Amplifiers:</b> Concept of Feedback: series &amp; shunt. Types of feedback: negative and positive Types of feedback connections: voltage shunt, voltage series, current series &amp; current shunt.</p> <p><b>5.2 Sinusoidal Oscillators:</b> Introduction, need and condition for oscillations, Barkhausen's criteria. Comparison of oscillators and amplifiers. Types of oscillators: LC Oscillators- Working principle of Hartley Oscillator and Colpitts Oscillator, RC Oscillators- Working principle of RC phase shift oscillator and Wein bridge oscillator. Crystal oscillator- Concept, working principle and applications.</p>	Classroom Learning, Reference books, NPTEL	CO5



Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
<b>UNIT –VI MULTIVIBRATORS (CL Hrs-10, Marks-12)</b>				
6	<p><b>TLO 6.1:</b> Explain with sketches working of given type of multivibrator.</p> <p><b>TLO 6.2:</b> Calculate the frequency of output waveform of multivibrator.</p> <p><b>TLO 6.3:</b> Explain with sketch working of Schmitt trigger.</p>	<p>6.1 Transistor as a Switch.</p> <p>6.2 Classification of multivibrator: Astable multivibrator: circuit diagram, working principle, waveforms &amp; Time period. Monostable multivibrator: circuit diagram, working principle, waveforms &amp; Time period. Bistable multivibrator: circuit diagram, working principle, waveforms, applications.</p> <p>6.3 Applications of multivibrator: Schmitt trigger</p>	Classroom Learning, Reference books, NPTEL	<b>CO6</b>

#### V. 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*	Observe output waveform and test the performance of positive and negative diode clipper.	Test the performance of diode clipper.	02	CO1
2	Observe output waveform and test the performance of positive and negative diode clamper.	Test the performance of diode clamper.	02	CO1
3*	Observe output waveform and test the performance of RC integrator and differentiator.	Test the performance of RC integrator and differentiator.	02	CO1
4*	Build and plot the frequency response of common emitter BJT amplifier. Determine gain and bandwidth.	Build and plot the frequency response of common emitter BJT amplifier. Determine gain and bandwidth.	02	CO2
5	Plot the frequency response of RC coupled BJT amplifier.	Plot the frequency response of RC coupled BJT amplifier.	02	CO2
6*	Simulate the frequency response of FET amplifier.	Simulate the frequency response of FET amplifier.	02	CO2
7*	Build/ Test single tuned BJT amplifier.	Build/ Test single tuned BJT amplifier.	02	CO3
8	Build/ Test double tuned BJT amplifier.	Build/ Test double tuned BJT amplifier.	02	CO3
9*	Build/ Test the performance of class-A power amplifier.	Build/ Test the performance of class-A power amplifier.	02	CO4

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
10*	Build/ Test the performance of class-B push pull power amplifier.	Build/ Test the performance of class-B push pull power amplifier.	02	CO4
11*	Build and test/simulate the performance of negative feedback of a given type of amplifier.	Build and test/simulate the performance of negative feedback of a given type of amplifier.	02	CO5
12*	Observe the waveform and measure the frequency of Hartley/Colpitt's oscillator.	Observe the waveform and measure the frequency of Hartley/Colpitt's oscillator.	02	CO5
13	Observe/simulate the waveform and measure the frequency of RC phase shift oscillator.	Observe/simulate the waveform and measure the frequency of RC phase shift oscillator.	02	CO5
14*	Observe the waveform and measure the frequency of crystal oscillator.	Observe the waveform and measure the frequency of crystal oscillator.	02	CO5
15*	Build/test switching characteristics of BJT.	Build/test switching characteristics of BJT.	02	CO6
16*	Observe the waveforms of astable multivibrator and measure its time period and frequency.	Observe the waveforms of astable multivibrator and measure its time period and frequency.	02	CO6
17	Observe the waveforms of monostable multivibrator and measure its pulse width.	Observe the waveforms of monostable multivibrator and measure its pulse width.	02	CO6

**Note:** A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. A judicious mix of a minimum of 12 or more practical needs to be performed. Out of which, the practicals marked as ‘ \* ’ are compulsory.

## VI. SUGGESTED MICRO PROJECT /ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/ SKILLS DEVELOPMENT (SELF-LEARNING)

### Micro project

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her. In special situations where groups have to be formed for micro-projects, the number of students in the group should not exceed three.

The micro-project could be industry application-based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs (Affective Domain Outcomes). Each student will have to maintain an activity chart consisting of individual contributions to the project work and give a seminar presentation of it before submission. The student ought to submit a micro-project by the end of the semester to develop the industry-oriented COs.

A suggestive list of micro-projects is given here. Similar micro-projects could be added by the concerned faculty:

- Build and test a circuit to pass only high frequency signals.
- Build and test a circuit to pass only low frequency signals.
- Construct a circuit on general purpose PCB to clamp +2V signal with input signal 5Vpp.
- Construct audio amplifier circuit using IC810 or equivalent IC.
- Build and test frequency response of single stage BJT amplifier.
- Construct power amplifier for FM receiver output.
- Construct class-B push pull amplifier and test its performance.
- Construct negative feedback amplifier and test its performance.
- Build a circuit of astable multivibrator on general purpose PCB and test its performance.

#### Assignment/Activity

- Make a chart to compare all types of RC filters with its frequency responses.
- Make library survey regarding different electronic circuits and voltage regulators.
- Give a seminar on any relevant topic.
- Collect information on various multivibrators using IC555 and its applications.
- Prepare power point presentation on class-A class-B, class-C operation of power amplifier.
- Undertake a market survey for different ICs and electronic circuits and make a report.

#### VII. LABORATORY EQUIPMENT/ INSTRUMENTS/ TOOLS/ SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Variable DC power supply 0-30V, 2 Amp, SC protection, display for voltage and current	1,2,4,5,6,7,8,9,10,11,12,13,14,15,16,17
2	Cathode Ray Oscilloscope Dual trace 20 MHz, 1M $\Omega$ , Input Impedance	1,2,3,4,5,6,7,8,9,10,11,12,13,14,16,17
3	Function Generator 0-2MHz with Sine, square, and triangular output	1,2,3,4,5,6,7,8,9,10,11
4	Digital Multimeter: 3 1/2-digit display, 9999 counts digital	9,15

#### VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr. No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Wave shaping circuits	CO1	8	2	6	2	10
2	II	Low power amplifiers	CO2	12	2	8	4	14
3	III	Tuned amplifiers	CO3	8	4	4	-	8
4	IV	Power amplifiers	CO4	12	2	8	2	12
5	V	Feedback amplifiers & Oscillators	CO5	14	2	8	4	14
6	VI	Multivibrators	CO6	10	2	8	2	12
<b>Grand Total</b>				<b>64</b>	<b>14</b>	<b>42</b>	<b>14</b>	<b>70</b>

## IX. ASSESSMENT METHODOLOGIES / TOOLS

Formative assessment (Assessment for Learning)		Summative Assessment (Assessment of Learning)	
1. Tests	4. Self-Learning	1. End Term Exam	
2. Assignment	5. Term Work	2. Micro-project	
3. Midterm Exam	6. Seminar/Presentation		

## X. 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	3	3	-	2	2	2	2	3
CO2	3	3	3	3	-	2	2	3	2	3
CO3	3	2	2	3	-	2	2	3	2	3
CO4	3	2	3	3	-	2	2	3	2	3
CO5	3	3	3	3	-	2	2	3	2	3
CO6	3	2	3	3	-	2	2	3	2	3

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

\*PSOs are to be formulated at the institute level

## XI. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher
1	Albert Malvino	Basic Electronics.	8 <sup>th</sup> Edition, Tata McGraw Hill 2015 ISBN10:1259200116 ISBN13:9781259200113
2	Allen Mottershead	Electronics Devices and Circuits	PHI Learning Publishers ISBN: 9788120301245
3	B. L. Theraja, S Chand	Basic Electronics	Publishing, 2007, ISBN 10: 8121925568 ISBN 13: 9788121925563
4	R. S. Sedha	Applied Electronics	S. Chand & company Ltd., New Delhi, ISBN:8121927833
5	P. Ramesh Babu	Electronics Devices and Circuits	Scitech Publication Pvt. Ltd 2009 ISBN:8183711723
6	Boylestad & Nashelsky	Electronic Devices and Circuit Theory	Pearson Education India; 11 edition (2015) ISBN: 978-9332542600

## XII. LEARNING WEBSITES &amp; PORTALS

Sr.No	Link/Portal	Description
1.	<a href="https://www.electronicshub.org">https://www.electronicshub.org</a>	Diode clippers, clampers and RC filters
2.	<a href="https://www.tutorialspoint.com/amplifiers/multi_stage_transistor_amplifier.htm">https://www.tutorialspoint.com/amplifiers/multi_stage_transistor_amplifier.htm</a>	Multistage low power BJT amplifiers
3.	<a href="https://www.tutorialspoint.com/amplifiers/tuned_amplifiers.htm">https://www.tutorialspoint.com/amplifiers/tuned_amplifiers.htm</a>	Tuned amplifier using BJT
4.	<a href="https://www.tutorialspoint.com/amplifiers/power_amplifiers.htm">https://www.tutorialspoint.com/amplifiers/power_amplifiers.htm</a>	Types of Power amplifier
5.	<a href="https://www.tutorialspoint.com/amplifiers/amplifiers_feedback.htm">https://www.tutorialspoint.com/amplifiers/amplifiers_feedback.htm</a>	Feedback amplifiers and types
6.	<a href="https://en.wikipedia.org/wiki/Electronic_oscillator">https://en.wikipedia.org/wiki/Electronic_oscillator</a> or <a href="https://www.tutorialspoint.com/sinusoidal_oscillators/sinusoidal_hartley_oscillator.htm">https://www.tutorialspoint.com/sinusoidal_oscillators/sinusoidal_hartley_oscillator.htm</a>	Oscillators and types
7.	<a href="https://learnabout-electronics.org/Oscillators/osc41.php">https://learnabout-electronics.org/Oscillators/osc41.php</a>	Multivibrators

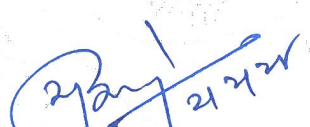
Name &amp; Signature:


Smt. N.S. Bakde  
Lecturer in E&TC


Smt. P.V. Lengare  
Lecturer in E&TC

(Course Experts)

Name &amp; Signature:


  
Shri. S.S. Prabhune  
(Programme Head)

Name &amp; Signature:


  
Shri. S.B. Kulkarni  
(CDC In-charge)

**GOVERNMENT POLYTECHNIC, PUNE**  
**'120 – NEP' SCHEME**

<b>PROGRAMME</b>	<b>DIPLOMA IN ET</b>
<b>PROGRAMME CODE</b>	<b>03</b>
<b>COURSE TITLE</b>	<b>ELECTRONICS WORKSHOP PRACTICE</b>
<b>COURSE CODE</b>	<b>ET21205</b>
<b>PREREQUISITE COURSE CODE &amp; TITLE</b>	<b>NA</b>

**I. LEARNING & ASSESSMENT SCHEME**

Course Code	Course Title	Course Type	Learning Scheme						Credits	Paper Duration	Assessment Scheme										Total Marks
			Actual Contact Hrs./Week			SLH	NLH	Theory			Based on LL & TSL				Based on SL						
			CL	TL	LL			FA-TH			SA-TH	Total		Practical		SLA					
						Max	Min					Max	Min	Max	Min	Max	Min				
ET11201	ELECTRONICS WORKSHOP PRACTICE	DSC	2	-	2	2	6	3	--	--	--	--	50	20	50@	20	25	10	125		

**Abbreviations:** CL-Classroom Learning, TL-Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS – Indian Knowledge System, SLA- Self Learning Assessment

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

**Note:**

**FA-TH** represents an average of two class tests of 30 marks each conducted during the semester.

- If a candidate is not securing minimum passing marks in **FA-PR** (Formative Assessment - Practical) of any course, then the candidate shall be declared as '**Detained**' in that semester.
- If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as '**fail**' and will have to repeat and resubmit SLA work.
- Notional learning hours** for the semester are (CL + LL + TL + SL) hrs. \* 15 Weeks
- 1 credit** is equivalent to **30 Notional hours**.
- \* Self-learning hours shall not be reflected in the Timetable.
- \* Self-learning includes micro-projects/assignments/other activities.

**II. RATIONALE:**

This course is intended to help the students of Diploma in Engineering to get idea of various Electronic Materials and Components employed in electronic industries. It will make the students familiar with the suitability of various electronic materials and components for different applications. This course is intended to develop skills of testing components that will be needed for the project and setting up of many experiments in basic and applied technology courses.

**III. COURSE-LEVEL LEARNING OUTCOMES (CO'S)**

Students will be able to achieve & demonstrate the following CO's on completion of course-based learning

CO1: Identify the relevant material for the electronic applications.

CO2: Suggest relevant electronic components for the given application.

CO3: Identify the Surface Mount Devices for specific applications.

CO4: Use specific components for roof top solar energy systems.

## IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
<b>UNIT-I ELECTRONIC MATERIALS (CL Hrs-06, Marks-NIL)</b>				
1.	<p>TLO 1.1 Explain the effect of the given factor on the resistivity of electrical material.</p> <p>TLO 1.2 Describe the properties of the given Photo emissive material.</p> <p>TLO 1.3 Explain the phenomenon of dielectric material.</p> <p>TLO 1.4 Select the dielectric material for the given application.</p> <p>TLO 1.5 Classify the magnetic material on the basis of given magnetic properties.</p>	<p>1.1 Factors affecting the resistivity of material like temperature, area of cross-section, length (or distance) of the element.</p> <p>1.2 Photo emissive materials: Properties, impurities used to emit different colors, applications</p> <p>1.3 Dielectric Materials: Types, Properties, frequency dependence of electronic polarisability, frequency dependence of permittivity</p> <p>1.4 Magnetic Materials: Properties, classification: Permanent magnetic dipole, diamagnetism, paramagnetism, ferromagnetism.</p>	<p>Chalk-Board</p> <p>Video Demonstrations</p> <p>Hands-on</p>	<b>CO1</b>
<b>UNIT - II ELECTRONIC COMPONENTS (CL Hrs-12, Marks-NIL)</b>				
2.	<p>TLO 2.1 Select the passive Component for the given application.</p> <p>TLO 2.2 Suggest the relevant combination of materials for the LED of the given color</p> <p>TLO 2.3 Describe the given type of IC and its package.</p> <p>TLO 2.4 Differentiate between the given types of ICs.</p> <p>TLO 2.5 Identify different types of switches and relays.</p> <p>TLO 2.6 Test different types of switches and relays.</p> <p>TLO 2.7 Identify different types of cables and connectors.</p> <p>TLO 2.8 Test different types of cables and connectors.</p> <p>TLO 2.9 Identify different types of transformers.</p>	<p>2.1 Passive Components: Concepts and Specifications and applications Voltage Dependent Resistor (VDR), Temperature Dependent Resistor (TDR), Light Dependent Resistor (LDR).</p> <p>2.2 Construction, working principle and applications of OLED</p> <p>2.3 Integrated Circuit: Introduction to Monolithic IC, thick &amp; thin film IC, Hybrid IC, Linear IC, Digital IC and IC packages (SIP, TO5, Flat, DIP), Pin , Device Identification, Temperature ranges.</p> <p>2.4 Types, specifications, applications &amp; testing of Switches &amp; Relays</p> <p>2.5 Types, specifications, applications &amp; testing of Cable &amp; connectors</p> <p>2.6 Types, specifications, applications &amp; testing of Transformers</p>	<p>Chalk-Board</p> <p>Hands-on Model Demonstration</p> <p>Video Demonstrations</p>	<b>CO2</b>

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
<b>UNIT - III SURFACE MOUNT DEVICES (CL Hrs-08, Marks-NIL)</b>				
3	<p>TLO 3.1 Explain SMT and SMD.</p> <p>TLO 3.2 Describe the steps involved in the assembly technique in the SMT.</p> <p>TLO 3.3 Differentiate between the given type of the soldering/ de-soldering in SMT.</p> <p>TLO 3.4 Identify the need of SMT with respect to its advantages.</p> <p>TLO 3.5 Classify the SMD packages with respect to the given type of components.</p>	<p>3.1 Introduction to Surface Mount Technology (SMT) and Surface mount Devices(SMD).</p> <p>3.2 Assembly and rework techniques: Contact and noncontact types of soldering and de-soldering Advantages and Disadvantages of SMT</p> <p>SMD packages : Two terminal package for passive and active components, Three or four terminal packages, five or six terminal packages, More than six terminal packages; Examples of each Automatic component insertion technique</p>	<p>Chalk-Board Model Demonstration Video Demonstrations Hands-o</p>	<b>CO3</b>
<b>UNIT -IV SOLAR SYSTEM COMPONENTS (CL Hrs-06, Marks-NIL)</b>				
4	<p>TLO 4.1 State the basic principle of Photovoltaic Cell for the given application.</p> <p>TLO 4.2 Illustrate construction of solar panel.</p> <p>TLO 4.3 List the different types of solar batteries for the given specifications</p> <p>TLO 4.4 Use of battery bank for solar power system .</p> <p>TLO 4.5 Choose the suitable battery for a solar energy system.</p>	<p>4.1 Photovoltaic materials</p> <p>4.2 Solar Cell: Working Principle and Construction</p> <p>4.3 Materials used in a Solar Panel</p> <p>4.4 Batteries used in solar panel, its ratings and selection factors</p> <p>4.5 Specifications of battery like battery Capacity ,power ratings, depth of discharge(DOD),round trip efficiency, warranty and life span</p>	<p>Chalk-Board Model Demonstration Video Demonstrations Hands-on</p>	<b>CO4</b>



## V. 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*	Determine resistivity for a given length of wire keeping area constant	Determination of resistivity.	02	CO1
2	Use photo electric cell to study I-V characteristics .	Determination of photoelectric cell characteristics	02	CO1
3*	Plot the charging and discharging curve of two different capacitors each having different dielectric material	Charging and discharging curve of two different capacitors	02	CO1
4*	Test the performance of Light Dependent Resistor (LDR) asa dark sensor	LDR as a Dark Sensor	02	CO2
5*	Test the identified analog IC's, digital IC's.	Testing of different IC	02	CO2
6*	Test the identified switches and relays.	Test various switches and relays.	02	CO2
7	Identify various cable and connectors used in the given circuit	Identify various cable and connectors by physical Observation	02	CO2
8*	Test identified cable and connectors used in the given circuit	Test various cable and connectors.	02	CO2
9	Identify transformer used in the given circuit	Identify various transformers.	02	CO2
10	Test transformer used in the given circuit	Test various transformers.	02	CO2
11*	Determine SMD component value (Resistor, Capacitor and Inductor) using their nomenclature.	Determination of SMD component value	02	CO3
12	Soldering of Surface Mounted Devices (SMD).	Soldering of SMD	02	CO3
13	Identify given SMD according to package type	Identification of given SMD	02	CO3
14*	Plot V-I Characteristics of the solar cell.	Characteristics of the solar cell.	02	CO4
15	Use a Solar Panel (Small panel approx. - 4.5 V output) to drive any small load	Use of Solar Panel to drive any small load	02	CO4
16	Measure voltage and current by connecting three batteries first in series and then parallel each having rating of 6V,2A	Voltage and current measurement using series and parallel connection of batteries	02	CO4

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
<b>Note:</b> A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the Cos and competency. A judicious mix of a minimum of 12 or more practical needs to be performed. Out of which, the practicals marked as ‘ *’ are compulsory.				

## VI. SUGGESTED MICRO PROJECT /ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/ SKILLS DEVELOPMENT (SELF-LEARNING)

### Micro project

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her. In special situations where groups have to be formed for micro-projects, the number of students in the group should not exceed three.

The micro-project could be industry application-based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs.(Affective Domain Outcomes) .Each student will have to maintain an activity chart consisting of individual contributions to the project work and give a seminar presentation of it before submission. The student ought to submit a micro-project by the end of the semester to develop the industry-oriented COs.

A suggestive list of micro-projects is given here. Similar micro-projects could be added by the concerned faculty:

- Record values of different parameters ( Direction, tilt angle, distance between pedestal, connection of solar panel ) during installation of a solar panel by watching animation video
- Collect different samples of photoemissive material and prepare chart of their applications.
- Collect different samples of dielectric material and prepare chart of their applications.
- Collect different samples of magnetic material and prepare chart of their applications.
- Collect capacitors of different values and make a chart for the specification and application of the same.
- Prepare a chart on different types of switches and relays.
- Prepare a chart on different types of cables and connectors.
- Prepare a chart on different types of transformers.
- Describe the solar panel installation process for residential purpose

### Assignment

- Collect information on electronic materials and prepare charts of the same.
- Collect information on electronic components and prepare charts of the same.
- Make a chart of different types of ICs.
- Make a chart of different types of SMD packages.

**VII. LABORATORY EQUIPMENT/ INSTRUMENTS/ TOOLS/ SOFTWARE REQUIRED**

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Voltmeter - 0-10V, Ammeter 0-1A, Battery 0-12V, metal wire-40cm,50cm,60cm,70cm,80cm,90cm or as available, Resistance Box: 4 decade ranges from 1 ohm to 1K,accuracy 0.1 % - 1 %	1
2	Variable power supply 0-12V,500mA Microammeter 0-100 $\mu$ A Voltmeter/Multimeter 0 to 10V Photoelectric cell setup	2
3	Resistor, Capacitor, Voltmeter/Multimeter, Ammeter/Multimeter, Power Supply, Stop watch, Switch	3
4	LDR ,LED, 1K ohm Resistor ,50K ohm Resistor ,BC547– BJT ,9V battery ,Breadboard	4
5	IC tester, TTL IC's, CMOS IC's	5
6	Multimeter, switches and relays	6
7	Different types of cables and connectors	7
8	Multimeter, cables and connectors	8
9	Different types of transformers	9
10	Multimeter, transformer	10
11	Different values of SMD resistor, SMD capacitor and SMD Inductor	11
12	Soldering iron with soldering station( use 15,18 W iron), 63/27 flux cord solder wire, surface mounted components, magnifying glass	12
13	SMD of different packages like transistor SOT23 pack, transistor SOT89 Pack, IC SO8 Pack, IC SO14 pack	13
14	A solar panel, a voltmeter, a micro-ammeter, a variable resistor and a 100 W lamp.	14
15	Solar panel (output 4.5V) cell and any load that it can drive	15
16	Solar Cells Potentiometer Voltage Meter Current Meter	16

**VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS &ASSESSMENT PURPOSE  
(Specification Table)****NOT APPLICABLE**

## IX. ASSESSMENT METHODOLOGIES / TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
1. Self – Learning 2. Term Work	1. End Term Exam 2. Micro-Project

## X. 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	2	1	1	-	-	1	2	3	2	3
CO2	2	2	2	2	2	1	2	3	3	3
CO3	2	2	2	2	1	1	2	2	2	3
CO4	2	2	2	2	2	1	2	2	2	3

**Legends:- High:03, Medium:02, Low:01, NoMapping: -**

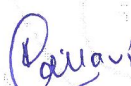
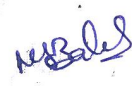


\*PSOs are to be formulated at the institute level

## XI. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher
1	Milton Kaufman , Arthur H. Seidman , Perry J Sheneman	Handbook for Electronics Engineering Technicians Hardcover	McGraw-Hill ,SBN-13 978-0070334083
2	Charles A. Harper	Electronic Assembly Fabrication: Chips, Circuit Boards, Packages, and Components (ELECTRONICS)	McGraw-Hill Professional ,SBN-13 978-0071378826
3	Rathore	Fundamentals Of Renewable Energy Sources	Himanshu Publications: eISBN no.9781003245643
4	Walter ,Bosshart	Printed Circuit Boards	Tata McGraw Hill ISBN-13 978-0074515495
5	Grover & Jamwal	Electronic Components and Materials	Dhanpat Rai & Sons, ISBN-13 5551234023845
6	Dhir S M	Electronic Components and Materials	Tata McGraw Hill ISBN: 9780074630822
7	Madhuri Joshi	Electronic Components and Materials	Shroff Publishers & Distributors private ltd.ISBN-13: 978-8173669002

## XII. LEARNING WEBSITES &amp; PORTALS

Sr.No	Link/Portal	Description
1	<a href="https://www.electronics-tutorials.ws/resistor/res_1.html">https://www.electronics-tutorials.ws/resistor/res_1.html</a>	Resistors
2	<a href="https://www.greenmatch.co.uk/blog/2014/12/how-are-solar-panels-made">https://www.greenmatch.co.uk/blog/2014/12/how-are-solar-panels-made</a>	Solar panels
3	<a href="https://www.britannica.com/technology/integrated-circuit/Fabricating-ICs">https://www.britannica.com/technology/integrated-circuit/Fabricating-ICs</a>	IC fabrication
4	<a href="https://resources.pcb.cadence.com/blog/2023-ic-fabrication-process-flow-chart">https://resources.pcb.cadence.com/blog/2023-ic-fabrication-process-flow-chart</a>	IC fabrication process
5	<a href="https://en.wikipedia.org/wiki/Electronic_component">https://en.wikipedia.org/wiki/Electronic_component</a>	Different electronic components
6	<a href="https://www.seeedstudio.com/blog/2017/12/28/difference-between-smt-and-smd/">https://www.seeedstudio.com/blog/2017/12/28/difference-between-smt-and-smd/</a>	SMT and SMD
7	<a href="https://www.literoflightusa.org/how-are-solar-panels-made/">https://www.literoflightusa.org/how-are-solar-panels-made/</a>	Solar cell and solar panel
8	<a href="https://www.google.com/search?q=practicle+on+solar+cell+experiment&amp;sca_esv=573057508&amp;rlz=1C1YTUH_enI">https://www.google.com/search?q=practicle+on+solar+cell+experiment&amp;sca_esv=573057508&amp;rlz=1C1YTUH_enI</a>	Solar cell characteristics
9	<a href="https://www.google.com/search?q=installation+process+of+solar+panels+animation&amp;sca_esv=573067372&amp;rlz">https://www.google.com/search?q=installation+process+of+solar+panels+animation&amp;sca_esv=573067372&amp;rlz</a>	Installation of solar panel
10	<a href="https://renewablelab.niu.edu/experiments/seriesParallelSolarCells">https://renewablelab.niu.edu/experiments/seriesParallelSolarCells</a>	Solar cell in series and parallel
11	<a href="https://www.electronicshobby.com/blog/category/soldering">https://www.electronicshobby.com/blog/category/soldering</a>	Soldering methods
12	<a href="https://www.electronicshobby.com/blog/electronic-components">https://www.electronicshobby.com/blog/electronic-components</a>	For electronic Components, SMT,PCB
13	<a href="https://www.electronicshobby.com/types-of-integrated-circuits-classification-of-ics-by-structure/">https://www.electronicshobby.com/types-of-integrated-circuits-classification-of-ics-by-structure/</a>	For Integrated Circuits

Name & Signature:	
 <b>Smt. P.V. Lengare</b> Lecturer in E&TC	 <b>Smt. N.S. Bakde</b> Lecturer in E&TC
(Course Experts)	
Name & Signature:	Name & Signature:
 <b>Shri. S.S. Prabhune</b> (Programme Head)	 <b>Shri. S.B. Kulkarni</b> (CDC In-charge)

## GOVERNMENT POLYTECHNIC, PUNE

### ‘120 – NEP’ SCHEME

<b>PROGRAMME</b>	<b>DIPLOMA IN CE/EE/ET/ME/MT/CM/IT/DDGM</b>
<b>PROGRAMME CODE</b>	<b>01/02/03/04/05/06/07/08</b>
<b>COURSE TITLE</b>	<b>Professional Communication</b>
<b>COURSE CODE</b>	<b>HU11202</b>
<b>PREREQUISITE COURSE CODE &amp; TITLE</b>	<b>NA</b>

#### I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme						Credits	Paper Duration	Assessment Scheme										Total Marks
			Actual Contact Hrs./Week			SL	H	NLH			Theory			Based on LL & TSL				Based on SL			
			CL	TL	LL						Total	Practical		SLA							
												FA-TH	SA-TH	FA-PR	SA-PR	Max	Min				
Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min										
HU11202	PROFESSIONAL COMMUNICATION SKILLS	SEC	-	-	2	-	2	1		-	-	-	-	25	10	25@	10	-	-	50	

**Total IKS Hrs for Sem. : 0 Hrs**

**Abbreviations:** CL- Classroom Learning, TL- Tu tutorial Learning, LL-Laboratory Learning, SL H-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS – Indian Knowledge System, SLA - Self Learning Assessment.

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

**Note :**

1. FA-TH represents the average of two class tests of 30 marks each conducted during the semester.
2. If the candidate does not secure minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If the 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.\* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
- 6.\* Self-learning hours shall not be reflected in the timetable.
- 7.\* Self-learning includes micro-projects/assignments / other activities.

#### II. RATIONALE:

Communication is key to the smooth and efficient functioning of any industry or business. Professional communication is the need of every organization to maintain ethics, quality and standards. The efficacy of business communication skills is essential for engineering professionals to instruct, guide and motivate peers/ subordinates to achieve desired goals at the workplace. Thus, this course has been designed to enhance professional communication skills for effective presentation both in written and oral forms at the workplace.

#### III. COURSE-LEVEL LEARNING OUTCOMES (CO'S):

Students will be able to achieve and demonstrate the following COs on completion of course-based learning

- CO1 - Communicate effectively (oral and written) in various formal and informal situations minimizing the barriers.
- CO2 - Develop listening skills through active listening and note-taking.
- CO3 - Write the circulars, notices and minutes of the meeting.
- CO4 - Draft enquiry letter, complaint letter, and Job application with resume / CV, Compose effective Emails.
- CO5 - Write Industrial reports.

**IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT:**

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
<b>UNIT-I PROFESSIONAL COMMUNICATION: AN OVERVIEW</b>				
1	<p>TLO 1.1 Describe the importance of professional communication in given situations.</p> <p>TLO 1.2 Identify the types of communication barriers in given situations and suggest remedies.</p> <p>TLO 1.3 Use different types of verbal and non-verbal communication for the given situation.</p>	<p>1.1 Definition of professional communication- Importance, relevance, Elements and process of communication,7 C's of Professional Communication (Clarity, Conciseness, correctness, coherent, concrete, courteous &amp; Complete).</p> <p>1.2 Communication barriers, Types of barriers (Linguistic, Psychological, Technological).</p> <p>1.3 Types of Communication- Verbal (Oral-Written), Formal, Informal (Grapevine) and Vertical Comm.</p>	<p>Language lab, Role plays, Chalkboard, Reference books, Case studies.</p>	<b>CO1</b>
<b>UNIT - II LISTENING &amp; NOTE-TAKING</b>				
2	<p>TLO 2.1 Identify the difference between listening and hearing.</p> <p>TLO 2.2 Differentiate the types of listening in various situations.</p> <p>TLO 2.3 Take notes during lectures and seminars. Make use of types of note-taking and note-making for different subjects/topics.</p>	<p>2.1 Difference between listening &amp; Hearing.</p> <p>2.2 Types of listening a)Active listening b)Passive listening c)Selective listening.</p> <p>2.3 Techniques of Note-taking, Types of note taking (Outline notes, Mind Mapping, Flowcharts).</p>	<p>Language Lab, Classroom learning, NPTEL, Role Play.</p>	<b>CO2</b>
<b>UNIT - III OFFICE DRAFTING</b>				
3	<p>TLO 3.1 Prepare notices/agenda for the given type of meeting/information.</p> <p>TLO 3.2 Prepare minutes of meeting/s.</p> <p>TLO 3.3 Draft a circular for a particular information/event.</p>	<p>3.1 Format of Notice, Drafting Agenda.</p> <p>3.2 Preparing Minutes of the meeting.</p> <p>3.3 Format of Circular.</p>	<p>Whiteboard, Language Lab, Reference books, Classroom learning.</p>	<b>CO3</b>
<b>UNIT - IV WRITING SKILLS FOR PROFESSIONAL COMMUNICATION</b>				
4	<p>TLO 4.1 Compose cover letter and CV / Resume for jobs.</p> <p>TLO 4.2 Apply E-mail Etiquettes for professional purposes.</p> <p>TLO 4.3 Compose Emails for different official purposes.</p>	<p>4.1 Job Application with Resume / CV.</p> <p>4.2 E-Mail Etiquettes.</p> <p>4.3 Writing official E-Mails to communicate intended purposes.</p>	<p>Language lab, Classroom learning NPTEL, Reference books.</p>	<b>CO4</b>

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
<b>UNIT - V REPORT WRITING</b>				
5	TLO 5.1 Compose technical reports. TLO5.2 Draft accident and Investigation.	5.1 Introduction to report writing 5.2 Accident Report and Investigation Report.	Chalk and talk, Language Lab, Collaborative learning, Classroom learning.	<b>CO5</b>

#### V. 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 1.1 Draw the communication cycle using real-life examples and explain the process of communication.	Communication Process and Cycle	2	CO1
2	LLO 2.1 Undertake the Roleplay / Group discussion to illustrate types/barriers to communication.	Role plays and Group Discussion	2	CO1
3	*LLO 3.1 Listen to audio in the language lab and make notes of it.	Active Listening	2	CO2
4	*LLO 4.1 Give a presentation / Seminar using the 7 C's of Communication.	Presentations / Seminars	2	CO1
5	*LLO 5.1 Explain the types of note-taking with examples and make notes on any one topic related to your curriculum.	Note taking & Note Making	2	CO2
6	*LLO 6.1 Prepare agenda for meeting and draft minutes of the meeting.	Agenda and Minutes of the Meeting	2	CO3
7	*LLO 7.1 Draft circulars for the given situation.	Office Drafting	2	CO3
8	*LLO 8.1 Respond to job advertisements referring to newspapers, and LinkedIn. Write a cover letter with a resume /CV.	Job Application with Resume / CV	2	CO4
9	*LLO 9.1: Write Four (formal) E-mails using ethics and etiquette.	E-Mail writing.	2	CO4
10	*LLO 10.1: Write a detailed report on the Accident/ Investigation.	Technical Report writing	2	CO5
11	*LLO 11.1: Prepare a case study related to linguistic barriers: language pronunciation, punctuation, and technical jargon and suggest remedies for the same.	Barriers to Communication	2	CO1



Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
12	LLO 12.1: draft complaint/enquiry letter for various situations.	Complaint and Enquiry letter	2	CO4
13	LLO 13.1: List psychological barriers to communication. LLO 13.2 Prepare case studies on any two psychological barriers and suggest remedies to overcome the barriers.	Psychological barriers to Communication.	2	CO1
14	*LLO 14.1 - Draw a flow chart and mind mapping for any topic related to the curriculum.	Listening Skills.	2	CO2
15	*LLO 15.1 - Face mock interview arranged by your teacher.	Job Application, Resume / CV & Interview.	2	CO4

**Note:**

- "\*" marked practicals are compulsory for coverage of all course outcomes.
- The remaining practicals are recommended to provide enhanced skills/abilities.
- Any 12 assignments out of 15 are compulsory

**Note:**

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her at the beginning of the semester. She/he ought to submit it by the end of the semester to develop the industry-oriented COs. Each micro-project should encompass two or more COs. The micro-project could be industry application-based, internet-based, workshop-based, laboratory-based or field-based. Each student will have to maintain a dated work diary consisting of individual contributions to the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than 15 (fifteen) student engagement hours during the course. In the first four semesters, the micro-project could be group-based. However, in higher semesters, it should be individually undertaken to build up the skill and confidence in every student to become a problem solver so that s/he contributes to the projects of the industry. A suggestive list is given here. Similar micro-projects could be added by the concerned faculty.

## VI. SUGGESTED MICRO PROJECT/ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT (SELF-LEARNING)

### Micro project

- Conduct an interview of any person and follow the procedure ( interview questions, photo with the interviewee etc.)
- Listening and Speaking are lifelong learnings. Explain with appropriate examples and real-life case studies.
- Collect (four to five) emails with technical jargon, and barriers, make required corrections and keep a record of both the emails (original and Corrected one)
- Prepare a case study on Technological barriers to communication
- Complete any one certification course of (Two Weeks duration) from (MOOC/ NPTEL/ Coursera/ any other source)related to Communication Skills / Personality Development.
- Prepare a report on aspects of body language.

**VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED:**

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Language Lab with software with internet facility.	All
2	LCD Projector	All
3	Smart Board with networking.	All
4	Printer.	All

**VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE**

(Specification Table):

N.A.

**IX. ASSESSMENT METHODOLOGIES/TOOLS:**

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
1. Term Work (FA-PR) 2. Micro-project.	1. Practical Exam of <b>25</b> marks using language lab. (SA-PR)

**X. 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	-	-	-	-	-	-	1	-	-	-
CO2	-	-	-	-	-	-	1	-	-	-
CO3	-	-	-	-	-	-	1	-	-	-
CO4	-	-	-	-	-	-	1	-	-	-
CO5	-	-	-	-	-	-	1	-	-	-

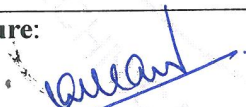
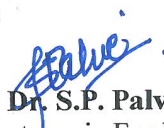
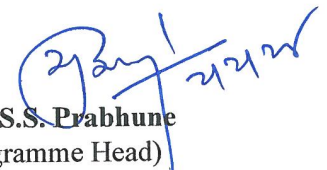

**Legends:- High:03, Medium:02, Low:01, No Mapping: -**  
\*PSOs are to be formulated at the institute level.

## XI.SUGGESTED LEARNING MATERIALS/BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	M Ashraf Rizvi	Effective Communication Skills	Tata McGraw-Hill Publication-ISBN 0070599521, 9780070599529
2	Sanjay Kumar and Pushp Lata	Communication Skills	Oxford University Press ISBN 9780199457069
3	MSBTE Textbook	Communication Skills	MSBTE
4	Robert King	Effective communication Skills	Audio Book -ISBN 978181667009742
5	N P Sudharshana, C Savitha	English for Technical Communication	Cambridge-ISBN 978-13-16640-08-1
6	C. Murlikrishna, Sunita Mishra	Communication Skills for Engineers	Pearson - ISBN 978-81-317-3384-4
7	Meenakshi Raman, Sangeeta Sharma	Technical Communication, Principles and Practice	Oxford University Press -ISBN 978-1316640-08-1
8	K. K. Sinha	Business Communication	Galgotiya Publishing company, New Delhi ISBN 9789356227064
9	Rajendra Pal, J.S. Korlahalli	Essentials of Business Communication	Sultan Chand & Sons, New Delhi ISBN 9788180547294

## XIII. LEARNING WEBSITES &amp; PORTALS

Sr.No	Link / Portal	Description
1	<a href="https://www.britishcouncil.in">https://www.britishcouncil.in</a>	conversations
2	<a href="https://www.coursera.org">https://www.coursera.org</a>	certification courses
3	<a href="https://www.udemy.com">https://www.udemy.com</a>	Communication skills training courses
4	<a href="http://www.makeuseof.com">http://www.makeuseof.com</a>	Dale Carnegie's free resources

<b>Name &amp; Signature:</b>  <b>Mr. V.V. Kulkarni</b> Lecturer in English		<b>Name &amp; Signature:</b>  <b>Dr. S.P. Palve</b> Lecturer in English	
<b>(Course Experts)</b>			
<b>Name &amp; Signature:</b>  <b>Shri. S.S. Prabhune</b> (Programme Head)		<b>Name &amp; Signature:</b>  <b>Shri. S.B. Kulkarni</b> (CDC In-charge)	

**GOVERNMENT POLYTECHNIC, PUNE**  
**'120 – NEP' SCHEME**

<b>PROGRAMME</b>	<b>DIPLOMA IN ET</b>
<b>PROGRAMME CODE</b>	<b>03</b>
<b>COURSE TITLE</b>	<b>PROGRAMMING IN 'C' LANGUAGE</b>
<b>COURSE CODE</b>	<b>CM21203</b>
<b>PREREQUISITE COURSE CODE &amp; TITLE</b>	<b>NA</b>

**I. LEARNING & ASSESSMENT SCHEME**

Course Code	Course Title	Course Type	Learning Scheme						Credits	Paper Duration	Assessment Scheme									
			Actual Contact Hrs./Week			SLH	NLH	Theory			Based on LL & TSL				Based on SL		Total Marks			
			CL	TL	LL						Practical		SLA							
											FA-PR	SA-PR	Max	Min	Max	Min				
CM21203	PROGRAMMING IN 'C' LANGUAGE	SEC	3	0	2	1	6	3	2	15	35*#	50	20	--	--	50@	20	25	10	125

Total IKS Hrs for Term: 0 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, IKS – Indian Knowledge System, SLA- Self Learning Assessment

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

**Note:**

FA-TH represents an average of two class tests of 15 marks each conducted during the semester.

- If a candidate is not securing minimum passing marks in FA-PR (Formative Assessment - Practical) of any course, then the candidate shall be declared as '**Detained**' in that semester.
- If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as '**fail**' and will have to repeat and resubmit SLA work.
- Notional learning hours** for the semester are (CL + LL + TL + SL) hrs. \* 15 Weeks
- 1 credit** is equivalent to **30 Notional hours**.
- \* Self-learning hours shall not be reflected in the Timetable.
- \*Self-learning includes micro-projects/assignments/other activities.

**II. RATIONALE:**

Programming language C is a versatile language used in many Micro controller based application. This course deals with concepts of programming to enhance programming skills of diploma students. By engaging with C programming, students acquire logical reasoning, problem-solving techniques, and analytical thinking which will enable the students to solve engineering problems.

**III. COURSE -LEVEL LEARNING OUTCOMES (CO'S)**

Students will be able to achieve & demonstrate the following CO's on completion of course-based learning

Apply the concepts of Programming to solve engineering (discipline) related problem

CO1- Interpret the basic code of C

CO2 - Implement decision making in C programming.

CO3 - Use arrays and strings in C Programming.

CO4 - Use functions in 'C' programs for modular programming approach

CO5 - Use pointers to increase efficiency of programs and Implement basic concept of structure in "C"

## IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
<b>UNIT-I Overview of C programming(Hrs-08, Marks-12)</b>				
1.	TLO 1.1 Describe the given data type. TLO 1.2 Construct algorithm, flowchart for the given problem TLO 1.3 Use pre-increment and post- increment operators in the given situation. TLO 1.4 Use bitwise operators in the given situation.	1.1.Structure of C : Assembler , Compiler, Linker, Interpreter 1.2character set: Keywords. Identifiers, different types of constants (Integer, character, string, and real) variables, scope of variables, concept of ASCII. 1.3Data types: Integer, signed ,unsigned, float 1.4Operators and Expression: Arithmetic, Logical,Assignment, Relational, Increment and Decrement, conditional, bitwise, operators, Evaluation of expression 1.5Algorithm and Flowchart: Formatted input output statement, input output function	Improved Lecture Tutorial Assignment Demonstration Simulation	<b>CO1</b>

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
<b>UNIT-II Decision and loop control (CL Hrs-10, Marks-10)</b>				
2	TLO 2.1:Write a 'C' program using the given decision making structure for two-way branching TLO 2.2: Write a 'C' program using the given decision making structure for multi-way branching TLO 2.3: Write a 'C' program using loop statements to solve the given iterative problem. TLO 2.4: Use related statements to alter the program flow in the given	2.1 Decision making: if statement (if. if-else. nested if-else), switch-case statement 2.2 Repetition in 'C' (loop control statement) while, do-while and for loop. break and continue statement, nested loop	Improved Lecture Tutorial Assignment Demonstration Simulation	<b>CO2</b>

UNIT-III Array and Strings (CL Hrs-10, Marks-10)				
3	TLO 3.1 Write steps to access element of the given array TLO 3.2 Write steps to perform operation on given array TLO 3.3 Write steps to initialize and declare given string in array	3.1 Introduction to Array and its types 3.2 Declaration , initialization of array 3.3 Processing elements of an array, adding, deleting, sorting, searching, 3.4 Introduction to String: Initialization,declaring and display of string 3.5String handling functions- strcat(), strcmp(), strcpy(), strlen(), strlwr(),strupr()	Improved Lecture Tutorial Assignment Demonstration Simulation	CO3

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
UNIT- IV Functions (CL Hrs-08, Marks-08)				
4	TLO 4.1: Use inbuilt function for the given program. TLO 4.2: Develop relevant user defined function for given program. TLO 4.3: Create programs based on categories of user defined functions TLO4.4: Write recursion function for the given problem.	4.1Function: Concept and need of Function. 4.2Libraryfunction: Math function,string handling function. 4.3User defined function types :Elements of user defined functions, Calling a user defined function, Categories of user defined functions- No argument- No return value, Argument- No return value, No argument- Return value, Argument- Return value. 4.4 Recursive function (only concept)	Improved Lecture Tutorial Assignment Demonstration Simulation	CO4
UNIT –V Pointers and structures(CL Hrs-12, Marks-10)				
5	TLO 5.1: Use pointer for address access to manipulate the given data. TLO 5.2: Use pointer to access memory location to solve the given problem. TLO 5.3 Create a structure for given data. TLO 5.4:Develop a program to access elements of structure	5.1 Pointer concept 5.2 Address and indirection operators 5.3 Declaration and Initialization of pointer variables. 5.4 Accessing a variable through its pointer 5.5 Introduction and features and syntax of structure. 5.6 Declaring and Initialization of structure 5.7 Initialization, Accessing structure members using pointer	Improved Lecture Tutorial Assignment Demonstration Simulation	CO5

## V. 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 1.1: Apply rules to draw flowchart for given program	(*)Write algorithm and draw flow chart for following programs : A) Addition/Subtraction of Two numbers B) Exchange value of Two variables	2	CO1
2	LLO 2.1: Implement basic input output statement of C language.	(*)Write the Program to display the message "Hello GPP", name, address, date of birth and email id using printf() function.	2	CO1
3	LLO 3.1: Apply Logical operators on given data	(*)Write a program to demonstrate use of Logical operators	2	CO1
4	LLO 4.1: Apply Arithmetic operators on given data.	Write a program to demonstrate use of Arithmetic operators	2	CO1
5	LLO 5.1: Apply relevant operator on given data	Write a program to check whether entered year is leap or not	2	CO1
6	LLO 6.1: Apply conditional operator on given data.	Write a program to demonstrate use of Conditional operator	2	CO1
7	LLO 7.1: Implement if,if-else nested if-else statements for solving given task	(*)Write a program to demonstrate use of if, if-else nested if-else statements.	2	CO2
8	LLO 8.1: Apply switch-case statement for Implementing menu driven program.	(*)Write a program to demonstrate the use of switch, case statements.	2	CO2
9	LLO9.1:USE loop to implement iteration	(*)Write a program to demonstrate the use of for loop.	2	CO2
10	LLO 10.1: Implement post tested loop using do-while loop	Write a program to demonstrate the use of while, do while	2	CO2
11	LLO 11.1: Implement array for given data	(*)Write a program to declare, modify and print elements of a given data array.	2	CO3
12	LLO 12.1: Use array to copy data	Write a program to copy one array into second array for given data elements.	2	CO3
13	LLO 13.1: Create a C program for implementing pointers	Write a program to sort numbers in ascending and descending in a given array.	2	CO3
14	LLO 14.1: Perform string operations using standard library functions	(*)Write a program to accept a string from user and handling functions.	2	CO4
15	LLO 15.1: Implement function to add two numbers	Write the program to add two numbers using function	2	CO4

16	LLO 16.1: Implement inbuilt math functions to perform mathematical operations.	Write a program to implement following math functions i) mod() ii) sqrt() iii)pow() iv)exp()	2	CO4
17	LLO 16.1:Implement address and pointer operation for given data	Write a program to use address operator (&) and pointer operator(*)for given data.	2	CO5
18	LLO 17.1:create c program to access elements of array using pointer	Write a program to access the array elements using pointer	2	CO5
19	LLO 18.1:create a c program to implement pointers	Write a program to exchange given values of two variables using pointer.	2	CO5
20	LLO 20.1:.Use structures to implement multiple data types	(*)Create structure DATA using „C“ having members day, month, year and assign initial values to that structure	2	CO5
Minimum 12 for 2 LL Hrs./Week or 24 for 4 LL hrs./Week are to be Performed. *' Marked Practicals (LLOs) Are mandatory Judicial mix of LLOs are to be performed to complete minimum requirement of 12 / 24 as applicable				

## VI.SUGGESTED MICRO PROJECT/ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT (SELF-LEARNING)

### Micro project

**Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her. In special situations where groups have to be formed for micro- projects, the number of students in the group should not exceed three.**

The micro-project could be industry application based, internet-based, workshop- based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs.(Affective Domain Outcomes) .Each student will have to maintain activity chart consisting of individual contribution in the project work and give a seminar presentation of it before submission.. The student ought to submit micro-project by the end of the semester to develop the industry oriented COs.

A suggestive list of micro-projects is given here. Similar micro-projects could be added by the concerned faculty:

- 1 Simple Calculator: Each group will prepare a menu driven program to perform four mathematical operation.
- 2 Bus Reservation System: Each batch will prepare a menu driven program to following operations  
i) Book a Ticket ii) List the information of all the tickets booked
- 3 Employee Record System: Each group will prepare a menu driven program to perform following Operations.  
i). Add Record ii).List Record
- 4 String Manipulation Project: Each group will prepare a menu driven program to perform following operations. (Any two)  
i) Sub Strings ii) Reverse String iii) String Integer iii)Sort a string
5. Matrix operations: Each group will prepare a menu driven program to perform following operation. (Any two)  
i). Matrix addition ii) Matrix Multiplication iii) Matrix Transpose iv)Sum of Diagonal of Matrix.



6. Patterns: Each group will prepare a menu driven program to perform following operation. (Any two)

1	1	*	1
121	12	**	22
12321	123	***	333
1234321	1234	**	4444
123454321	12345	*	55555

7. Digital Clock Using "C"

### Assignment

1. Each of the following expressions involves the use of a library function. Identify the purpose of each expression.

- i. `abs(i - 2 * j)`
- ii. `fabs(x + y)`
- iii. `isprint (c)`
- iv. `isdigit (c)`

2. A 'C' program contains the following declarations and initial assignments:

`int i= 8, j = 5, k;`

`float x = 0.005, y = -0.01, z;`

`char a, b, c = 'c', d = 'd';`

Determine the value of each of the following assignment expressions. Use the values originally assigned to the variables for each expression.

- i. `k = (i + j) y -= x`
- ii. `z = (x + y) x *= 2`
- iii. `K = (x+y)`
- iv. `K = c`
- v. `i += 2`

3. A number is called an Armstrong number if the sum of the cubes of the digits of the number is equal to the number. For example  $153 = 1^3 + 5^3 + 3^3$ . Write a C program that asks the user to enter a number and returns if it is Armstrong or not (use function)

4. Write a C program that calculates the HCF and LCM of two numbers

5. Write a C program to input n numbers in an array, calculate the sum of all even numbers and all odd numbers in the array and print the larger sum

6. Write a program to find area of i) square ii) triangle

7. Write a C program to accept 10 values in an integer array. Display the number of odd, even, and negative numbers.

8. Write a C program to check whether a given string is palindrome or not.
9. Input date, month and year from the user, and using switch case, display in worded format. e.g. input: d=16, m=7, y=1992 output: 16th July, 1992
10. Write a C program, which will print two digit numbers whose sum of both digit is multiple of seven. e.g. 16,25,34.....

#### VII .LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Hardware: Personal computer	All
2	Operating system: Windows XP/Windows 7	All
3	Software: Turbo C	All

#### VIII.SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr. No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Overview of C Programming	CO1	8	2	6	4	12
2	II	Decision and loop control	CO2	10	2	4	4	10
3	III	Array and String	CO3	10	2	4	4	10
4	IV	Functions	CO4	08	2	2	4	8
5	V	Pointers and structures	CO5	12	2	4	4	10
<b>Grand Total</b>				<b>48</b>	<b>10</b>	<b>20</b>	<b>20</b>	<b>50</b>

#### IX . ASSESSMENT

##### METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
<ol style="list-style-type: none"> <li>1. Tests</li> <li>2. Rubrics for COs</li> <li>3. Assignment</li> <li>4. Midterm Exam</li> <li>5. Self-Learning</li> <li>6. Term Work</li> <li>7. Seminar/Presentation</li> </ol>	<ol style="list-style-type: none"> <li>1. End Term Exam</li> <li>2. Micro-project</li> </ol>

## X.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	2	3	-					
CO2	3	2	3	3	-					
CO3	2	2	3	3	-					
CO4	2	2	3	3	-					
CO5	2	2	3	3	-					

**Legends:- High:03, Medium:02, Low:01, No Mapping: -**  
 \*PSOs are to be formulated at the institute level

## XI.SUGGESTED LEARNING MATERIALS/BOOKS

Sr.No	Author	Title	Publisher
1.	Balguruswamy	Programming in C	Tata McGraw Hill, ISBN :978-1-25
2.	Kanetkar	Let us "C"	Edition 2017, BPB Publications 2016 ISBN : 9788183331630
3.	Denis Ritche	C programming Language	Pearson Publication ISBN:10.0131103628
4.	Gottfried	Schaum's outlines programming with C	McGraw Hill Professional ISBN-13.978-0070240353

## XII. LEARNING WEBSITES &amp; PORTALS

Sr.No	Link/Portal	Description
1.	Turbo C editor	Used to edit C programs
2.	<a href="http://www.sourcecodeworld.com">www.sourcecodeworld.com</a>	C programming basics
3.	<a href="http://www.tutorialspoint.com">www.tutorialspoint.com</a>	Basics of C programming
4.	<a href="http://www.cprogramming.com">www.cprogramming.com</a>	It covers both "C" in depth with beginner friendly tutorial and advanced
5.	<a href="http://www.c4learn.com/c-programs/">http://www.c4learn.com/c-programs/</a>	It provides easy to learn material

Name &amp; Signature:

*V.G. Mahendra*  
**Smt. V.G. Mahendra**  
 Lecturer in Electronics  
 (Course Experts)

Name &amp; Signature:

*S.S. Prabhune*  
**Shri. S. S. Prabhune**  
 (Programme Head)

Name &amp; Signature:

*S.B. Kulkarni*  
**Shri. S.B. Kulkarni**  
 (CDC In-charge)

**GOVERNMENT POLYTECHNIC, PUNE**

‘120 – NEP’ SCHEME

<b>PROGRAMME</b>	<b>DIPLOMA IN CE/EE/ET/ME/MT/CM/IT/DDGM</b>
<b>PROGRAMME CODE</b>	<b>01/02/04/05/05/06/07/08</b>
<b>COURSE TITLE</b>	<b>YOUTH LEADERSHIP FOR CLIMATE ACTION</b>
<b>COURSE CODE</b>	<b>HU21202</b>
<b>PREREQUISITE COURSE CODE AND TITLE</b>	<b>NA</b>

**I. LEARNING &ASSESSMENT SCHEME:**

Course Code	Course Title	Course Type	Learning Scheme					Credits	Paper Duration Hrs.	Assessment Scheme										Total Marks
			Actual Contact Hrs./Week			SLH	NLH			Theory			Based on LL &TSL				Based on SL			
			CL	TL	LL					FA-TH	SA-TH	Total	FA-PR		SA-PR		SLA			
													Max	Min	Max	Min	Max	Min		
HU21202	YOUTH LEADERSHIP FOR CLIMATE ACTION	VEC	-	-	-	2	2	1	-	-	-	-	-	-	-	-	-	50	20	50

**Total IKS Hrs for Term: 0 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, IKS – Indian Knowledge System, 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 semester.
2. If a candidate is not securing minimum passing marks in FA-PR (Formative Assessment - Practical) of any course, then the candidate shall be declared as 'Detained' in that semester.
3. If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) 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. \* 15 Weeks
5. 1 credit is equivalent to 30 Notional hours.
6. \* Self-learning hours shall not be reflected in the Timetable.
- 6.\*Self-learning includes micro-projects/assignments/other activities.

**II. RATIONALE:**

Climate change is a global phenomenon that transcends borders. Climate change poses significant threats to biodiversity, ecosystems, and natural resources. Its impacts, such as rising temperatures, extreme weather events, and sea-level rise, affect communities worldwide. Addressing climate change is a collective responsibility to safeguard the planet and its ecosystems for current and future generations. Climate change exacerbates social and economic inequalities, affecting vulnerable communities disproportionately. With increasing climate risks, and exposure to hazards, citizens need to improve clean and green skills.

Mitigating climate change and taking climate action is essential for preserving the Earth's biodiversity, maintaining ecosystem services, and ensuring the sustainability of vital resources upon which human societies depend. By taking climate action, societies can enhance resilience, reduce vulnerability, and promote social and economic stability. Sustainable practices help protect, preserve, and sustain the environment, as well as stimulate economic growth in sectors such as renewable energy and energy efficiency.

Climate action involves transitioning to more sustainable and resource-efficient practices. This includes adopting clean energy sources, improving energy efficiency, and promoting circular economies. Imparting skills to the human resources in the clean and green sectors is also a climate action. Such measures not only mitigate climate change but also contribute to the efficient use of resources and the reduction of environmental degradation.

The national, state, and multilateral efforts, such as the Mission Life, State Climate Action Planning, Paris Agreement, etc. provide a framework for countries to work together in reducing greenhouse gas emissions, adapting to climate impacts, and fostering technology transfer for sustainable development.

**III. COURSE-LEVEL LEARNING OUTCOMES ( CO's)**

Students will be able to achieve & and demonstrate the following COs on completion of course-based learning

**CO1:** Demonstrate a comprehensive understanding of the science behind climate change, its causes, and its impacts on the environment, economy and society.

**CO2:** Understand the principles of water resource management (WRM), water conservation and its application in the context of climate change.

**CO3:** Understand the relationship between climate change and waste management, including the issues and impacts of waste management practices on greenhouse gas emissions.

**CO4:** Demonstrate a comprehensive understanding of energy systems, including sources, distribution, and consumption patterns

**CO5:** Advocate for and implement energy conservation practices at individual, community, and organizational levels to reduce overall energy demand.

**CO6:** Develop a comprehensive understanding of the intricate interconnections between biodiversity and climate, and recognize the reciprocal impacts each has on the other.

**IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT:**

Sr. No	Theory Learning Outcomes(TLO'S) aligned to COs.	Learning content mapped with TLOs.	Suggested Learning Pedagogies	Relevant COs
<b>UNIT-I LIVING WITH CLIMATE CHANGE</b>				
<b>SUBUNIT 1: CLIMATE CHANGE PHENOMENON AND SCIENCE</b>				
1.1	<p><b>TLO 1.1.1</b> Able to articulate the fundamental differences between weather and climate</p> <p><b>TLO 1.1.2</b> Understanding of the basic principles of climate change, including the greenhouse effect, human-induced factors, and the consequences of a warming planet.</p> <p><b>TLO 1.1.3</b> Able to define the concept of a carbon footprint, understanding it as the total amount of greenhouse gases.</p>	<p>1.1.1 Understanding Climate: Weather versus Climate</p> <p>1.1.2 Climate and the Greenhouse Effect</p> <p>1.1.3 Natural and Human-induced Climate Change</p> <p>1.1.4 Carbon footprint</p>	<p>Video Lectures (Online Mode: Link <a href="https://www.mahayouthnet.in/">https://www.mahayouthnet.in/</a>)</p>	1
<b>SUB UNIT 2: CLIMATE CHANGE IMPACTS</b>				
1.2	<p><b>TLO 1.2.1</b> Grasp the foundational science behind climate change, including the greenhouse effect, human-induced emissions, and the role of feedback mechanisms in global warming.</p> <p><b>TLO 1.2.2</b> Identify and analyze key indicators of climate change, such as rising global temperatures, changing precipitation patterns, sea level rise, and the frequency of extreme weather events.</p> <p><b>TLO 1.2.3</b> Understand the diverse climate patterns across India's biogeographic regions, including the Himalayas, Indo-Gangetic Plains, Western Ghats, Eastern Ghats, Deccan Plateau, and coastal regions.</p>	<p>1.2.1 Global impacts and uncertainties</p> <p>1.2.2 Effects on India and its various biogeographic regions</p> <p>1.2.3 Impacts on livelihoods and economy: Agriculture and Horticulture</p> <p>1.2.4 Impacts on Vulnerable Communities: Fishing Communities</p>	<p>Video Lectures (Online Mode: Link <a href="https://www.mahayouthnet.in/">https://www.mahayouthnet.in/</a>)</p>	1

**SUB UNIT 3: CLIMATE ACTION**

1.3	<p><b>TLO1.3.1</b> Understand the concept of climate change mitigation and adaptation and its role in preparing for and responding to the impacts of climate change.</p> <p><b>TLO1.3.2</b> Understand the concept of sustainable development and its three dimensions: economic, social, and environmental.</p> <p><b>TLO1.3.3</b> Identify and articulate the connections between climate change impacts and existing social, economic, and environmental inequalities.</p> <p><b>TLO1.3.4</b> Understand the importance of community-based climate action and initiatives led by local communities in India.</p> <p><b>TLO 1.3.5</b> Understand the concepts of green skills and green work, emphasizing their role in promoting sustainability and environmentally conscious practices in various industries.</p>	<p>1.3.1 Mitigation and Adaptation                  1.3.2 Intergovernmental processes                  1.3.3 Sustainable Development Goals                  1.3.4 Climate Justice                  1.3.5 India’s journey towards Climate Action                  1.3.6 Majhi Vasundhara and Other Initiatives                  1.3.7 Role of Individuals                  1.3.8 Green Skills and Green Work</p>	<p>Video Lectures (Online Mode: Link <a href="https://www.mahayouthnet.in/">https://www.mahayouthnet.in/</a>)</p>	2
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**UNIT-II WATER MANAGEMENT FOR CLIMATE CHANGE**

**SUB UNIT 1: THE NEED OF WATER MANAGEMENT AND CONSERVATION**

2.1	<p><b>TLO 2.1.1</b> Understand the concept of water management and its significance in addressing water-related challenges.</p> <p><b>TLO 2.1.2</b> Describe the water cycle and its role in the distribution and availability of water.</p> <p><b>TLO 2.1.3</b> Identify regions facing water scarcity and understand the factors contributing to water shortages.</p> <p><b>TLO 2.1.4</b> Analyze patterns of human water consumption and its impact on local and global water resources.</p> <p><b>TLO 2.1.5</b> Examine water quality issues, including pollution sources, contaminants, and their effects on ecosystems and human health.</p> <p><b>TLO 2.1.6</b> Recognize the role of community engagement in water conservation efforts and sustainable water management practices.</p> <p><b>TLO 2.1.7</b> Understand the</p>	<p>2.1.1 Water - the basis of life.                  2.1.2 The water cycle and freshwater availability.                  2.1.3 Water use in India and the importance of groundwater.                  2.1.4 Water Resources in Maharashtra.                  2.1.5 Use of water in our lives.                  2.1.6 Virtual Water.                  2.1.7 Traditions of water use and management.                  2.1.8 Water Quality - an important dimension.                  2.1.9 Wastewater: a problem and a potential resource.</p>	<p>Video Lectures (Online Mode: Link <a href="https://www.mahayouthnet.in/">https://www.mahayouthnet.in/</a>)</p>	2
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	concept of wastewater and Identify and analyze the sources of pollutants in wastewater, including industrial discharges, agricultural runoff, and urban sewage.			
<b>SUB UNIT 2: ISSUES AND CHALLENGES IN WATER MANAGEMENT</b>				
2.2	<p><b>TLO 2.2.1</b> Understand the concept of water stress and its implications for a region's ability to meet water demand for various purposes.</p> <p><b>TLO 2.2.2</b> Explore the role of agriculture in water stress, including irrigation practices, cropping patterns, and the impact of changing agricultural practices.</p> <p><b>TLO 2.2.3</b> Understand the concept of water pollution and differentiate between various types of pollutants affecting water bodies.</p> <p><b>TLO 2.2.4</b> Understand the environmental, ecological, and public health impacts of different pollutants in water, such as nutrients, heavy metals, pathogens, and synthetic chemicals.</p> <p><b>TLO 2.2.5</b> Identify common waterborne diseases, such as cholera, typhoid, dysentery, and gastroenteritis, and understand their causative agents.</p> <p><b>TLO 2.2.6</b> Define the challenges associated with inadequate sanitation, including issues related to open defecation, lack of access to sanitary facilities, and the impact on public health.</p>	<p>2.2.1 Water Stress in India.</p> <p>2.2.2 Water resources limitation and increasing use.</p> <p>2.2.3 Water stress in agriculture.</p> <p>2.2.4 Water pollution and contamination.</p> <p>2.2.5 Health impacts of poor water quality.</p> <p>2.2.6 Water management and climate change.</p> <p>2.2.7 The global challenge of water and sanitation.</p> <p>2.2.8 Summary - causes of water stress.</p>	<p>Video Lectures (Online Mode: Link <a href="https://www.mahayouthnet.in/">https://www.mahayouthnet.in/</a>)</p>	2
<b>SUB UNIT 3:TOWARDS SUSTAINABLE WATER MANAGEMENT</b>				
2.3	<p><b>TLO 2.3.1</b> Understand and define the concept of sustainable water management, considering its ecological, social, and economic dimensions.</p> <p><b>TLO 2.3.2</b> Understand the significant initiatives launched by the Government of India/State government which focuses on water resources and management.</p>	<p>2.3.1 Towards sustainable water management</p> <p>2.3.2 Swachh Bharat - The Mission for a Clean India</p> <p>2.3.3 Jal Jeevan Mission - Water for All</p> <p>2.3.4 Atal Bhujal Yojana - Replenish Groundwater</p> <p>2.3.5 Mission Amrit Sarovar - Rejuvenate Water bodies</p> <p>2.3.6 Jalyukt Shivar Abhiyan – Waterscapes.</p>	<p>Video Lectures (Online Mode: Link <a href="https://www.mahayouthnet.in/">https://www.mahayouthnet.in/</a>)</p>	2



**SUB UNIT 4: INDIVIDUAL AND COMMUNITY ACTIONS FOR WATER AND WASTEWATER MANAGEMENT**

2.4	<p><b>TLO 2.4.1</b> Understand the concept of a water audit and its significance in assessing water use, efficiency, and conservation.</p> <p><b>TLO 2.4.2</b> Analyze water use patterns in common household activities, including bathing, washing dishes, laundry, and gardening.</p> <p><b>TLO 2.4.3</b> Understand the definition of greywater and Recognize common sources of greywater in households, including bathroom sinks, showers, bathtubs, and washing machines.</p> <p><b>TLO 2.4.4</b> promote awareness within communities about the benefits of greywater management and its potential impact on water conservation.</p> <p><b>TLO 2.4.5</b> Understand the concept of rainwater harvesting and its significance in sustainable water management.</p> <p><b>TLO 2.4.6</b> Learn different methods used to calculate rainwater harvesting potential</p>	<p>2.4.1 Conduct water audits</p> <p>2.4.2 Save water at home</p> <p>2.4.3 Promote greywater management at home and in the community</p> <p>2.4.4 Spread the word on sustainable water management</p> <p>2.4.5 Calculate Rainwater Harvesting Potential.</p>		2
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**UNIT III: WASTE MANAGEMENT AND CLIMATE ACTION**

**SUBUNIT 1: WHAT IS WASTE?**

3.1	<p><b>TLO 3.1.1</b> Understand the term "domestic waste" and distinguish it from other types of waste generated in different contexts.</p> <p><b>TLO 3.1.2</b> Classify domestic waste into different categories such as organic waste, recyclables, hazardous waste, and non-recyclables.</p> <p><b>TLO 3.1.3</b> Learn various methods used to quantify household waste, including direct measurement, sampling, and estimation techniques.</p> <p><b>TLO 3.1.4</b> Identify specific waste patterns associated with different generations and lifestyles</p> <p><b>TLO 3.1.5</b> Understand the Sustainable Development Goals (SDGs)</p>	<p>3.1.1 Define and enlist types of waste</p> <p>3.1.2 List the components of domestic waste</p> <p>3.1.3 Differentiate between biodegradable and non-biodegradable waste</p> <p>3.1.4 Assess the quantum of waste generated at home</p> <p>3.1.5 Changes in Waste generation over human generations</p> <p>3.1.6 Review lifestyle choices</p> <p>3.1.7 SDGs and Link of Waste with SDGs</p>	<p>Video Lectures (Online Mode: Link <a href="https://www.mahayouthnet.in/">https://www.mahayouthnet.in/</a>)</p>	3
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	<b>TLO 3.1.6</b> Analyze the critical role of waste management in achieving multiple SDGs			
<b>SUBUNIT 2: ISSUES IN WASTE MANAGEMENT</b>				
3.2	<p><b>TLO 3.2.1</b> Emphasizing waste impact on the environment, human health, and overall sustainability.</p> <p><b>TLO 3.2.2</b> Identify health risks associated with improper waste disposal, such as the spread of diseases and exposure to hazardous materials.</p> <p><b>TLO 3.2.3</b> Analyze how waste, particularly organic waste in landfills, contributes to greenhouse gas emissions and climate change.</p>	<p>3.2.1 Why is waste an issue?</p> <p>3.2.2 Health impacts from mismanagement of waste</p> <p>3.2.3 Work conditions of waste workers</p> <p>3.2.4 Waste of natural resources and increased greenhouse gas emissions</p>	<p>Video Lectures (Online Mode: Link <a href="https://www.mahayouthnet.in/">https://www.mahayouthnet.in/</a>)</p>	3
<b>SUBUNIT 3: APPROACHES TO WASTE MANAGEMENT</b>				
3.3	<p><b>TLO 3.3.1</b> Clearly define the waste management hierarchy</p> <p><b>TLO 3.3.2</b> Waste management hierarchy role in guiding sustainable waste management practices such as source reduction, reuse, recycling, energy recovery, and disposal.</p>	<p>3.3.1 Hierarchy of waste management</p> <p>3.3.2 Waste segregation at source</p> <p>3.3.3 Reduce, Reuse, Recycle and Recover</p> <p>3.3.4 Recycling of waste materials</p> <p>3.3.5 Principle of circular economy</p> <p>3.3.6 Avoiding waste by design</p> <p>3.3.7 Composting</p>	<p>Video Lectures (Online Mode: Link <a href="https://www.mahayouthnet.in/">https://www.mahayouthnet.in/</a>)</p>	3
<b>SUBUNIT 4: LEGISLATIONS RELATED TO WASTE MANAGEMENT</b>				
3.4	<p><b>TLO 3.4.1</b> Familiarize yourself with major national and international legislation related to waste management.</p> <p><b>TLO 3.4.2</b> Define Extended Producer Responsibility (EPR) and explain its concept in the context of environmental management.</p> <p><b>TLO 3.4.3</b> Define biomedical waste and distinguish it from other types of waste. Identify the various sources and types of biomedical waste generated in healthcare facilities.</p>	<p>4.1 Municipal Solid Waste Management Rules 2016</p> <p>4.2 Plastic Waste Management Rules</p> <p>4.3 Extended Producer Responsibility (EPR)</p> <p>4.4 Biomedical Waste Management</p> <p>4.5 Preventive Measures for Manual Scavenging</p>	<p>Video Lectures (Online Mode: Link <a href="https://www.mahayouthnet.in/">https://www.mahayouthnet.in/</a>)</p>	3
<b>SUBUNIT 5: ACTION FOR IMPROVING WASTE MANAGEMENT</b>				
3.5	<p><b>TLO 3.5.1</b> Develop skills in data collection methods for waste assessment, such as waste audits, surveys, and interviews.</p>	<p>5.1 Waste assessment in your community or town</p> <p>5.2 Setting up a compost unit</p>	<p>Video Lectures (Online Mode: Link <a href="https://www.mahayouthnet.in/">https://www.mahayouthnet.in/</a>)</p>	3

	<p><b>TLO 3.5.2</b> Analyze collected data to identify patterns, trends, and areas for improvement in waste management practices.</p> <p><b>TLO 3.5.3</b> Define composting and explain the biological processes involved in the decomposition of organic matter.</p> <p><b>TLO 3.5.4</b> Explore different composting methods, such as aerobic and anaerobic composting, and choose the most suitable technique for the compost unit.</p> <p><b>TLO 3.5.5</b> Explore different biogas production technologies, such as continuous stirred tank reactors (CSTR) and anaerobic digesters.</p>	5.3 Biogas: Is it a possibility?		
<b>UNIT IV: ENERGY MANAGEMENT AND CLIMATE ACTION</b>				
<b>SUBUNIT 1: ENERGY IN OUR LIVES</b>				
4.1	<p><b>TLO 4.1.1</b> Identify the key principles of efficient energy use and conservation.</p> <p><b>TLO 4.1.2</b> Familiarize yourself with different energy sources, including renewable and non-renewable options.</p> <p><b>TLO 4.1.3</b> Understand the connection between energy production, consumption, and climate change.</p> <p><b>TLO 4.1.4</b> Understand India's commitments to sustainable energy at the national and international levels, including agreements</p>	<p>4.1.1 Energy and quality of life 4.1.2 Sources of energy 4.1.3 Energy and C Change 4.1.4 Judicious use of non-renewable energy resources 4.1.5 A Just Transition 4.1.7 India's commitment to sustainable energy 4.1.8 Policies and Programs for Energy Management 4.1.9 Clean Energy for Cooking</p>	<p>Video Lectures (Online Mode: Link <a href="https://www.mahayouthnet.in/">https://www.mahayouthnet.in/</a>)</p>	4

<b>SUBUNIT 2: YOUTH ACTION TO IMPROVE ENERGY MANAGEMENT</b>				
<b>4.2</b>	<p><b>TLO 4.2.1</b> Recognize the role of youth in driving positive change in energy management.</p> <p><b>TLO 4.2.2</b> Understand how youth-led initiatives can influence energy policies, behaviours, and practices.</p> <p><b>TLO 4.2.3</b> Identify and promote energy-efficient practices in daily life, schools, and communities.</p>	<p>4.1.1 Avoid energy wastage</p> <p>4.2.2 Energy-efficient appliances</p> <p>4.2.3 Renewable Energy-Specific Policies and Schemes</p> <p>4.2.4 Low Carbon Lifestyles book</p>	<p>Video Lectures (Online Mode: Link <a href="https://www.mahayouthnet.in/">https://www.mahayouthnet.in/</a>)</p>	4
<b>SUBUNIT 3: PROMOTE SUSTAINABLE ENERGY AT HOME, INSTITUTION AND IN THE COMMUNITY</b>				
<b>4.3</b>	<p>TLO 4.3.1 Identify and calculate energy requirements at the household level and enlist ways of efficient energy usage</p> <p>TLO 4.3.2 Identify opportunities for improving public energy use in their village or town</p> <p>TLO 4.3.3 Design surveys that effectively capture data on energy-efficient appliance availability and usage patterns.</p> <p>TLO 4.3.4 Identify and analyze emerging technologies within the energy sector that require specialized skills.</p> <p>TLO 4.3.5 Demonstrate the ability to map existing skills within the energy sector workforce.</p> <p>TLO 4.3.6 Analyze skill gaps and their implications for the industry.</p>	<p>4.3.1 Energy audit at home or institution</p> <p>4.3.2 Energy saving opportunities</p> <p>4.3.3 Energy access survey</p> <p>4.3.4 Surveys of energy-efficient appliance availability and use</p> <p>4.3.5 Survey of renewable energy use</p> <p>4.3.6 Survey energy sector skilling opportunities</p> <p>4.3.7 Share study findings with policymakers</p>	<p>Video Lectures (Online Mode: Link <a href="https://www.mahayouthnet.in/">https://www.mahayouthnet.in/</a>)</p>	5
<b>UNIT V: BIODIVERSITY CONSERVATION AND CLIMATE ACTION</b>				
<b>SUBUNIT 1: BIODIVERSITY IN OUR LIVES</b>				
<b>5.1</b>	<p><b>TLO 5.1.1</b> Understand the concept of biodiversity and its components</p> <p><b>TLO 5.1.2</b> Clearly define the concept of biocultural diversity, explaining the interconnectedness of biological diversity (biodiversity) and cultural diversity.</p> <p><b>TLO 5.1.3</b> Clearly define the concept of human dependence on biodiversity, outlining the various ways in which humans rely on</p>	<p><b>5.1.1</b> What is biodiversity?</p> <p><b>5.1.2</b> What is Biocultural diversity?</p> <p><b>5.1.3</b> Nature of Human Dependence on Biodiversity</p> <p><b>5.1.4</b> Biodiversity resources in your landscape</p>	<p>Video Lectures (Online Mode: Link <a href="https://www.mahayouthnet.in/">https://www.mahayouthnet.in/</a>)</p>	6

	diverse ecosystems for survival and well-being. <b>TLO 5.1.4</b> Develop the ability to identify and categorize the various forms of biodiversity present in the specific landscape, including plants, animals, microorganisms, and their interactions.			
<b>SUBUNIT 2: THREATS TO BIODIVERSITY</b>				
5.2	<b>TLO 5.2.1</b> Categorize and differentiate between natural and anthropogenic threats to biodiversity, including habitat loss, pollution, climate change, invasive species, and overexploitation. <b>TLO 5.2.2</b> Clearly define the concepts of biocultural diversity and climate change, highlighting the interconnectedness between biological diversity, cultural diversity, and changing climatic conditions.	<b>5.2.1 Threats to biodiversity</b> <b>2.2.2 Biocultural diversity and climate change</b>	Video Lectures (Online Mode: Link <a href="https://www.mahayouthnet.in/">https://www.mahayouthnet.in/</a> )	6
<b>SUBUNIT 3: CONSERVING BIODIVERSITY</b>				
5.3	<b>TLO 5.3.1</b> Clearly define the concept of biodiversity conservation, emphasizing its importance in maintaining ecological balance and supporting human well-being. <b>TLO 5.3.2</b> Explore the historical background that led to the development of forest acts, considering factors such as colonial influences, resource extraction, and changing societal attitudes towards forests. <b>TLO 5.3.3</b> Clearly define the concept of biodiversity conservation actions, emphasizing the multifaceted approaches and strategies employed to protect and sustain biodiversity.	<b>5.3.1</b> Approaches to conservation of biodiversity. <b>5.3.</b> Key legislations for biodiversity conservation <b>5.3.3</b> Actions for biodiversity conservation at various levels, including awareness raising and advocacy in the community	Video Lectures (Online Mode: Link <a href="https://www.mahayouthnet.in/">https://www.mahayouthnet.in/</a> )	6

**Note: All above Units are Mandatory units. (In Online mode, only Units nos 1 and 2 are Mandatory and units nos 3,4, and 5 are Elective/optional)**

#### V. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL/TUTORIAL EXPERIENCES.

NOT APPLICABLE

**VI. SUGGESTED MICROPROJECT/ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT (SELF-LEARNING)**
**Table 01: Individual Activities**

Sr. No	Unit Name	Activity	Activity Details
1	Living with Climate Change	Calculation of your carbon footprint online	To Calculate your carbon footprint online at <a href="https://www.unfccc.int/">https://www.unfccc.int/</a> <a href="https://www.carbonfootprint.com/">https://www.carbonfootprint.com/</a> Use two carbon footprint calculators available online to Prepare your report for Carbon footprint. Compare the calculators used and suggest which is the better calculator with the reasons.
2	Water Management and Climate Action	Conducting water audits	To conduct a Personal-level water audit. 1. Track your overall water usage: a) Read your water meter, b) Estimate usage without a meter 2. Measure individual fixture flow rates: a) Faucet and showerhead flow b) Toilet flush: 3. Monitor your water habits: a) Keep a water use log b) Observe your routines 4. Analyze your findings: a) Compare your usage to benchmarks, b) Identify potential leaks c) Prioritize areas for improvement 5. Implement water-saving strategies: a) Install water-efficient fixtures b) Shorten showers and bath times c) Run appliances only when full d) Fix leaky faucets promptly e) Utilize alternative water sources
3	Waste Management and Climate Action	Surveying Home waste	To find out How much waste is generated in your home every day conduct a home survey for a week Analyze as per the following: a) What makes up the maximum part of the waste? b) How much of what was thrown out could have been reused or recycled? c) Could the amount of garbage be reduced? List the ways to reduce waste at home. Calculate: a) Waste generated over a week (in grams) divided by 7= waste (gms)/ day, b) Waste (gms)/ day divided by the number of persons in your house= Waste (gms)/ day/capita Using your survey results, you can calculate the approximate waste generated by the entire population of a block of flats, township, village, town, city, etc.
4	Energy Management and Climate Action	Preparation of Survey report on energy-efficient appliances.	To prepare a Survey report on energy-efficient appliances, their availability and use. 1. Availability of Energy-Efficient Appliances: 2. Use of Energy-Efficient Appliances 3. Government Policies and Incentives 4. Technological Advancements 5. Environmental Impact and Consumer Trends
5	Biodiversity Conservation and Climate Action	Preparation of a Survey report on Biodiversity resources in your landscape	To prepare a Survey report on Biodiversity resources in your landscape based on any one point among the list given below. 1. List of trees, plants, and shrubs in the village/ town outskirts, their classification, occurrence, and usage study. 2. Draw a biocultural map of the landscape of the village/ town, the diversity of trees (mother trees) and those who maintain it 3. A village called Tree: Understand a tree as an ecosystem and the biodiversity associated with the tree. 4. Ranmeva special study 5. Dietary diversity across three generations, a 'change over time' study.

Table 2: Group Activity

Sr. No.	Unit Name	Community Project Name	Activity Details
1.	Living with Climate Change	Conduction of Feasibility Study of Renewable Energy	Conduct a feasibility study on implementing renewable energy sources (such as solar, wind, or hydroelectric power) for a specific area or institution. Analyze costs, benefits, environmental impacts, and logistics involved in transitioning to renewable energy.
2.	Water Management and Climate Action	Preparation of water audit for the college campus.	To prepare a water audit for the college campus based on the following points 1. Gather Information: 2. Identify Water Use Areas: 3. Assess Indoor Water Usage: 4. Evaluate Outdoor Water Usage: 5. Measurements and Inspections: 6. Data Analysis: 7. Recommendations for Conservation: 8. Cost-Benefit Analysis: 9. Create an Action Plan: 10. Implementation and Monitoring: 11. Educational Outreach: 12. Documentation and Reporting:
3.	Waste Management and Climate Action	Conduction of survey on Waste assessment in your locality.	1. Conduct a survey of waste management systems in your town/locality. Observe all the stages of waste management, and note who is involved at each stage viz. Waste collection Transport Processing in different ways Disposal etc. 2. Analysis of waste management in your /locality. 3. Assessment of Waste Segregation in your /locality.
4	Energy Management and Climate Action	Conduction of energy audit at home or Institute	To conduct an energy audit at home or Institute based on the following points. Analyze your findings based on the energy audit and suggest necessary actions to minimize energy consumption. 1. Gather information and Create a checklist about the following. <b>1. Lighting:</b> <ul style="list-style-type: none"> <li>• Turn off lights in unoccupied rooms.</li> <li>• Replace incandescent bulbs with LEDs</li> <li>• Utilize natural light whenever possible</li> </ul> <b>2. Heating and Cooling:</b> <ul style="list-style-type: none"> <li>• Set your thermostat to energy-efficient temperatures (25°C in summer, 20°C in winter)</li> <li>• Seal air leaks around windows and doors.</li> <li>• Clean or replace air filters regularly.</li> </ul> <b>3. Appliances:</b> <ul style="list-style-type: none"> <li>• Unplug electronics and chargers when not in use.</li> <li>• Wash clothes and dishes in cold water whenever possible.</li> <li>• Use energy-efficient appliances when purchasing new ones</li> </ul> <b>4. Insulation:</b> <ul style="list-style-type: none"> <li>• Check your attic and basement for proper insulation.</li> <li>• Seal any gaps or cracks around pipes and vents.</li> </ul> <b>5. Suggest corrective actions.</b>

Sr. No.	Unit Name	Community Project Name	Activity Details
5.	Biodiversity Conservation and Climate Action	Preparation of report on Bio-Cultural Diversity Conservation	Prepare a report on Bio-Cultural Diversity Conservation. The report should include : <b>a) Introduction</b> i) What is biodiversity? ii) What is its importance in our life? iii) Connections of human beings with their nonliving surrounding and with living forms. <b>b) Biodiversity resources in your landscape -:</b> List of trees, plants, and shrubs in the village/ town outskirts, their classification, occurrence, and usage study. <b>c) Understand a tree as an ecosystem and the biodiversity associated with the tree.</b>
<p><b>Note:</b> (1) <b>Individual activities:</b></p> <p>The student should complete <b>any Three activities</b> among the list given in Table No. 01. above. ( <b>Total Marks: 30 i.e. 10 Marks for each activity</b>)</p> <p>(2) <b>Group activity:</b></p> <p>Students should complete <b>any One Community Project</b> among the list given in Table No. 02 above. (<b>Total Marks: 20</b>)</p>			

#### VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	NIL ( SLA Course)	NIL

#### VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & AND ASSESSMENT PURPOSE

(Specification Table)

NOT APPLICABLE



**IX. ASSESSMENT METHODOLOGIES/TOOLS**

<b>Formative assessment (Assessment for Learning)</b>	<b>Summative Assessment (Assessment of Learning)</b>
Individual activities and group activities. (50 marks)	Online Examination and issue of online certificate. (Total 4 Certificates)

**Note: Student will be awarded 1 credit only upon submission of certificates**

- i) One Certificate on combined completion of Units 1 and 2 and**
- ii) One Certificate each on completion of Units nos. 3,4, and 5.**

**A total of 4 Certificates are needed to be submitted which will be issued online along with the submission of Individual activities and Group activities.**

**X. SUGGESTED COs- POs MATRIX FORM**

**NOT APPLICABLE**

**XI. SUGGESTED LEARNING MATERIALS/BOOKS**

<b>Sr.No</b>	<b>Description</b>	<b>Mode</b>	<b>Remarks</b>
1	Learning material.	Learning material is available in PDF form	Learning material is available for all units in PDF form at the institute website.

**XII. LEARNING WEBSITES & PORTALS**

<b>Sr.No</b>	<b>Web Link /Portal</b>	<b>Description</b>
1	(Online Mode: Link <a href="https://www.mahayouthnet.in/">https://www.mahayouthnet.in/</a> )	Learning material is available online in the course menu after registration for this online course for all units.

**XIII. ROLE OF STUDENT AND FACULTY:****(a) ROLE OF STUDENT.**

- 1. i) Course Registration:** Students should register for this course by adopting the normal procedure for registration as applicable for other courses, as per the schedule declared in the academic calendar through his/her MIS login.
- ii) Online Registration:** Online registration for this **Self-paced course “YOUTH LEADERSHIP FOR CLIMATE ACTION”** in online mode by using the URL as under.

“ URL for online registration: <https://www.mahayouthnet.in/>

Students may join the course by scanning the QR Code as mentioned below.



**(Important Note: Students must complete both actions “a” and “b” as mentioned above. Merely completing the registration process in the Institute MIS will not get the student registered for this course.)**




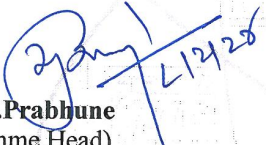

2. Students should complete the **Module No. 01 and 02** of this course in online mode and complete the online assignments as available in the online module. Upon completion of these activities, the student will receive a certificate of completion for Units No. 1 and 2. (Will be generated Online from The portal)
3. Students should take up online **Module Nos. 03, 04 and 05 (which are available as “Elective Modules” in the same online module, No separate registration is needed for these modules)** and complete all unit-wise assignments as available in the online module. Upon completion of these activities, students will receive a separate certificate of completion for each unit i.e. **Units 03,04 and 05** i.e. **three certificates**. (Will be generated Online from The portal)
4. Student must submit all 4 certificates (first certificate upon completing units nos. 1 and 2 and individual certificates upon completing units nos 3,4 and 5. A Total 4 certificates are needed to be submitted to the concerned faculty assigned for this course by the Concerned Head of the Department)
5. **Most Important Note regarding the award of 1 credit for this course: student must complete any 3 individual activities among the list of activities mentioned in table no 1 above AND must complete any 1 group activity AND submit all 4 certificates (generated in online mode upon completion of all 5 units in online study mode). Upon satisfying these conditions, the student will be awarded 1 credit for this course (SLA).**
6. **Detention/ Fail:** If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as a 'fail' and will have to repeat and resubmit SLA work.

**(b) ROLE OF FACULTY:**

1. i) **Regarding confirmation of Course Registration:** Faculty should confirm that the course registration has been confirmed by the concerned registration in charge and HOD from their MIS login.  
  
ii) **Online Registration for the course:** Faculty should confirm that the student has registered for the course in online mode by scanning the QR code OR through the link provided by the portal for registering for the **Self-paced course “YOUTH LEADERSHIP FOR CLIMATE ACTION”** in online mode. Faculty should collect screenshots from the students and maintain a record of such screenshots for the concerned semester/term.
2. **Regarding submissions to be accepted:** The faculty should ensure that the student has completed all 5 modules as mentioned above. The faculty should get the 4 certificates (per student) submitted as submission against completion of the online self-paced course **“YOUTH LEADERSHIP FOR CLIMATE ACTION”** during the term/semester for which, the student have registered. Also, the Faculty should accept the submissions from each student regarding the completion of the group activities as well as individual activities as mentioned above. This activity of submission must be completed before the last date of submission for other courses. ie before the provisional detention schedule as per the academic calendar for that term.

**3. Regarding SLA assessment and allocation of Marks:** Faculty should assess the submission with following guidelines.

- i) Upon submission of online generated all 4 certificates (upon completion of online modules from the portal), the student should be considered eligible for the award of 1 credit along with satisfying the following conditions. ( Faculty must not assess the individual activities and group activities if the student fails to submit all 4 certificates as proof of completion of the online course)
- ii) Upon accepting the submission concerning individual activities and group activities, the assessment of these activities should be done by the faculty as per the assessment norms mentioned above in “VI” titled “**SUGGESTED MICROPROJECT/ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT (SELF-LEARNING)**”
- iii) Faculty should preserve the record of student-wise allotted marks in the rubrics provided for SLA assessment.
- iv) FACULTY should fill UP the marks of the student in the MIS mark sheet, only if the student has completed the online course ( submitted all 4 certificates) and assessment of the group activities along with individual activities has been completed within the term schedule.
- v) In case the student fails to complete “ iv” above, the faculty should fill up the marks obtained by the student for the part-submission and fill up those marks in the MIS mark sheet.

Name & Signature:	
 <b>Shri. Nitin D. Toradmal</b> Lecturer in Electronics Govt. Polytechnic, Pune	 <b>Shri. Balaji Vharkat</b> UNICEF, Maharashtra
 <b>Shri. Girish W. Sonone</b> Lecturer in Electronics Govt. Polytechnic, Mumbai	
Name & Signature:	Name & Signature:
 <b>Shri.S.S.Prabhune</b> (Programme Head)	 <b>Shri.S.B.Kulkarni</b> (CDC In-charge)