GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

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

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme										
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	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.

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:

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
	UNIT I VOCABULARY (CL Hrs. -10, Marks-12)			
1.	TLO 1.1 Use transcription to pronounce words correctly. TLO 1.2 Use prefixes and suffixes for flexibility and precision in language. TLO 1.3 Employ synonyms and antonyms to express similarity and contrast between words. TLO 1.4 Use Homophones to expand their vocabulary. TLO 1.5 Make use of the collocations correctly.	1.1 Phonetics: Vowels (12), Consonants (24), Diphthongs (8) 1.2 Prefix & Suffix: Definition & Examples, List of common prefixes and suffixes 1.3 Synonyms & Antonyms: Vocabulary expansion, context & Usage 1.4 Homophones: Identifying Homophones, Meaning & Context, Vocabulary Expansion 1.5 Collocations: Definition & identification, types of collocations.	Language Lab Drill, Classroom learning, Reference Books & NPTEL.	**CO1**
	UNIT II PARAGRAPH AND DIALOGUE WRITING (CL Hrs. -06, Marks-12)			
2.	TLO 2.1 Formulate paragraphs with Synchronized sentence structure on the given situation/topic. TLO 2.2 Develop dialogues to practice language skills in a structured and meaningful way.	**2.1 Types of paragraphs:** Technical, Descriptive and Narrative **2.2 Dialogue Writing:** i. Greetings ii. Development iii. Closing Sentence.	Classroom learning Skit, Language Lab, YouTube & videos	**CO2**
	UNIT III COMPREHENSION - SEEN AND UNSEEN PASSAGES (CL-Hrs. - 16, Marks-24)			
3.	TLO 3.1 Respond to the given questions of the specified passage. TLO 3.2 Formulate sentences using new words TLO 3.3 Use correct syntax to construct meaningful sentences for the given situation. TLO 3.4 Interpretation of passages in written and Spoken Form.	3.1 Passages from MSBTE workbook 1. Say No to Plastic bags 2. Interview of Dr. APJ Abdul Kalam 3. Maximum Achievements 4. Be Remarkable 5. Arunima Sinha: A Biography 6. Roses of Gratitude 3.2 Importance of Comprehension 3.3 Unseen Passages3.4 Interpretation of passages in written and Spoken Form.	Classroom learning, interactive sessions & discussion	**CO3**

	UNIT- IV COMMUNICATIVE LANGUAGE (CL-Hrs. -07, Marks-14)			
4.	TLO 4.1 Describe technical objects with specifications. TLO 4.2 Explain the given picture in grammatically correct language. TLO 4.3 Diary Entry on situations. TLO 4.4 Translate from English to Marathi/Hindi- and vice versa.	4.1 Technical objects: i. Heading ii. Description of Technical objects. 4.2 Picture Description: i. Situational picture. ii. Describe in your own words 4.3 Diary Entry : i. Date ii. Content iii. Name of the writer 4.4 Translation of paragraph from English to Marathi/Hindi-Vice versa (Question not to be asked on Translation in Theory Examination)	Language Lab, Pictures on situations and classroom learning.	CO4
	UNIT- V PRESENTATION SKILLS (CL Hrs. - 06, Marks- 08)			
5.	TLO 5.1 Cultivate/Develop the habit of being presentable TLO 5.2 Formulate speeches for occasions TLO 5.3 Prepare PowerPoint presentation TLO 5.4 Use appropriate body language for effective communication	5.1 Dressing & Grooming : i. Dressing for the occasion. ii. Proper grooming 5.2 Speech Writing: i. Situation ii. Salutations iii. Introduction of the topic iv. Description/Body v. Conclusion 5.3 PowerPoint Presentation: i. Layout ii. Font size iii. Colour combination 5.4 Kinesics : i. Facial expressions ii Eye contact iii Postures iv Gestures	Classroom Learning & Language Lab.	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 transcription in the correct form. LLO 1.2 Learn to differentiate vowels, diphthongs and consonants.	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: *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
			Grand Total	**45**	**13**	**20**	**37**	**70**

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-
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.	http://nptel.ac.in/courses/106102064/1	Online Learning Initiatives by IITs and IISc
2.	www.scilab.org/-SCILab	Signal processing, statistical analysis, and image enhancement.
3.	www.mathworks.com/product/matlab/-MATLAB	Applications of concepts of Mathematics to coding.
4.	Spreadsheet Applications	Use of Microsoft Excel, Apple Numbers, and Google Sheets.
5.	https://ocw.mit.edu/	MIT Courseware

Name & Signature:

Mr. V.V. Kulkarni
Lecturer in English

Dr. S. P. Palve
Lecturer in English

(Course Experts)

Name & Signature:

Dr. D.N. Rewadkar
(Programme Head)

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GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMA IN ET / CM / IT
PROGRAMME CODE	03/ 06 / 07
COURSE TITLE	ENGINEERING GRAPHICS
COURSE CODE	ME11202
PREREQUISITE COURSE CODE & TITLE	NA

I. LEARNING & ASSESSMENT SCHEME

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

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
	UNIT-I BASIC ELEMENTS OF DRAWING (CL Hrs-04, Marks-04)			
1.	TLO 1.1 Prepare drawing using drawing instruments. TLO 1.2 Use IS SP-46 for dimensioning TLO 1.3 Use different types of lines. TLO 1.4 Draw regular geometrical figures. TLO 1.5 Draw figures having tangency constructions.	1.1 Drawing Instruments and supporting material: method to use them with applications. 1.2 Standard sizes of drawing sheets (ISO-A series) 1.3 I.S. codes for planning and layout. 1.4 Letters and numbers (single stroke vertical) 1.5 Convention of lines and their applications. 1.6 Scale - reduced, enlarged & full size 1.7 Dimensioning techniques as per SP-46 (Latest edition) – types and applications of chain, parallel and coordinate dimensioning 1.8 Geometrical constructions	Model Demonstration	CO1, CO4
	UNIT-II ENGINEERING CURVES AND LOCI OF POINTS (CL Hrs-06, Marks-12)			
2	TLO 2.1 Explain different engineering curves with areas of application. TLO 2.2 Draw different conic sections. TLO 2.3 Draw involute and cycloidal curves. TLO 2.4 Draw helix and spiral curves from the given data TLO 2.5 Plot Loci of points from given data.	2.1 Concept and understanding of focus, directrix, vertex and eccentricity. Conic sections. 2.2 Methods to draw an ellipse by Arcs of Circle method & Concentric circles method. 2.3 Methods to draw a parabola by Directrix-Focus method & Rectangle method 2.4 Methods to draw a hyperbola by Directrix-Focus method. 2.5 Methods to draw involutes: circle & pentagon 2.6 Methods to draw Cycloidal curve: cycloid, epicycloid and hypocycloid 2.7 Methods to draw Helix & Archimedean spiral. 2.8 Loci of points on Single slider crank mechanism with given specifications.	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 squires (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
		Grand Total		30	0	0	50	50

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, NoMapping: -
*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	Jeyapoovan 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.	https://www.youtube.com/watch?v=dmt6_n7Sgcg	Free Hand Sketches
2.	https://www.youtube.com/watch?v=dmt6_n7Sgcg	Orthographic Projection
3.	https://www.youtube.com/watch?v=3WXPanCq9LI	Basics of Projection
4.	https://www.youtube.com/watch?v=fvjk7PlxAu0	Introduction to Engineering Graphics
5.	https://www.youtube.com/watch?v=cmR9cfWJRUU	Basics of AutoCAD

Name & Signature: **Mr. M. R Mundhe** Lecturer in Mechanical Engineering (Course Experts)	**Mr. R. S.Solanke** Lecturer in Mechanical Engineering
Name & Signature: **Dr. D.N.Rewadkar** (Programme Head)	Name & Signature: **Shri. S.B.Kulkarni** (CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

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

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme										
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	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,@S - 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 Photoectricity 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
	UNIT-I GENERAL PHYSICS (CL Hrs-07, Marks-10)			
1.	**TLO 1.1:** . 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.	**1.1. Units and Measurement** 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. **1.2 Types of Motion** Displacement, Velocity, Acceleration and retardation Angular displacement, Angular velocity, Angular acceleration and Units. Three equations of angular motion. SHM and its application.	Chalk and board Improved lecture, Tutorial Assignment, and Demonstration	**CO1**
	UNIT-II ELECTROSTATICS (CL Hrs-09, Marks-14)			
2	**TLO 2.1** Describe properties of electric lines of force. **TLO 2.2** Calculate electrostatic force, electric field and electric potential difference of the given static charge. **TLO 2.3** Calculate the equivalent capacity and energy stored in the combination of the capacitors.	**2.1 Electric charge**, 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. **2.2 Electric potential:** Explanation, Definition, Potential due to a point charge, potential due to a charged sphere, potential of the earth, absolute electric potential, analytical treatment. **2.3 Electric Capacitor:** Capacitance Introduction of conductor, unit, principle of condenser, parallel plate condenser, capacitances in series and parallel, Super Capacitors and Application, analytical treatment.	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
	UNIT-III CURRENT ELECTRICITY (CL Hrs-09, Marks-14)			
3	**TLO 3.1**. State and Explain Ohm's law. **TLO 3.2**. Explain the principle of the potentiometer and its application.	**3.1 Current**, 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. **3.2 Potentiometer,** Principle of the potentiometer, Potential gradient, Construction of potentiometer, Applications of potentiometer, E.M.F., Comparison of E.M.F. using potentiometer.	Chalk and board, Improved lecture, Tutorial Assignment, Demonstration	CO3
	UNIT- IV MAGNETISM (CL Hrs-05, Marks-08)			
4	TLO.4.1. Calculate Magnetic induction for the given conductor. TLO 4.2 Explain Electromagnetism with its applications.	**4.1 Magnetic effect of electric current,** Magnetism, Intensity of magnetic field, Magnetic induction, Magnetic Flux, Magnetic lines of force and its Properties, Analytical treatment. **4.2Electromagnetism** and its application.	Simulation, Model Display, Demonstration Chalk and board, Presentations.	CO4
	UNIT –V OPTICS AND LASER (CL Hrs-07, Marks-12)			
5	**TLO 5.1**. State laws of reflection and refraction. Describe the phenomenon of total internal reflection. **TLO 5.2** Distinguish between optical fibre communication systems and ordinary systems. **TLO 5.3** Differentiate between properties of ordinary light and laser light. State applications of laser in different fields	**5.1 Light:** 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. **5.2 Fiber optics**: 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.	Simulation, Demonstration, Flipped Classroom, Collaborative Learning, Case Study, chalk and board etc.	CO5

		5.3 Laser: 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.		
UNIT –VI MODERN PHYSICS (CL Hrs-08, Marks-12)				
6	**TLO 6.1.** Explain the production of X-rays. Describe the properties and applications of X-rays in different fields. **TLO 6.2.** Describe properties of photon Derive Einstein's photoelectric equation. Explain the working of a given photoelectric device.	**6.1 X-ray:** 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. **6.2 Photo electricity:** 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.	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
			Grand Total	**45**	**18**	**25**	**27**	**70**

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 & PORTALS

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

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

Name & Signature:

Smt. D.V. Saurkar
Lecturer in Physics

Mr. N.S. Salave
Lecturer in Physics

Mr A.D. Ghorpade
Lecturer in Physics

(Course Experts)

Name & Signature:

Dr. D.N. Rewadkar
(Programme Head)

Name & Signature:

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

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMAIN CM/IT
PROGRAMME CODE	06/07
COURSE TITLE	BASIC MATHEMATICS
COURSE CODE	SC11206
PREREQUISITE COURSE CODE & TITLE	NA

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme										
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL &TSL Practical				Based on SL		Total Marks
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
SC11206	BASIC MATHEMATICS	AEC	4	2	-	2	8	4	3	30	70	100	40	-	-	-	-	25	10	125

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.

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:

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)

Studentswillbeabletoachieve&demonstratethefollowing CO'soncompletionofcourse-basedlearning

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
	UNIT-I ALGEBRA (CL Hrs-12, Marks-14)			
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. 1.3Matrices: 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 (Indian Mathematics).	Improved Lecture Tutorial Assignment Demonstration Simulation	CO1

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Sr. No.	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
	UNIT-II TRIGONOMETRY (CL Hrs-16, Marks-14)			
2	TLO 2.1: Apply the concept of Compound angle, allied angle, and multiple angles to solve the given simple engineering problem(s). TLO 2.2: Apply the concept of Sub-multiple angle to solve the given simple engineering-related problem(s). TLO 2.3: Apply the concept of factorization and de-factorization formulae to solve the given simple engineering problem(s). TLO 2.4: Investigate given simple problems by utilizing inverse trigonometric ratios. TLO 2.5: Use concepts given in Ancient Indian Mathematics for trigonometry to solve given problems.	2.1 Trigonometric ratios of allied angles, compound angles, multiple angles (2Λ, 3Λ), and submultiples angles (without proof). 2.2 Factorization and De factorization formulae (without proof). 2.3 Inverse Trigonometric Ratios and related problems. 2.4 Principal values and the relation between trigonometric and inverse trigonometric ratios. 2.5 Trigonometry in Indian Knowledge System: The Evolution of Sine Function in India. 2.6 Indian Trigonometry: Basic Indian Trigonometry - Introduction and Terminology (From Ancient Beginnings to Nilakantha). 2.7 Trigonometry in Indian Knowledge System: Pythagorean triples in Sulabasutras.	Improved Lecture Tutorial Assignment Demonstration Simulation	CO2
	UNIT-III STRAIGHT LINE (CL Hrs-06, Marks-08)			
3	TLO 3.1 Calculate the angle between given two straight lines. TLO 3.2 Formulate equation of straight lines related to given engineering problems. TLO 3.3 Identify the perpendicular distance from the given point to the line. TLO 3.4 Calculate theperpendicular distance between the given two parallel lines. TLO 3.5 Use geometry given in Sulabasutras to solve the given problems.	3.1 Straight line and slope of a straight line: The angle between two lines Condition of parallel and perpendicular lines 3.2 Various forms of straight lines: a. General form b. Slope-point form c. Slope-intercept form d. Two-point form e. Double intercept form 3.3 Perpendicular distance from a point on the line 3.4 Perpendicular distance between two parallel lines 3.5 Geometry in Sulabasutras in Indian Knowledge System: a. Construction of square b. Circling the square	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 DIFFERENTIAL CALCULUS (CL Hrs-16, Marks-20)			
4	TLO 4.1: Solve the given simple problems based on functions. TLO 4.2: Solve the given simple problems based on rules of differentiation. TLO 4.3: Obtain the derivatives of composite, implicit, parametric, inverse, logarithmic, and exponential functions. TLO 4.4: Apply the concept of differentiation to find the given equation of tangent and normal. TLO 4.5: Apply the concept of differentiation to calculate maxima, minima, and radius of curvature for a given function. TLO 4.6: Familiar with the concept of calculus given in Indian Mathematics.	4.1 Functions and Limits: Concept of function and simple examples. 4.2 Functions and Limits: Concept of limits without examples. 4.3 Derivatives: Rules of derivatives such as sum, product, and quotient of functions. 4.4 Derivatives: Derivative of composite functions (chain rule), implicit and parametric functions. 4.5 Derivatives: Derivatives of inverse, logarithmic, and exponential functions. 4.6 Applications of derivative: Second-order derivative without examples, equation of tangent and normal, maxima and minima, radius of curvature. 4.7 Calculus in Indian Knowledge System: The Discovery of Calculus by Indian Astronomers.	Improved Lecture Tutorial Assignment Demonstration Simulation	**CO4**
	UNIT –V STATISTICS (CL Hrs-10, Marks-14)			
5	TLO 5.1: Obtain the range and coefficient of range of the given grouped and ungrouped data. TLO 5.2: Calculate the mean and standard deviation of ungrouped and grouped data related to the given simple engineering problem(s). TLO 5.3: Determine the variance and coefficient of variance of given grouped and ungrouped data. TLO 5.4: Justify the consistency of given simple sets of data.	5.1 Range, coefficient of range of discrete and grouped data. 5.2 Mean deviation and standard deviation from the mean of grouped and ungrouped data. 5.3 Variance and coefficient of variance. 5.4 Comparison of two sets of observation.	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: 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

- **Matrix Inversion Function:** Create a function that takes a matrix as input and returns its inverse matrix if it exists. You can implement this using various programming languages like Python, and libraries like NumPy can be helpful.
- **Variance and Coefficient of Variance Calculation**: Collect data on marks obtained by your class in a mid-term test. Compute the variance and coefficient of variance of the data. Interpret the results using free open-source software like Orange, which is a data visualization and analysis tool.
- **Cryptography Using Matrices**: Prepare models using matrices to solve simple problems based on cryptography. You can explore techniques like matrix multiplication for encryption and decryption.
- **Data Analysis Models**: Collect data on quality control analysis, energy efficiency assessment, environmental monitoring, and process optimization. Analyze the data, calculate variance and standard deviation, and create a presentation, including short videos, to present your findings.
- **Geometric Models**: Prepare models using the concept of tangent and normal bending of roads in case of sliding of a vehicle. Express these geometric models using any open-source software suitable for geometry visualization.
- **Radius of Curvature in Railway Tracks**: Create models using the concept of the radius of curvature in

railway track design. Express these models geometrically through any open-source software suitable for geometry visualization.

- **Maxima and Minima Model**: Design a model for a window in the form of a rectangle surmounted by a semicircular opening. Optimize the total perimeter of the window to admit maximum light through the whole opening using the concept of maxima and minima. Verify the result mathematically.
- **Trigonometric Waveform Visualization**: Visualize trigonometric waveforms and create animations using sine or cosine functions. Use software or programming languages like Python with libraries such as Matplotlib to create these visualizations.
- **Trigonometric Function Calculator**: Develop a program for a trigonometric function calculator that computes sine, cosine, and tangent values. This can be implemented as a simple command-line tool or a graphical calculator application.
- **Applications of Radius of Curvature**: Collect and present applications of the radius of curvature in various fields such as lens design, optics, mirror properties, road design, structural analysis, roller coaster track design, and composite material manufacturing in a 5-minute video presentation.
- **Engineering Problems with Trigonometry**: Prepare models using trigonometry based on at least 10 engineering problems. Apply trigonometric principles to calculate angles, distances, forces, and dimensions relevant to the chosen area and create a poster presentation.
- **Determinant-Based Area Calculation**: Create charts and use determinants to find the area of regular shapes. You can use software like MATLAB, Python, or even manual calculations.
- **Matrix-Based Math Game**: Design a puzzle and create a math game based on matrix operations. Develop a grid of numbers and operations for players to solve using matrix manipulation rules.
- **Musical Composition with Matrices**: Use matrices as a tool for music composition. Assign different musical elements (notes, chords, rhythms) to matrix elements and experiment with combining and transforming matrices to create unique musical compositions. You can use music notation software or traditional instruments to bring your compositions to life.

Assignment

- Collect examples based on real-world applications of logarithms and prepare a PDF file.
- Solve the simultaneous system of equations in two variables by Matrix Inversion Method. Write down a mathematical program using any open-source software to verify the result.
- Collect examples of coding theory using applications of matrices and prepare a PDF file.
- Represent the Graph of the Trigonometric function and logarithmic function on Geogebra and interpret the nature of the graph. Make a PDF file.
- Measure the height of trees in surrounding locations using trigonometry and prepare a presentation.
- Find the derivative of y = x^sinx and visualize the graph of the function and its derivative using any open-source software geometrically.
- Find the height of the room or distance between two pillars by using the concept of a straight line.
- Collect at least 10 examples based on real-world applications of standard deviation/variance.
- Collect at least 10 examples based on real-world uses of applications of derivatives.

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr. No	Equipment Name with Broad Specifications	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	Differential Calculus	CO4	16	2	8	10	20
5	V	Statistics	CO5	10	2	6	6	14
Grand Total				**60**	**10**	**28**	**32**	**70**

IX. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
1. Tests 2. Rubrics for COs 3. Assignment 4. Self-Learning	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	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

Sr. No	Author	Title	Publisher
2	Dutta D.	A textbook of Engineering Mathematics	New Age publication New Delhi,2006 ISBN: 978-81-224-1689-3
3	Kreysizg, Ervin	Advance Engineering Mathematics	Wiley publication New Delhi 2016 ISBN:978-81-265-5423-2
4	Das H. K.	Advance Engineering Mathematics	S Chand publication New Delhi 2008 ISBN: 9788121903455
5	Marvin L. Bittinger David J. Ellenbogen Scott A. Surgent	Calculus and Its Applications	Addison-Wesley 10th Edition ISBN-13:978-0-321-69433-1
6	C. S. Seshadri	Studies in the History of Indian Mathematics	Hindustan Book Agency, New Delhi110016. ISBN978-93-80250-06-9
7	George Gheverghese Joseph	Indian Mathematics Engaging with the World from Ancientto ModernTimes	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;1stedition (2018), ISBN-978-1644291795

XIII. LEARNING WEBSITES & PORTALS

Sr. No	Link/Portal	Description
1.	http://nptel.ac.in/courses/106102064/1	Online Learning Initiatives by IITs and IISc
2.	www.scilab.org/-SCILab	Signal processing, statistical analysis and image enhancement.
3.	www.mathworks.com/product/matlab/-MATLAB	Applications of concepts of Mathematics to coding.
4.	SpreadsheetApplications	Use of Microsoft Excel, Apple Numbers and Google Sheets.

Sr. No	Link/Portal	Description
5.	https://ocw.mit.edu/	MIT Courseware
6.	https://www.khanacademy.org/math?gclid=CNqIIuabCys4CFdOJaddHoPig	Concept of Mathematics through video lectures and notes
7.	http://ocw.abu.edu.ng/courses/mathematics/	List of Mathematical Courses.
8.	https://libguides.furman.edu/oer/subject/mathematics	Open Education Resources (OER) in Mathematics.
9.	https://phet.colorado.edu/en/simulations/filter?subjects=math&type=html,prototype	Phet Simulation for Mathematics.
10.	https://libguides.cmich.edu/OER/mathematics	Mathematics with OER.

Name & Signature:

Shri. Vitthal B. Shinde
Lecturer in Mathematics

Shri. Sachin B. Yede
Lecturer in Mathematics

(Course Experts)

Name & Signature:	Name & Signature:
Dr. D. N. Rewadkar (Programme Head)	**Shri. S. B. Kulkarni** (CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMA IN CM/IT
PROGRAMME CODE	06/07
COURSE TITLE	ENGINEERING WORKSHOP PRACTICE
COURSE CODE	WS21205
PREREQUISITE COURSE CODE & TITLE	NA

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme											
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL &TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
WS21205	ENGINEERING WORKSHOP PRACTICE	SEC	-	-	4	-	4	2	-	-	-	-	-	50	20	50@	20	-	-	100

Total IKS Hrs for Term: 0Hrs

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:

A diploma engineer in his/her professional life works in a typical business environment where s/he interacts with computers, peripherals and related devices and instruments. They must be able to use and maintain these equipment authentically. Diploma pass out must be able to use and maintain these system peripherals authentically. They must also possess basic skills in assembling desktop computers, interfacing with peripheral devices, installing new devices and carrying out basic preventive and breakdown maintenance. Hence, this course is designed to develop these vital skills through various workshop-based activities.

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: Carryout elementary-level maintenance of a PC.
CO2: Create partitions and format hard disk drives.
CO3: Install and configure the Operating system.
CO4: Configure different types of peripheral devices.
CO5: Setup a small Local Area Network.
CO6: Use diagnostic software for fault finding in Computer systems.

IV. THEORYLEARNINGOUTCOMESANDALIGNEDCOURSECONTENT

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
Theoretical Inputs related to Practical skill be provided during practical Hrs.				

V. LABORATORY LEARNING OUT COME 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 Identify desktop/laptop by its type and verify its specifications LLO 1.2 Identify the type of server and verify its Specification	Lab Exp:1 Desktop/laptop/server type identification and its specification	2	CO1
2	LLO 2.1 Open PC Panel and Identify Components LLO 2.2 Clean inside PC - Boards and Slots	Lab Exp:2 Identification and cleaning of Components	4	CO1
3	LLO 3.1 Undertake Preventive Maintenance of PC using a vacuum cleaner and simple tools	Lab Exp:3 Preventive Maintenance of PC	2	CO1
4	LLO 4.1 Connect/disconnect the power socket and controller socket to disk drives and motherboard.	Lab Exp:4 Perform Internal socket connections	2	CO1
5	LLO 5.1 Configure different BIOS settings in the computer system	Lab Exp:5 Perform BIOS settings	2	CO1
6	LLO 6.1 Partition and manage hard disk LLO 6.2 Format hard drives with different file systems.	Lab Exp:6 Manage a Hard disk,	2	CO2
7	LLO 7.1 Install Operating System – Windows family (such as Windows 10, 11)	Lab Exp:7 Installation of Windows Operating System	2	CO3
8	LLO 8.1 Install Operating System – Unix family (such as Linux/Ubuntu/Centos)	Lab Exp:8 Installation of Unix family Operating System	2	CO3
9	LLO 9.1 Clean peripheral devices and connect them to the computer	Lab Exp:9 Peripheral devices cleaning	4	CO4

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
10	LLO 10.1 Install local printer by applying various types of configuration settings. LLO 10.2 Remove and mount cartridge, troubleshoot paper jam	Lab Exp:10 Installation of local and Network printer	2	CO4
11	LLO 11.1 Share the printer, devices, and folders on a network.	Lab Exp:11 Share devices, files and folders	4	CO4
12	LLO 12.1 Install and configure scanner	Lab Exp:12 Installation of the scanner	2	CO4
13	LLO 13.1 Set and configure monitor/display, Speaker, Microphone and LCD Projector	Lab Exp:13 Set Input/output devices	2	CO4
14	LLO 14.1 Prepare and test crossover and straight cable, CAT5, CAT6 Cable, using connector, crimping tools, splicer	Lab Exp:14 Make CAT5, CAT6 Cable	2	CO5
15	LLO 15.1 Connect/disconnect LAN Cable, External Hard disk, Modem, LCD/DLP Projector	Lab Exp:15 Connect devices to external port	2	CO5
16	LLO 16.1 Connect Modem, Hub/Switches/routers and verify the connection	Lab Exp:16 Networking devices connection	2	CO5
17	LLO 17.1 Check different types of fibre optic cable construction and connectivity	Lab Exp:17 Fiber optic cable construction	2	CO5
18	LLO 18.1 Connect two Switches/Hubs using normal and uplink port	Lab Exp:18 Connection of Switches/Hubs	2	CO5
19	LLO 19.1 Configure devices to setup Wi-Fi environment	Lab Exp:19 Setup Wi-Fi environment	2	CO5
20	LLO 20.1 Create a small wired network environment	Lab Exp:20 Setup wired network environment	4	CO5
21	LLO 21.1 Set and configure Bluetooth-based wireless mouse, keyboard and other devices	Lab Exp:21 Setup wireless I/O devices	2	CO5
22	LLO 22.1 Use diagnostic software for PC fault finding	Lab Exp:22 Fault diagnostics	4	CO6
23	LLO 23.1 Install Antivirus and Configure various settings	Lab Exp:23 Anti-viruses installation	2	CO6
24	LLO 24.1 Replace internal components of PC	Lab Exp:24 Component replacement	4	CO6

VI. SUGGESTED MICROPROJECT/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	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	1,2,3,4,5,6,7,8,9,10,11,12,13,14, 15,16,17,18,19,20,21,22
2	LCD/DLP Projector(Epson EB-X49 XGA Projector Brightness: 3600lm with HDMI Port (Optional Wi-Fi).	15
3	Modems, hubs, switches, Router	16
4	Wi-Fi set-up with access point and repeater	19
5	Bluetooth-based wireless mouse and keyboard or any other device	21
6	Cat5/Cat6 cable, with RJ 45 Connectors, LAN tester	14
7	Fiber optic cable with SC, ST, and LC Connectors	17
8	Laser Printer	10,11
9	Scanner	12
10	Hub/Switches/Routers	18
11	Fault-finding software, antivirus	22,23
12	Operating System, Hard Disk	6,8
13	Computer Maintenance kit	2,3,4,5,6,7,8,9,10,11,12,13,14, 15,16,17,18,19,20,21,22
14	External Hard Disk(500 GB/1 TB)	15
15	Light vacuum cleaner, approx. 200 watts with brushes and	2,3,9

VIII.SUGGESTED FORWEIGHTAGETO LEARNING EFFORTS&ASSESSMENTPURPOSE(Specification Table)

NOT APPLICABLE

IX. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
Rubrics for COs , Terms work, Presentation	End of Term Examination (Lab. performance), Viva-voce

X. SUGGESTED COs- POsMATRIXFORM

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	-	3	-	-	-	3	-	1
CO2	1	-	-	2	-	-	-	3	-	1
CO3	1	-	-	2	-	-	1	3	-	1
CO4	-	-	-	2	-	-	1	3	-	1
CO5	1	1	1	2	-	-	-	3	-	1
CO6	-	2	1	2	-	-	-	3	-	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	James, K.L.	The computer hardware installation, interfacing, troubleshooting and maintenance	PHI Learning, New Delhi, 2014 ISBN: 978-81-203-4798-4
2	Minasi, Mark	The Complete PC Upgrade And maintenance Guide	BPB Publication, New Delhi ISBN:978-81-265-0627-9
3	Kadam, Sachin	Computer Architecture and Maintenance Vol.1	Shroff Publication, Mumbai ISBN: 978-9350230244
4	Craig Zacker, John Rourke	The Complete Reference PC Hardware	McGraw Hill Education ISBN-13:978-0070436060

XII. LEARNING WEBSITES & PORTALS

Sr. No	Link/Portal	Description
1.	http://www.ciscopress.com/articles/article.asp?p=2086239&seqNum=4 Essential Introduction to Computer	Reading material about computer Lab Procedures and tool use
2.	http://www.instructables.com/id/Computer-Assembly/	Reading material about Computer assembly

3.	http://www.liutilities.com/how-to/operate-a-laptop-computer/	Article about How To Operate a Laptop Computer
4.	https://video.search.yahoo.com/search/video?fr=mcafee&ei=UTF-8&p=hardware+maintenance+and+troublesho	Video about Troubleshooting of Computer
5.	geeksforgeeks.org/how-to-set-up-a-LAN-network	Reading material about the process of settingup a LAN
6.	https://www.youtube.com/watch?v=ee2fyg-B5WE	Video about setting a LAN

Name & Signature:

Mrs. Sheetal J. Siraskar
Lecturer in Computer Engineering

Mrs. Priya K. Zade
Lecturer in Computer Engineering

(Course Experts)

Name & Signature:	Name & Signature:
Dr. D.N. Rewadkar (Programme Head)	**Shri. S.B. Kulkarni** (CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

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

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme											
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	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.

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:

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
	UNIT-I INTRODUCTION TO COMPUTER SYSTEM (CL Hrs-2, Marks-NIL)			
1.	**TLO 1.1** Explain the functions of components in the block diagram of the computer system. **TLO 1.2** Classify the given type of software. **TLO 1.3** Explain the characteristics of the given type of network. **TLO 1.4** Describe the application of the given type of network connecting device. **TLO 1.5** Describe the procedure to manage a file /folder in the given way.	**1.1 Basics of Computer System:** Overview of Hardware and Software: block diagram of Computer System, Input/output unit CPU, Control Unit, Arithmetic logic Unit (ALU), Memory Unit. **1.2 Internal components:** processor, motherboards, random access memory (RAM), read-only memory (ROM), video cards, sound cards and internal hard disk drives). **1.3 External Devices:** 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. **1.4 Application Software:** 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. **1.5 Network environments:** network interface cards, hubs, switches, routers and modems, the concept of LAN, MAN, WAN, WLAN, Wi-Fi and Bluetooth. **1.6 Working with Operating Systems:** 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.	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
		UNIT-II WORD PROCESSING (CL Hrs-3, Marks-NIL)		
2	**TLO 2.1** Write the steps to create the given text document. **TLO 2.2** Explain the given feature for document editing. **TLO 2.3** Explain the given page setup features of a document. **TLO 2.4** Write the given table formatting feature. **TLO 2.5** Write the steps to set the given type of document layout	**2.1 Word Processing:** 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. **2.2 Editing a Document:** 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. **2.3 Changing the Layout of a Document:** Adjust page margins, Change page orientation, Create headers and footers, Set and change indentations, and Insert and clear tabs. **2.4 Inserting Elements to Word Documents:** 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. **2.5 Working with Tables:** 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. **2.6 Working with Columned Layouts and Section Breaks:** 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.	Hands-on Demonstration Presentations	CO2
		UNIT-III SPREADSHEETS (CL Hrs-03, Marks-NIL)		
3	**TLO 3.1** Write the steps to create the given spreadsheet. **TLO 3.2** Explain the given formatting feature of a worksheet. **TLO 3.3** Write steps to insert formulas and functions in the given worksheet. **TLO 3.4** Write steps to create charts for the	**3.1 Working with Spreadsheets:** Overview of workbook and worksheet, Create Worksheet Entering sample data, Save, Copy Worksheet, Delete Worksheet, Close and open Workbook. **3.2 Editing Worksheet:** 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 **3.3 Formatting Cells and sheet:** Setting Cell Type, Setting Fonts, Text options, rotating cells, Setting Colors, Text Alignments, Merge and Wrap, applying	Hands-on Demonstration Presentations	CO3

	given data set. **TLO 3.5** Explain steps to perform data filter, sort and validation operations on the given data set. **TLO 3.6** Write steps to set up and print a spreadsheet.	Borders and Shades, Sheet Options, Adjust Margins, Page Orientation, Header and Footer, Insert Page Breaks. **3.4 Working with Formula:** 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. **3.5 Working with Charts**: 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. **3.6 Advanced Operations:** Conditional Formatting, Data Filtering, Data Sorting, Using Ranges, Data Validation, Adding Graphics, Printing Worksheets, print area, margins, header, footer and other page setup options.		
UNIT- IV PRESENTATION TOOL (CL Hrs-04, Marks-NIL)				
4	**TLO 4.1:** Write the steps to create the given slide presentation. **TLO 4.2:** Write the steps to insert multiple media in the given presentation. **TLO 4.3:**Explain the method of including animation, and transition effects in a slide show. **TLO 4.4:**Write steps to apply table features in the given presentation **TLO 4.5:** Write steps to manage charts in the given presentation.	**4.1 Creating a Presentation:** 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. **4.2 Inserting Media Elements:** 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. **4.3 Working with Tables:** Insert a Table in a Slide, Format Tables, and Import Tables from Other Office Applications. **4.4 Working with Charts:** Insert Charts in a Slide, Modify a Chart, and Import Charts from Other Office Applications.	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
UNIT –V BASICS OF INTERNET AND EMERGING TECHNOLOGIES (CL Hrs-04, Marks-NIL)				
5	**TLO 5.1** Explain the use of the given setting option in browsers. **TLO 5.2** Explain the given option used for effective searching in search engine **TLO 5.3** Explain the features of the given web service. **TLO 5.4** Explain concepts and applications of emerging technologies **TLO 5.5** Use various elementary cloud-based tools	**5.1 World Wide Web:** 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. **5.2 Web Services:** e-Mail, Chat, Video Conferencing, e-learning, e-shopping, e-Reservation, e-Groups, Social Networking. **5.3 Emerging Technologies:** IoT, AI and ML, Drone Technologies,3D Printing. **5.4 Tools:** Docs, Drive, forms, quiz, Translate and other Apps.	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	LLO 1.1 Identify various Input/output devices, connections and peripherals of the computer system. LLO 1.2 Work with Computer systems, Input/output devices, and peripherals to manage files and folders for data storage.	a) Work with Computer Systems, Input/output devices, and peripherals. b) Work with files and folders	2	CO1
2	LLO 2.1 Create and manage Word document. LLO 2.2 Apply formatting features on text at line, paragraph and page level.	Work with document files: a) Create, edit and save documents in Word Processing. b) Text, lines and paragraph-level formatting	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	LLO 5.1 Apply page layout features in word processing. LLO 5.2 Print a document by applying various print options LLO 5.3 Use mail merge in word processing	Working with layout and printing a) Document page layout, Themes, and printing. b) Use of mail merge with options.	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	--	--	--	--
		Grand Total		**15**	--	--	--	--

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	PSO-3
CO1	1	-	-	-	-	-	1	2	-	-
CO2	-	-	-	3	-	-	1	-	-	1
CO3	-	2	1	3	-	-	1	-	3	1
CO4	-	-	-	3	-	-	1	-	-	1
CO5	1	-	-	3	-	-	3	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	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: 978-153368373
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.	https://www.microsoft.com/en-in/learning/office-training.aspx	Office
2.	http://www.tutorialsforopenoffice.org/	Open Office
3.	https://s3-ap-southeast-1.amazonaws.com/r4ltue295xy0d/Special_Edition_Using_StarOffice_6_0.pdf	Open Office
4.	https://ashishmodi.weebly.com/uploads/1/8/9/7/18970467/computer_fundamental.pdf	Computer Fundamental
5.	http://www.tutorialsforopenoffice.org/	Open Office
6.	https://www.tutorialspoint.com/computer_fundamentals/index.htm	Computer Fundamental
7.	https://www.tutorialspoint.com/word/	Word Processing
8.	https://www.javatpoint.com/ms-word-tutorial	Word Processing
9.	https://support.microsoft.com/en-au/office/word-for-windows-training-7bed85c6-2c3d-4c3c-a2a5-5ed8847	Word Processing
10.	https://www.javatpoint.com/excel-tutorial	Spreadsheet
11.	https://support.microsoft.com/en-au/office/excel-video-training-9bc05390-e94c-46af-a5b3-d7c22f6990bb	Spreadsheet
12.	https://www.javatpoint.com/powerpoint-tutorial	Powerpoint Presentation
13.	https://support.microsoft.com/en-au/office/powerpoint-for-windows-training-40e8c930-cb0b-40d8-82c4-b	Powerpoint Presentation
14.	https://www.geeksforgeeks.org/ms-dos-operating-system/	Operating System

Name & Signature:

Mrs. Priyanka L. Sonwane
Lecturer in Information Technology

Mrs. Aafiya A Shaikh
Lecturer in Computer Engineering

(Course Experts)

Name & Signature:	Name & Signature:
Dr. D.N. Rewadkar (Programme Head)	**Shri. S.B. Kulkarni** (CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMA IN CM / IT
PROGRAMME CODE	06/07
COURSE TITLE	Linux Basics
COURSE CODE	CM21202
PREREQUISITE COURSE CODE & TITLE	NA

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme											
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
CM21202	Linux BASICS	DSC	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.

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:

Linux Operating System is Open source and freely distributed Operating System (O.S). Apart from the fact that it's freely distributed, Linux's functionality, adaptability and robustness make it highly suitable for the server platform. The course aims at providing knowledge of shell and command line essentials.

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: Install and Configure Linux O.S.
CO2: Execute various commands of the Linux Operating System.
CO3: Manage files and Directories in Linux OS
CO4: Compress and archive files in Linux OS.
CO5: Write and execute programs using shell scripting.

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
	UNIT-I INTRODUCTION TO LINUX OPERATING SYSTEM (CL Hrs-02, Marks-NIL)			
1.	**TLO1.1:** Describe the History of Linux. **TLO1.2:** Identify different types of shells. **TLO1.3:** Compare Linux file systems.	**1.1.** Operating System and Linux **1.2.** History, Overview of Linux **1.3.** Shell: Bourne, Korn, Cshell. **1.4.** Linux releases, Linux File Systems (ext) and versions.	Class Room Teaching, Presentations	**CO1**
	UNIT-II THE SHELL (CL Hrs-04, Marks-NIL)			
2	**TLO2.1:** Use the History command. **TLO2.2:** Use filename arguments. **TLO2.3:** Execute file-related Commands. **TLO2.4:** Execute commands using pipes and I/O redirection.	**2.1** The Command Line. **2.2** Command Line Editing. **2.3** Command and Filename Completion. **2.4** History: History Events, History command, History Event Editing. **2.5** Configuring History: HISTFILE and HISTSAVE. **2.6** Filename Expansion: *, ?, [ ]: Matching Multiple Characters, Matching Single Characters, Matching a Range of Characters, Matching Shell Symbols, Generating Patterns. **2.7** Standard Input/Output and Redirection: Redirecting the Standard Output: > and >>, The Standard Input. **2.8** Pipes: |, Redirecting the Standard Error:2>, >>.	Demonstration, Presentations	**CO2**
	UNIT-III LINUX FILES AND DIRECTORIES (CL Hrs-02, Marks-NIL)			
3	**TLO3.1:** Describe Linux file structure. **TLO3.2:** Use absolute and relative pathnames. **TLO3.3:** Execute file and Directory commands. **TLO3.4:** Change file and directory permissions. **TLO3.5:** Use the link command.	**3.1** Linux Files, The File Structure-Home Directories, Pathnames, System Directories. **3.2** Listing, Displaying, and Printing Files(ls, cat, more, less, and lpr). **3.3** Displaying Files: cat, less, and more, Printing Files: lpr, lpq and lprm. **3.4** Managing Directories (mkdir, rmdir, ls, cd, and pwd): Creating and Deleting Directories, Displaying Directory Contents, Moving Through Directories, and Referencing the Parent Directory.	Demonstration, Presentations	**CO3**

		3.5 File and Directory Operations (find, cp, mv, rm, and ln): Searching Directories: find, Searching the Working Directory, Locating Directories, Copying Files, Moving Files, Copying and Moving Directories, Erasing Files and Directories: The rm Command. **3.6** Links: The ln Command, Symbolic Links, Hard Links. **3.7** File and Directory Permissions: chmod.		
UNIT- IV ARCHIVE, EDITORS AND UTILITIES (CL Hrs-03, Marks-NIL)				
4	**TLO4.1:** Compress and archive files. **TLO4.2:** Create and modify files using the vi editor. **TLO4.3:** Use the line editing command.	**4.1** Archive Files and Devices: tar Displaying Archive Contents, Creating Archives, Extracting Archives, Updating Archives and Compressing Archives. **4.2** File Compression: (gzip, bzip2, and zip) Compression with gzip, Compressing with bzip2, Using Zip. **4.3** The vi Editor: vi Command, Input, and Line Editing Modes. **4.4** Creating, Saving and Quitting a File in vi, Managing Editing Modes in vi. **4.5** vi Editing Commands: Common Operations.	Demonstration, Presentations	**CO4**
UNIT –V FILTERS, REGULAR EXPRESSIONS AND SHELL PROGRAMMING (CL Hrs-04, Marks-NIL)				
5	**TLO5.1:** Execute Linux filters. **TLO5.2:** Execute commands using regular expressions. **TLO5.3:** Execute shell script programs.	**5.1** Filters and Regular Expressions: Using Redirection and Pipes with Filters: cat, tee, head and tail. **5.2** Types of Filter Output: wc, spell and sort. **5.3** Configuring Your Login Shell with Special Shell Variables. **5.4** Introduction to BASH Shell Programming, Variables and Scripts.	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	**LLO 1.1:**Installing Linux: Hardware, Software, Requirements, Opening Disk space for Linux partitions **LLO 1.2:** Virtual Consoles **LLO 1.3:** Configuring GRUB / LILO Boot Loader.	Installation of Linux Operating System	04	**CO1**
2	**LLO 2.1:** Executing commands related to Login into user accounts, start-up and shutdown commands. **LLO 2.2:** command line editing commands, man, who, who am i, info, pwd.	Execute Basic Linux commands.	02	**CO2**
3	**LLO 3.1:** Executing Commands, I/O redirection and pipes. **LLO 3.2:** Practicing File Name Arguments: *,?, [ ].	Execute I/O redirection and File Name Arguments commands.	02	**CO3**
4	**LLO 4.1:**Executing various file-related commands –cat, more,ls, cd, cp, mv, rm, touch, mkdir, rmdir, find.	Working with Linux file commands.	04	**CO3**
5	**LLO 5.1:**Practicing Absolute and Relative Pathnames. **LLO 5.2:** Setting/Changing file and directory-related permissions chmod. **LLO 5.3:**Execute Link command.	Working with Pathnames and files. Permissions	04	**CO3**
6	**LLO 6.1:**Executing commands related to archive and file compression	Execute archive and file compression commands.	02	**CO4**
7	**LLO7.1** Executing various commands related to vi Editor. **LLO 7.2:** Practicing editing with vi editor. **LLO 7.3:** Practicing vi editing commands.	Practice vi Editor commands.	04	**CO4**
8	**LLO 8.1:** Executing various Shell commands: cat, tee, head and tail. **LLO 8.2:** Creating shell variables	Practice Shell commands.	02	**CO5**
9	**LLO 9.1:** Configuring Login Shell with Special Shell Variables. **LLO 9.2:**Practicing filter output: wc, spell and sort.	Practice Login Shell and filter c ommands.	02	**CO5**
10	**LLO10.1:**BASHShell Programming (any 4 basic programs without looping)	Implement basic Shell programs.	04	**CO5**

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

Self-Learning

Following are some suggestive self_learning topics:

a) Use ChatGPT/any other AI tool to explore information.
b) Online courses/MOOCs/Spoken Tutorial etc.
c) Write a shell program for the following:
1. Take 1st name as input from the user. (E.g., John)
2. Take 2nd name as input from the user. (E.g., Smith)
3. Display both names individually.
4. Display the message "Welcome John and Smith."
5. Redirect this output to a file.
d) Write a Shell script to calculate the gross salary of the employee. (HRA = 20% of basic salary, DA = 50% of basic salary).
e) Write a shell program for the following:
1. Execute commands to add "Hello GPP" 5 times in a file in Vi editor.
2. Execute commands to sort a file in alphabetical order with a numbered list.
f) Write a shell program to display the contents of two files in sorted format with numbers on each line.
g) Write a program to find misspelled words from two files and write the output to a new file.

Micro project

Not Applicable

Assignment

Prepare a journal of practicals performed in the laboratory.

VII. LABO

VIII. RATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Computer system with all necessary components like; motherboard, random access memory (RAM), read-only memory (ROM), internal hard disk drives, Mouse, Keyboard, and open-source operating System. (RedHat, Ubuntu etc.).	ALL

IX. 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 the Linux Operating System	CO1	02	--	--	--	--
2	II	The Shell	CO2	04	--	--	--	--
3	III	Linux Files and Directories	CO3	02	--	--	--	--
4	IV	Archive, Editors and Utilities	CO4	03	--	--	--	--
5	V	Filters, Regular Expressions and Shell programming	CO5	04	--	--	--	--
		Grand Total		**15**	--	--	--	--

X. 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

XI. 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	1	-	3	3	-	3
CO2	3	-	1	3	1	-	3	3	1	3
CO3	3	-	1	3	1	-	3	3	1	3
CO4	3	2	2	3	1	-	3	3	1	3
CO5	3	2	2	3	1	-	3	3	1	3

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

XII. SUGGESTED LEARNING MATERIALS/BOOKS

Sr.No	Title	Author	Publisher
1	Linux The Complete Reference	Richard Petersen	McGraw Hill,6thedition (16 January 2008)ISBN-10 007149247X
2	Linux command line and shell scripting	Richard Blum	Willey India, ISBN-10119700914
3	Linux Lab: Hands on Linux.	Prof. Dayanand Ambawade	DreamtechPress (14 September 2009)ISBN-10 935004000X

XIII. LEARNING WEBSITES & PORTALS

Sr.No	Link/Portal	Description
1.	https://maker.pro/linux/tutorial/basic-linux-commands-for-beginners	Linux Basic Commands
2.	https://www.guru99.com/must-know-linux-commands.html	Linux Basic Commands
3.	https://www.shellscript.sh/	Shell Scripts and Programs
4.	https://www.tutorialspoint.com/unix/shell_scripting.html	Shell Scripts and Programs examples
5.	https://spoken-tutorial.org/tutorial	Online Course

Name & Signature:

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Lecturer in Computer Engineering

Heena F. Khan
Lecturer in Information Technology

(Course Experts)

Name & Signature:

Dr. D.N. Rewadkar
(Programme Head)

Name & Signature:

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

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

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

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme										
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory					Based on LL & TSL				Based on SL		Total Marks
															Practical						
			CL	TL	LL					FA-TH	SA-TH	Total			FA-PR		SA-PR		SLA		
										Max	Max	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.

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:

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.

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
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 Kapalbhati 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 Dhyan Mudra and meditating.Star 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

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
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

Outcomes

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.	https://onlinecourses.swayam2.ac.in/aic19_ed28/preview	Introduction to Yoga and Applications of Yoga - Course (swayam2.ac.in)
2.	https://onlinecourses.swa am2.ac.in/aic23 review	Yoga for Creativity
3.	https://onlinecourses.swayam2.ac.in/aic23 ge05/preview	Yoga for concentration
4.	https://onlinecourses.swayam2.ac.in/aic23_ge06/previe w	Yoga for Memory Development
5.	https://onlinecourses.nptel.ac.in/noc21_hs29/preview	Psychology of Stress, Health and Well-being
6.	https://onlinecourses.swayam2.ac.in/ncc19_sc04/previe w	Food Nutrition for Healthy Living

Name & Signature:

Shri. Sunil P. Date
(Course Experts)

Name & Signature:	Name & Signature:
Dr. D.N. Rewadkar (Programme Head)	Shri. S.B. Kulkarni (CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

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

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme												
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL &TSL				Based on SL		Total Marks
														Practical							
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
SC11207	APPLIED MATHEMATICS	AEC	3	1	-	-	4	2	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.

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:

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 and 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 equations 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
UNIT-I Indefinite Integration (CL Hrs-15, Marks-20)				
1.	TLO1.1 Solve the given simple problem(s) based on rules of integration. TLO1.2 Evaluate the given simple integral(s) using the substitution method. TLO1.3 Integrate given simple functions using the integration by parts TLO1.4 Solve the given simple integral by partial fractions	**Unit - I Indefinite Integration** 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 the denominator of the proper fraction).	Improved Lecture Demonstration Chalk-Board Presentations Video Demonstrations	**CO1**
Unit - II Definite Integration (CL Hrs-08, Marks-12)				
2.	TLO2.1 Solve given examples based on Definite Integration. TLO2.2 Use properties of definite integration to solve given problems	Unit - II Definite Integration 2.1 Definite Integration: Definition, and 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	**CO2**
Unit - III Differential Equation (CL Hrs-08, Marks-12)				
3.	TLO3.1 Find the order and degree of given differential equations. TLO3.2 Form simple differential equations for given elementary engineering problems. TLO3.3 Solve given differential equations using the methods of Variable separable and Exact Differential Equations (Introduce the concept of a partial differential equation). TLO3.4 Solve the given Linear Differential Equation.	**Unit - III Differential Equation** 3.1 Concept of Differential Equation. 3.2 Order, degree and formation of Differential equations **3.3** Methods of solving differential equations: Variable separable form, Exact Differential Equation, Linear Differential Equation.	Video Demonstrations Presentations Chalk-Board Improved Lecture Flipped Classroom	**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 Numerical Methods (CL Hrs-06, Marks-14)				
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 the Bakhshali iterative method for finding approximate squareroots. (IKS)	**Unit - IV Numerical Methods** 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-Seidel and Jacobi's method. 4.3 Bakhshali iterative method for finding the approximate square root. (IKS)		**CO4**
Unit - V Probability Distribution (CL Hrs-08, Marks-12)				
5.	TLO5.1 Solve given problems based on repeated trials using Binomial distribution TLO5.2 Solve given problems when the number oftrials is large and the probability is very small. TLO5.3 Utilize the concept of normal distribution to solve related engineering problems	**Unit - V Probability Distribution** 5.1 Binomial distribution. 5.2 Poisson's distribution. 5.3 Normal distribution.		**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 Solve simple problems of Integration by substitution	*Integration by substitution	1	CO1
2	LLO 2.1 Solve integration using parts	*Integration by parts	1	CO1
3	LLO 3.1 Solve integration by partial fractions(only linear non-repeated factors at the denominator of the 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 equations.	Order, degree and formation of the differentialequation.	1	CO3
9	LLO 9.1 Solve the first-order first-degree differential equation using the variable separable method.	Variable separable method.	1	CO3
10	LLO 10.1 Solve the 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 differentialequations.	*Applications of differential equations.(Take programme specific problems)	1	CO3
12	LLO 12.1 Solve problems on the Bisection method and Regula falsi method.	*Bisection method and Regula falsi method.	1	CO4
13	LLO 13.1 Solve problems on the Newton-Raphson method.	Newton-Raphson method.	1	CO4
14	LLO 14.1 Solve problems on Jacobi's method and Gauss-Seidel Method.	Jacobi's method and Gauss-Seidel Method.	1	CO4
15	LLO 15.1 Use Bakhshali iterative methods for finding the approximate value of the square root. (IKS)	*Bakhshali iterative methods for findingthe 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 the above suggestive LLOs –

1. '*' Marked Practicals (LLOs) Are mandatory.
2. A minimum of 80% of the above list of lab experiments are to be performed.
3. A judicial mix of LLOs is to be performed to achieve the 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), and 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
Grand Total				**45**	**10**	**22**	**38**	**70**

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 textbook 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. Surgent	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	http://nptel.ac.in/courses/106102064/1	Online Learning Initiatives by IITs and IISc
2	https://www.khanacademy.org/math?gclid=CNqHuabCys4CFdOJaddHo Pig	Concept of Mathematics through video lectures andnotes
3	https://www.wolframalpha.com/	Solving mathematical problems, performing calculations, and visualizing mathematical concepts.
4	http://www.sosmath.com/	Free resources and tutorials
5	http://mathworld.wolfram.com/	Extensive math encyclopedia with detailed explanationsof mathematical concepts
6	https://www.mathsisfun.com/	Explanations and interactive lessons covering variousmath topics, from basic arithmetic to advanced
7	http://tutorial.math.lamar.edu/	The comprehensive set of notes and tutorials covers awide range of mathematics topics.
8	https://www.purplemath.com/	Purplemath is a great resource for students seeking helpwith algebra and other foundational mathematics to improve learning.
9	https://www.brilliant.org/	Interactive Learning in Mathematics

Sr. No	Link/Portal	Description
10	https://www.edx.org/	Offers a variety of courses
11	https://www.coursera.org/	Coursera offers online courses in applied mathematicsfrom universities and institutions around the globe.
12	https://ocw.mit.edu/index.htm	The Massachusetts Institute of Technology (MIT) offersfree 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:	Name & Signature:
Dr. D. N. Rewadkar (Programme Head)	**Shri. S. B. Kulkarni** (CDC In-charge)

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GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	**DIPLOMA IN IT / CM**
PROGRAMME CODE	01/02/03/04/05/**06/07**/08
COURSE TITLE	**BASIC ELECTRICAL ENGINEERING**
COURSE CODE	**EE21204**
PREREQUISITE COURSE CODE & TITLE	**NA**

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme											
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration in Hrs.	Theory				Based on LL &TSL				Based onSL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
EE21204	BASIC ELECTRICAL ENGINEERING	AEC	2	-	2	2	6	3	1	15	35*#	50	20	25	10	25@	10	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 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, thenthe 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 shallbe 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:

Diploma engineers have to deal with electrical systems. The course is designed with basic information to help students to apply basic concepts, rules, components and safety of electrical engineering and perform practical thereof. The basic concepts of electrical engineering in this course will be very useful to students in during field practicing in their technical areas.

COURSE-LEVEL LEARNING OUTCOMES (CO'S)

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

CO1: Measure various electrical quantities and parameters.

CO2: Use different electrical machines by making connections.

CO3: Use electrical safety devices in electrical circuits.

III. 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
UNIT-I BASIC ELECTRICAL FUNDAMENTALS (CL Hrs-12, Marks-15)				
1.	**TLO 1.1** Apply Faraday's law of electromagnetic induction and Fleming's right hand rule, Lenz's law for induced emf to find its magnitude and direction. **TLO 1.2** Differentiate alternating current (AC) and direct current (DC) **TLO 1.3** Explain parameters of single phase AC sinusoidal waveform **TLO 1.4** Describe the silent features of period, frequency, angular frequency, RMS **TLO 1.5** Calculate the power in three phase and single phase circuit. .	**1.1** Electric and magnetic circuits. **1.2** Series and parallel magnetic circuits. **1.3** Faraday's laws of electromagnetic induction, Fleming's right hand rule, Lenz's law **1.4** Dynamically and statically induced emf, self and mutual inductance **1.5** AC and DC quantity, advantages of AC over DC supply. **1.6** Single phase AC, sinusoidal AC wave: instantaneous value, cycle, amplitude, time period, frequency, angular frequency, RMS value, Average value for sinusoidal waveform, form factor, peak factor. **1.7** Power in single phase circuit- Active, Reactive and Apparent **1.8** Types of three phase supply system, Advantages of three phase supply system over single three phase supply system, Relationship between line and phase values for star and delta connected system. **1.9** Power in three phase circuit **2.0** Numerical on above topic	Chalk-Board Presentations Model Demonstrations Video	**CO1**
UNIT-II ELECTRICAL MACHINES (CL Hrs-12, Marks-12)				
2	**TLO 2.1** Explain the working principle of the given type of transformer. **TLO 2.2** Distinguish the construction of the given type of transformer. **TLO 2.3** Explain working principle and operation of Capacitor star capacitor run single phase induction motor. **TLO 2.4** Explain working principle and operation of Universal motor. **TLO 2.5** Describe the procedure to connect stepper motor for the given application with sketches.	**2.1** Transformer: Types of transformers, Difference between core type and shell type transformer, Working principle, construction, emf equation, Voltage ratio, current ratio and transformation ratio, efficiency and regulation. **2.2** Capacitor star capacitor run single phase induction motor- Working principle, Reversal of rotation and Applications **2.3** Universal motor: Working principle, Reversal of rotation and Applications **2.4** Stepper motor: Working principle, Types and Applications	Chalk-Board Presentations Model Demonstrations Video	**CO2**

UNIT-III ELECTRICAL SAFETY AND PROTECTIVE DEVICES (CL Hrs-06, Marks- 08)				
	TLO 3.1 Describe the characteristics and features of different protective devices **TLO 3.2** Select the relevant protective device for the given application. **TLO 3.3** Select the suitable switchgear for the given situation with justification. **TLO 3.4** Select the I.E rule related to be applied for given type of earthing.	**3.1** Fuse: Operation, types and applications **3.2** MCB and ELCB/RCB: Operation and general specifications **3.3** Earthing: Types, Importance of earthing, factors affecting earthing resistance. **3.4** Measures for reducing earth resistance, I.E rules relevant to earthing.	Chalk-Board Presentations Model Demonstrations Video	**CO3**

IV. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL/TUTORIAL EXPERIMENTS.

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles /Tutorial Titles	Numberof hrs.	Relevant COs
1	**LLO 1** Use electrical meters for measurement of electrical parameters	Measure the parameters of simple electrical circuit. (e.g. current, voltage, power,).	**2**	**CO1***
Any 11 of the following				
2	**LLO 2** Check the AC waveform parameters	Measure frequency, time period, rms value, peak value of sinusoidal AC waveform for resistive and inductive circuit using CRO.	**2**	**CO1**
3	**LLO 3** Find the phase voltage and line current relation in star connected load.	Measure the line voltage, phase voltage and phase current and line current in three phase star connected balanced load.	**2**	**CO1**
4	**LLO 4** Find the phase voltage and line current relation in delta connected load.	Measure the line voltage, phase voltage and phase current and line current in three phase delta connected balanced load	**2**	**CO1**
5	**LLO 5** Determine the transformation ratio	Determination of the voltage and current ratio of single phase transformer.	**2**	**CO2**
6	**LLO 6** Study of universal motor / single phase induction motor.	Study the reversal of rotation of universal motor / single phase induction motor.	**2**	**CO2**
7	**LLO 7** Study of stepper motor operation.	Study the operation of stepper motor for various speed rotation.	**2**	**CO2**
8	**LLO 8** Use multimeter for measurement of AC / DC quantities	Use of multimeter for measurement of voltage, current (AC, DC), resistance and continuity of the given electrical circuit	**2**	**CO3**

9	**LLO 9** Connection of fuses in electrical circuit.	Connect fuse in electrical circuit and check its operation at normal and abnormal conditions	**2**	**CO3**
10	**LLO 10** Connection of MCB in electrical circuit	Connect MCB in electrical circuit and check its operation at normal and abnormal conditions.	**2**	**CO3**
11	**LLO 11** Connection of ELCB in electrical circuit.	Connect ELCB in electrical circuit and check its operation at normal and abnormal conditions.	**2**	**CO3**
12	**LLO 12** Measurement of earth resistance.	Use of earth tester for measurement of earthing resistance of a installed earthing of laboratory.	**2**	**CO3**
13	**LLO 13** Determine efficiency and regulation of single phase transformer by direct loading.	Determine the efficiency and regulation of single phase transformer by direct loading.	**2**	**CO2**

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

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

Assignment

a. Numerical based on calculation of various parameters of given magnetic circuit.
b. Numerical based on calculation of self-inductance.
c. Numerical based on calculation of mutual inductance
d. Numerical on AC fundamental to calculate various parameters.
e. Numerical on 3 ph star delta circuits.
f. Working principle & construction of transformer & various motors.
g. Selection of relevant safety devices for relevant applications.
h. Few other similar to above as per the need .

Suggested Student Activity

a. Illustrate situations wherein electrical energy is required.
b. Prepare models in the form of mini-projects.
c. Prepare power point presentation related to basics of electrical engineering.
d. Prepare a chart of electric circuit elements and relevant industrial application.

Micro project

a. Types of Electrical equipment: Prepare chart showing real-life examples indicating various types of electrical equipment.
b. Prepare chart /model of magnetic circuit & electromagnetic induction.
c. Prepare a chart for transformer various types of motors showing construction and applications.

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Note :

"These are the just suggestive topics. Faculty must design Microproject/Activities/ Assignments based on Course Outcome requirements".

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VI. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Single Phase Transformer: 1kVA. single-phase. 230/150 V, air cooled -	5,13
2	Single phase auto transformer (Dimmer stat) 0-230 volt 2/5Amp	5,13
3	CRO-20 MHz Dual channel	2
4	Three phase Auto Transformer-10/5 kVA. Input 415 V ,3 phase. 50 Hz. Output (0-415 V, 10/20 A	3 & 4
5	Rheostat (0-500 Ohm, 1.2A), Nichrome wire wound rheostat on epoxy resin or class F insulating tube with two fixed and one sliding contact.	1
6	Rheostat (0 to 100Ω, 5A), Nichrome wire wound rheostat on epoxy resin or class F insulating tube with two fixed and one sliding contact.	8
7	Dc Ammeter range (0-5-10A). Portable analog PMMC type as per relevant BIS	1 & 8
8	D. C. Supply. A 230 V dc supply (with inbuilt rectifier to convert ac to dc)	1 & 8
9	DC Voltmeter Range (0-150- 300V). 1, Portable analog PMMC type as per relevant BIS	1 & 8
10	AC Voltmeter Range (0-150- 300 -600 V). Portable analog MI tyre as per relevant BIS	2, 3, 4, 5, 6, 7, 8, 9 & 10, 11
11	Lamp Bank load (0-230 V , 0-10A)	1,3,4,5,8,9& 10, 11
12	Single phase Universal motor- 1	6
13	Earth tester analog /digital type	12
14	Variable DC power supply 0-30V, 2.A SC protection, display for voltage and current.	1
15	Digital Multimeter – 3 ½ digit	1, 2, 3, 4, 5, 8, 9, 10 & 11

VII. 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	BASIC ELECTRICAL FUNDAMENTALS	CO1	12	4	5	6	15
2	II	ELECTRICAL MACHINES	CO2	12	4	4	4	12
3	III	ELECTRICAL SAFETY AND PROTECTIVE DEVICES	CO3	06	2	2	4	08
		Grand Total		**30**	**10**	**11**	**14**	**35**

VIII. 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

IX. 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/ Developmentof 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	2	1	-	1	-	-	1	1	-	-
CO3	2	-	-	3		-	3	1	-	-

X. SUGGESTED LEARNING MATERIALS/BOOKS

Sr.No	Author	Title	Publisher
1	B.L. Theraja	Electrical Technology Vol. I	S. Chand Publication, Delhi ISBN-9788121924405
2	V.N. Mittle	Basic Electrical Engineering	Tata McGraw Hill Publishing Company Ltd., New Delhi. ISBN- 0074516329, 9780074516324
3	Edward Hughes	Electrical Technology	Low Price Edition ISBN-9780582405196
4	H. Cotton	Electrical Technology	CBS Publishers & Distributors ISBN-8123909284, 9788123909288
5	S. B. Lal Saksena and Kaustuv Dasgupta	Fundamentals of Electrical Engineering Part-1	Cambridge University Press, New Delhi ISBN : 9781107464353

XI. LEARNING WEBSITES & PORTALS

Sr.No	Link/Portal	Description
1.	https://www.electrical4u.com/electrical-engineering-articles/basic-electrical/	Basic Electrical Parameters
2.	https://www.slideshare.net/ChetanPatil396/basic-electrical-parameters-basic-electrical-engineering	Basic Electrical Parameters
3.	https://www.britannica.com/science	Magnetic Circuits
4.	https://en.wikipedia.org/wiki/Magnetic_circuit	Magnetic Circuits
5.	https://en.wikipedia.org/wiki/Electromagnetic_induction	Electromagnetic Induction
6.	https://youtu.be/XT-UmPviH64?si=MLIZBB5BgOA2SWBk	Electromagnetic Induction
7.	https://youtu.be/M-QfX2fvpp4?si=xpZDAiX3-_7xrnnr	Basics Magnetic Circuits
8.	https://archive.nptel.ac.in/courses/117/106/117106108/	Basic Electrical Circuits

Name & Signature:

Smt. S.P. Phadnaik
Lecturer in Electrical Engineering

Smt. M. H. Bilgi
Lecturer in Electrical Engineering

(Course Experts)

Name & Signature:	Name & Signature:
Dr.D N Rewadkar (Programme Head)	**Shri.S.B.Kulkarni** (CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	**DIPLOMA IN COMPUTER/IT**
PROGRAMME CODE	01/02/03/04/05/**06/07**/08
COURSE TITLE	**BASIC ELECTRONICS ENGINEERING**
COURSE CODE	**ET21203**
PREREQUISITE COURSE CODE & TITLE	**NA**

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme											
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL &TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
ET21203	BASIC ELECTRONICS ENGINEERING	AEC	2	-	2	2	6	3	2	15	35*#	50	20	25	10	25@	10	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.

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.

I. RATIONALE:

Diploma engineers have to deal with electronic system. The course is designed with basic information to help student to apply basic concepts, rules, components and safety of electronic engineering and perform practical's thereof. The basic concepts of electronics engineering in this course will be very useful to students in during field practicing in their technical area.

II. 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 diode in different electronic circuits.
CO2: Use BJT and FET in various electronic circuits.
CO3: Use various types of sensors and transducers.

III. 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
UNIT I: DIODES AND THEIR APPLICATIONS (CL Hrs-10, Marks-12)				
1.	**TLO1.1:** Draw VI Characteristics of PN junction Diode. TLO1.2: Measure Zener voltage on VI Characteristics of Zener diode. **TLO1.2:** Explain the Working Principle of LED. **TLO1.3:** Describe Working of given type of Rectifier. **TLO1.4:** Explain the Working Principle of Regulated Power Supply. **TLO1.5:** Explain the Block diagram of ONLINE and OFFLINE UPS	**1.1**P-N Junction Diode: Construction, Working, Symbol, Applications **1.2** Zener Diode: Construction, Working, Symbol, Applications **1.3** LED: Working, Symbol, Applications **1.4** Rectifiers: Circuit Diagram, Working and Waveforms of Half Wave, Centre tapped, Bridge rectifiers. Ripple factor, Efficiency **1.5** Filters: Need of Filters, Circuit diagram, Working of C,L,CLC filters. **1.6** Block diagram of Regulated Power Supply. **1.7** UPS: Block diagram of ONLINE and OFFLINE UPS	Chalk-Board Demonstration Assignment.	**CO1**

UNIT-II: TRANSISTOR (CL Hrs-12, Marks-13)				
2	**TLO2.1:** Explain Working Principle of NPN transistor **TLO2.2:** Draw Input and Output Characteristics in CE configuration **TLO2.3:** Explain Transistor as an Amplifier. **TLO2.4:** Describe Working of n-channel JFET **TLO2.5:** Draw and Explain Drain and Transfer characteristic of n-channel JFET	**2.1** BJT: Types, Symbol, Construction, Working Principle of NPN transistor. **2.2** Transistor Configurations: CB, CE, CC **2.3** Transistor Characteristics in CE configuration. **2.4** Transistor Parameters α and β, Relation between them. **2.5** Circuit Diagram, Working of CE as an Amplifier. **2.6** Transistor as a Switch. **2.7** Types, Symbol of FET, Construction, Working Principle of n-channel JFET **2.8** Drain and Transfer characteristics of n-channel JFET	Chalk-Board Demonstration Assignment.	**CO2**

UNIT-III :TRANSDUCERS AND SENSORS (CL Hrs-08, Marks-10)				
3	**TLO3.1:** Select relevant Transducer for given application. **TLO3.2:** Compare and Classify Sensors and transducers with example. **TLO3.2:** Explain Working principle of given Sensor. **TLO3.3:** Explain Working principle of given Transducer	**3.1** Basic Definition, Difference, Classification of Transducers and Sensors **3.2** Working Principle of Thermistor, RTD, Phototransistor sensors. **3.3** Transducers: Need of Transducer, Types of Transducers, Active, Passive, Analog, Digital **3.4** Working Principle of LVDT, LDR, Thermocouple. **3.5** Selection Criteria for Transducer.	Chalk-Board Demonstration Assignment.	**CO3**

a. 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** Check the Forword and Reverse Bias V-I characteristics of PN junction diode.	*Connect PN Junction in circuit and test its operation in Forward and Reverse bias mode	2	CO1
2	**LLO1.2**Check the Forword and Reverse Bias V-I characteristics of Zener diode.	*Connect Zener diode in circuit and test its operation in Forward and Reverse bias mode	2	CO1
3	**LLO1.3** Check waveforms of Half wave, FWR, Bridge Rectifier	*Observe Waveforms of Half wave, FWR, Bridge Rectifier with and without filter.	2	CO1
4	**LLO1.4** Check the operation of UPS under ONLINE and OFFLINE mode.	Make the input output connections and measure output voltage of UPS under ONLINE and OFFLINE mode.	2	CO1
5	**LLO2.1**Check the operation of NPN transistor under CE configuration.	*Test Input and Output Characteristics of CE configuration.	2	CO2
6	**LLO2.1**Check the operation of transistor as a Switch.	*Test the operation of Transistor as switch	2	CO2
7	**LLO2.2** Check the operation of transistor as an amplifier.	*Test the operation of Transistor as an amplifier.	2	CO2
8	**LLO2.3**Check the operation of NPN transistor under CB configuration.	Test Input and Output Characteristics of CB configuration	2	CO2
9	**LLO2.4** Use BFW10 FET for drain and Transfer characteristics.	*Test the operation of FET	2	CO2
10	**LLO3.1** Use RTD(PT100) for measurement of Temperature	*Measure Temperature of Liquid using RTD	2	CO3
11	**LLO3.2**Use Active Transducer for measurement of Temperature	*Measure Temperature of water using Thermocouple	2	CO3

12	**LLO3.3**Use of photoelectric sensor to sense motion	*Check motion of given object using photoelectric sensor	2	CO3
13	**LLO3.3**Use passive transducer for measurement of resistance	*Measure resistance of LDR in varying intensity of light.	2	CO3
14	**LLO3.3**Use passive transducer for measurement of displacement	Measure displacement using LVDT	2	CO3
15	**LLO3.3**Use passive transducer for measurement of displacement	*Measure displacement using potentiometer.	2	CO3

Minimum 12 for 2 LL Hrs./Week or 24 for 4 LL hrs./Week are to be Performed.
'*' Marked Practical (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 microprojects, 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:

a. Prepare a chart of different types of diodes showing their specifications and applications
b. Prepare chart of transistors showing their specifications and Applications
c. Prepare a chart of different types of Rectifiers showing their specifications and applications
d. 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.
e. Rectifier : Build a half wave rectifier for 6V,500mA output current on general purpose PCB.
f. Rectifier :Build a full wave rectifier with capacitor filter for 6V,500mA output current on general purpose PCB.
g. BJT : Build a circuit to switch on and off the LED by using BJT as a switching component.
h. Passive Transducer: Build temperature controller using RTD.
i. Active Transducer: Build temperature controller using Thermocouple.

- SUGGESTED ASSIGNMENT:

a. Analyze Data sheets of BJT, FET and MOSFET
b. Make chart of Symbol, constructional diagram, characteristics of diodes, Transistor, MOSFET.
c. Differentiate active and Passive Transducers
d. Collect information of Active Transducers and prepare charts of the same.
e. Give seminar on any relevant topic.
f. Collect information of passive Transducers and prepare charts of the same.

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	All
2	Cathode Ray Oscilloscope Dual trace 20 MHz ,1MΩ, Input Impedance	All
3	Function Generator 0-2MHz with Sine, square, and triangular output	All
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	Diodes and Their Applications	CO1	10	4	6	2	12
2	II	Transistor	CO2	12	4	6	3	13
3	III	Transducers and Sensors	CO3	08	4	2	4	10
Grand Total				**30**	**12**	**14**	**09**	**35**

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

IX. 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	-	1	1	1	-	-
CO2	3	2	3	3	-	1	1	1	-	-
CO3	3	2	3	3	2	1	1	1	-	-
Legends:- High:03, **Medium:**02, **Low:**01, **No Mapping:** - *PSOs are to be formulated at the institute level										

X. SUGGESTED LEARNING MATERIALS/BOOKS

Sr.No	Author	Title	Publisher
1.	Albert Malvino	Basic Electronics.	8th Edition, Tata McGraw Hill ,2015ISBN10:1259200116 ISBN13:9781259200113
2.	B.L. Theraja	Basic Electronics.	2007, ISBN10:8121925568ISBN 13: 9788121925563
3.	R.S.Sedha	Applied Electronics	S. Chand&company Ltd., New Delhi,ISBN:8121927833 4 P.
4.	Ramesh Babu	Electronics Devices and Circuits	Scitech PublicationPvt.Ltd 2009, ISBN:8183711723 5
5.	H S Kalsi	Electronic Instrumentation	3 rd Edition, Tata McGraw Hill ISBN 978-0-07-070206-6

XI. LEARNING WEBSITES & PORTALS

Sr.No	Link/Portal	Description
1.	www.youtube.com/watch?v=anCnrtjNLQM	LVDT
2.	www.tutorialspoints.com/difference-between-bjt-and-fet	BJT,FET
3.	www.tutorialspoints.com/difference-between-sensors-and-transducers	Sensors and Transducer
4.	www.nptel.com	Online Learning Initiativesby IITs
5.	http://www.electronics-tutorials	Basic Electronics Tutorials and Revision
6.	https://en.wikipedia.org/wiki/P%E2%80%93n_junction	Semiconductor diodedescription

Name & Signature: **Smt. C. D. Pophale** Lecturer in Electronics	
(Course Experts)	
Name & Signature: **Dr.D N Rewadkar** (Programme Head)	Name & Signature: **Shri. S.B. Kulkarni** (CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE
'120-NEP'SCHEME

PROGRAMME	**DIPLOMA IN INFORMATION TECHNOLOGY**
PROGRAMME CODE	01/02/03/04/05/06/**07**/08
COURSE TITLE	**MULTIMEDIA AND ANIMATION**
COURSE CODE	**IT31201**
PREREQUISITE COURSE CODE & TITLE	**NA**

I. LEARNING AND ASSESSMENT SCHEME:

Course Code	CourseTitle	Course Type	Learning Scheme					Credits	Assessment Scheme											
			Actual Contact Hrs./Week						Paper Duration (hrs.)	Theory				Based on LL & TL				Based on Self Learning		Total Marks
														Practical						
			CL	TL	LL	SLH	NLH			FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
IT31201	MULTIMEDIA AND ANIMATION	DSC	2	0	2	0	4	2	0	0	0	0	0	50	20	25@	10	00	00	75

Total IKS Hrs. for Semester : 00 Hrs.

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

Legends: @InternalAssessment,**#**ExternalAssessment,***#**OnLineExamination,**@$-**InternalOnlineExamination.

Note:

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as **"Detained"** in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are(**CL+LL+TL+SL**)hrs.*15Weeks
5. 1 credit is equivalent to **30 Notional hrs.**
6. *Self learning hours shall not be reflected in the Timetable.
7. *Self learning includes microproject / assignment / other activities.

II. RATIONALE:

Multimedia techniques and animation make connections between verbal and visual representations of content. Multimedia applications use text, graphics, animation, images and audio. These applications can be used in entertainment, business and education which can enhance communication and learning.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

CO1: Describe the Multimedia components and color models.
CO2: Create images using Graphics processing tools.
CO3: Design web pages with multimedia components.
CO4: Develop 2D animation.
CO5: Use action script and authoring tools.

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
UNIT 1– Introduction to Multimedia (CL Hrs.- 06)				
1	**TLO1.1:** Describe characteristics of the given color model supported in graphics. **TLO1.2:** Describe the working of CRT display. **TLO1.3:** Describe the multimedia system architecture. **TLO1.4:** Explain concept of virtual reality with example.	1.1 Definitions -Where to use Multimedia, Multimedia in Business, Multimedia in Schools, Multimedia in Home, Multimedia in Public Places. 1.2 Multimedia System Architecture, Framework for Multimedia System, CRT display System, Flat Panel Display. 1.3 Color models- RGB, CMY, HSB, HUE, saturation and brightness. 1.4 Fundamentals of virtual reality.	Hands-on Demonstration Presentation	CO1
UNIT 2– Image editing and compression (CL Hrs.- 08)				
	TLO2.1: Describe various image file formats. **TLO2.2:** Describe image editing operations on an image. **TLO2.3:** Compare Lossy and Lossless image compression techniques. **TLO2.4:** Explain various Fonts and types.	2.1 Image types: Raster Format, Bitmap (BMP), Graphics Interchange Format(GIF), Joint Photographic Experts Group (JPEG),Tagged Image File Format (TIFF), Portable Network Graphics (PNG) and their differences. 2.2 Basic operations on image: crop, resize. 2.3 Image compression techniques lossy and lossless. 2.4 Fonts and its types, OCR Software. 2.5 2D Vs 3D images	Hands-on Demonstration Presentation	CO2
UNIT 3–Webpage development using multimedia (CL Hrs.- 06)				
	TLO3.1: Write steps to develop a webpage comprising of hypermedia. **TLO3.2:** Describe features of given audio file format. **TLO3.3:** Compare different types of audio.	3.1 Design Web Pages using Hypertext and hypermedia. 3.2 Different audio file formats. 3.3 Uncompressed audio format, lossless compressed audio format, Lossy compressed audio format, mp3,wav,mpeg-4, wma, pcm. 3.4 MIDI Vs Digital audio.	Hands-on Demonstration Presentation	CO3
UNIT 4– Video and Animation (CL Hrs.- 06)				

	TLO4.1: Explain digital video and standards. **TLO4.2:** Describe features of given video file format. **TLO4.3:** Describe Video Streaming process. **TLO4.4:** Explain Story Boarding. **TLO4.5:** Explain Principles of Animation.	4.1 Digital Video. 4.2 How video works, Broadcast video standards. 4.3 Video file formats: MPEG, MPEG1, MPEG2, MPEG4, AVI. 4.4 Video Streaming: Introduction to Streaming, Difference between streaming and downloading, how streaming works, buffering, factors affecting streaming. 4.5 Study of story board. 4.6 The Power of motion, Principles of Animation.	Hands-on Demonstration Presentation	CO4
UNIT 5– Action Script and Authoring tools (CL Hrs.- 06)				
	TLO5.1: Use action script to create animation. **TLO5.2:** Describe different types of Authoring tools.	5.1 Programming Concepts with respect to Action Script – Variables, Data types, conditionals, loops, arrays, Functions 5.2 Multimedia Authoring tools : Features. 5.3 Types of Authoring Tools: Card- and Page-Based Authoring tools, Icon-and Object Based Authoring tools, Time Based Authoring tools.	Hands-on Demonstration Presentation	CO5

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

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Sr. No.	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment/Practical Titles/Tutorial Titles	No. Of Hrs.	Relevant COs
1	LLO1: Use Image Editing Tools and Color Models.	a. Convert given image into different image formats and observe the changes in image quality and file size. b. Create different types of still images using various graphical processing tools and RGB/ CMY/ HSB color models.	02	CO1
2	LLO2: Design banners using multimedia components.	Design banner using graphics processing tool.	04	CO2
3	LLO3: Apply Effects to Text.	Apply drop shadow and reflection effects to Text.	02	CO2
4	LLO4: Apply Effects to Image.	Apply broken mirror effect to Image.	02	CO2
5	LLO5: Edit/Modify Images and apply effects.	Modify existing image by adding rainy season effect on any 2D image processing software.	02	CO2
6	LLO5: Edit/Modify Images and apply effects.	Design wallpaper showing water drop effect in image.	02	CO2
7	LLO6: Design web pages and embed audio and video.	Develop a webpage which show animation with sound effect / embed video using any professional HTML editor.	02	CO3
8	LLO7: Create 2D animation.	a. Develop a 2D animation using shape twinning and motion twinning. b. Develop different types of symbols (button symbol, graphic, movie clip symbol and similar types of icons).	04	CO4
9	LLO7: Create 2D animation.	Create 2D animation for bouncing and rolling ball down.	02	CO4
10	LLO7: Create 2D animation.	Create 2D animation using motion guide layer and masking.	02	CO4
11	LLO8: Create simple animation using action script.	a. Create animation using action script. (eg. Rotating object). b. Create a variable for different Data Types using Action Script.	04	CO5
12	ALL LLOs	Create animation using all components and action script.	04	All

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VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT(SELF LEARNING)

-NA-

VIII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr. No.	Equipment Name with broad specifications	Relevant LLO
1	Hardware: Personal computer Pentium IV,2 GHz minimum (i3-i5 preferable), RAM minimum 2 GB.	ALL LLOs
2	Graphics and animation development tools (Like Gif animation tool, Pencil, Synfig studios, Stykz, Blender, Scilab, Macromedia Flash, Corel Draw or any other tool)	

IX. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE

-NA-

X. ASSESSMENT METHODOLOGIES / TOOLS

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

Xl. SUGGESTED COs-POs–PSOs MATRIX FORM

CO / PO	PO1 Basic and Discipline Specific knowledge	PO2 Problem Analysis	PO3 Design/Development of Solutions	PO4 Engineering Tools, Experimentations and Testing	PO5 Engineering Practices for Society ,Sustainability and	PO6 Project Management	PO7 Life Long Learning
Describe the Multimedia components and color models.	3	-	2	-	-	2	2
Create images using Graphics processing tools.	2	2	1	3	1	1	3
Design web pages with multimedia components.	2	1	2	2	2	2	2
Develop 2D animation.	3	2	2	3	2	2	3

Use action script and authoring tools.	**3**	**1**	**2**	**2**	**1**	**2**	**3**

PSO - CO MAPPING

CO /PSO	**Hardware and Networking**	**Database Technologies**	**Software Development**
Describe the Multimedia components and color models.	**-**	**-**	**2**
Create images using Graphics processing tools.	**-**	**-**	**3**
Design web pages with multimedia components.	**1**	**-**	**3**
Develop 2D animation.	**-**	**-**	**2**
Use action script and authoring tools.	**-**	**-**	**2**
Summary	**1**	**-**	**2**

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr. No.	AUTHOR	TITLE	PUBLISHER
1	Vaughan Tay	Multimedia: Making it work,9e	McGraw Hill Education, New Delhi 2015, ISBN:9780071832885
2	Parekh Ranjan	Principles of Multimedia 2e	McGraw Hill Education, New Delhi.2015, ISBN-13: 978-1-2-90650-0
3	Roger Brounstein	Action Script 3.0 Bible	Wiley Publishing, Inc ISBN: 978-0-470-52523-4
4	Colin Moock	Essential Action Script 3.0	O'Reilly Media, Inc. ISBN: 0596526946
5	Andleigh, Prabhat K. Thakrar, Kiran	Multimedia Systems and Design	PHI Learning, New Delhi 2013 ISBN: 81-203-2177-4
6	Li, Ze-Nian	Fundamentals of Multimedia	PHI Learning, New Delhi 2013 ISBN:13-978-8120328174

XIII. LEARNING WEBSITES & PORTALS

Sr. No.	Link/Portal	Description
1	https://www.tutorialspoint.com/multimedia/ (As on 16/01/2024)	Introduction to Multimedia.
2	https://www.adobe.com/devnet/actionscript/articles/actionscript3_overview.html (As on 16/01/2024)	Introduction to action script. Installing Adobe flash ,writing and executing action script.
3	http://edutechwiki.unige.ch/en/AS3_Tutorials_Beginner (As on 16/01/2024)	Action script Tutorial
4	https://www.cloudflare.com/learning/performance/what-is-streaming/ (As on 16/01/2024)	Video Streaming

Name & Signature: 1) Smt. H.F. Khan 2) Smt. P.L. Sonawane (Course Experts)	
Name & Signature: Dr. D.N. Rewadkar (Program Head) (Information Technology)	**Name & Signature:** (Shri. S.B. Kulkarni) (CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	**DIPLOMA IN CE/EE/ET/ME/MT/CM/IT/DDGM**
PROGRAMME CODE	**01/02/03/04/05/06/07/08**
COURSE TITLE	**PROFESSIONAL COMMUNICATION**
COURSE CODE	**HU11202**
PREREQUISITE COURSE CODE & TITLE	**NA**

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme											
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	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
	UNIT-I PROFESSIONAL COMMUNICATION: AN OVERVIEW			
1	TLO 1.1 Describe the importance of professional communication in given situations. TLO 1.2 Identify the types of communication barriers in given situations and suggest remedies. TLO 1.3 Use different types of verbal and non–verbal communication for the given situation.	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 & Complete). 1.2 Communication barriers, Types of barriers (Linguistic, Psychological, Technological). 1.3 Types of Communication– Verbal (Oral-Written), Formal, Informal (Grapevine) and Vertical Comm.	Language lab, Role plays, Chalkboard, Reference books, Case studies.	**CO1**
	UNIT - II LISTENING & NOTE-TAKING			
2	TLO 2.1 Identify the difference between listening and hearing. TLO 2.2 Differentiate the types of listening in various situations. TLO 2.3 Take notes during lectures and seminars. Make use of types of note-taking and note-making for different subjects/topics.	2.1 Difference between listening & Hearing. 2.2 Types of listening a)Active listening b)Passive listening c)Selective listening. 2.3 Techniques of Note-taking, Types of note taking (Outline notes, Mind Mapping, Flowcharts).	Language Lab, Classroom learning, NPTEL, Role Play.	**CO2**
	UNIT - III OFFICE DRAFTING			
3	TLO 3.1 Prepare notices/agenda for the given type of meeting/information. TLO 3.2 Prepare minutes of meeting/s. TLO 3.3 Draft a circular for a particular information/event.	3.1 Format of Notice, Drafting Agenda. 3.2 Preparing Minutes of the meeting. 3.3 Format of Circular.	Whiteboard, Language Lab, Reference books, Classroom learning.	**CO3**
	UNIT - IV WRITING SKILLS FOR PROFESSIONAL COMMUNICATION			
4	TLO 4.1 Compose cover letter and CV / Resume for jobs. TLO 4.2 Apply E-mail Etiquettes for professional purposes. TLO 4.3 Compose Emails for different official purposes.	4.1 Job Application with Resume / CV. 4.2 E-Mail Etiquettes. 4.3 Writing official E-Mails to communicate intended purposes.	Language lab, Classroom learning NPTEL, Reference books.	**CO4**

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
UNIT - V REPORT WRITING				
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.	**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 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 **25** marks using language lab**.** **(SA-PR)**

X. SUGGESTED COs- POs MATRIX FORM:

Course Outcomes (COs)	Programme Outcomes(POs)							ProgrammeSpecific 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 & PORTALS

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

Name & Signature:

Mr. V.V. Kulkarni
Lecturer in English

Dr. S.P. Palve
Lecturer in English

(Course Experts)

Name & Signature:	Name & Signature:
Dr.D.N Rewadkar (Programme Head)	**Shri. S.B. Kulkarni** (CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	**DIPLOMA IN** CE/EE/ET/ME/MT/**CM/IT**/DDGM
PROGRAMME CODE	01/02/03/04/05/**06/07**/08
COURSE TITLE	**PROGRAMMING IN C**
COURSE CODE	**CM21204**
PREREQUISITE COURSE CODE & TITLE	**NA**

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme										
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
CM21204	PROGRAMMING IN C	DSC	4	-	4	-	8	4	--	30	70	100	40	50	20	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.

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:

The C programming language is a general-purpose, operating system-agnostic, and procedural language that supports structured programming. Numerous companies use C as a programming language for embedded systems development, application development, and socket programming. C programming acts as a foundation for higher level programming which includes problem solving, building logic, developing algorithms and flowcharts. All the concepts learned will assist the student to grasp advanced languages at ease.

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: Establish Strong foundation in building procedural programs with 'C' language tokens.
CO2: Develop C program involving branching and looping statements.
CO3: Implement programs using Arrays and Strings.
CO4: Write C program using predefined and user-defined functions.
CO5: Execute programs using pointers.
CO6: Create and Implement user -defined data types such as Structures.

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
UNIT-I INTRODUCTION TO COMPUTER PROGRAMMING (CL Hrs-08, Marks-10)				
1.	**TLO 1.1** Introduction to Programming. **TLO 1.2** To know the history and basic structure of C. **TLO 1.3** Identify the given building blocks of a C Program. **TLO 1.4** Use basic constructs like constants, variables , data types for developing C programs. **TLO 1.5** Managing Input and Output Operations. **TLO 1.6** Develop C programs using Operators and Expressions.	**1.1** Introduction to Computing: Introduction, Art of Programming through Algorithms and Flowcharts. **1.2** Overview of C: History and importance of C, Basic structure of C program, executing a C program. **1.3** Constants, Variable and Data Types: Introduction, Character Set, C Tokens, Keywords and Identifiers, Constants, Variables, Data Types, Declaration of Variables, Assigning Values to Variables, Defining Symbolic Constants,Type def. **1.4** Managing Input and Output Operations: Reading a Character, Writing a Character, Formatted Input, Formatted Output. **1.5** Operators and Expressions: Introduction, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operator, Bitwise Operators, Special Operators, Arithmetic Expressions, Evaluation of Expressions, Type Conversions in Expressions, Operator Precedence and Associativity, sizeof operator.	Hands-on Demonstration Presentations	**CO1**
UNIT-II CONTROL STRUCTURES (CL Hrs-08, Marks-10)				
2	**TLO 2.1** Write a 'C' program using decision making statements **TLO 2.2** Use loop statements in C program to solve iterative problems. **TLO 2.3** Use appropriate statement to alter the program flow in the loop.	**2.1** Decision Making and Branching: Introduction, Decision Making with IF Statement, Simple IF Statement, the IF-ELSE Statement, Nesting of IF-ELSE Statements, The ELSE IF Ladder, The Switch statement, The ? : Operator, **2.2** Jump Statements: break, continue, goto, return. **2.3** Decision Making and Looping: While loop, for loop, do-while loop.	Hands-on Demonstration Presentations	**CO2**
UNIT-III ARRAYS AND STRINGS (CL Hrs-12, Marks-14)				
3	**TLO 3.1** Explain the characteristics of an Array. **TLO 3.2** Enlist the types of Arrays. **TLO 3.3** Write C Program to perform operations on one dimensional array. **TLO 3.4** Declare, initialize and access elements of two dimensional array. **TLO 3.5** Declare, initialize and access functions using String.	**3.1** Arrays: Introduction to array: Array Definition, Initialization of arrays, Types: one- dimensional arrays, two-dimensional arrays, multidimensional arrays. Searching Sorting, Matrix Addition, Multiplication, Transpose of a matrix. **3.2** Strings: Introduction to String: declaration & initialization of string, string variables, reading string, writing string. Concatenation & comparison of two strings, string handling functions**.**	Hands-on Demonstration Presentations	**CO3**

UNIT- IV FUNCTIONS IN C (CL Hrs-12, Marks-14)				
4	**TLO 4.1** Explain need of Functions in C program. **TLO 4.2** Write C Program involving C library functions. **TLO 4.3** Write user defined functions for given problem in C program **TLO 4.4** Write C Program for calling function by 'value and calling function by 'reference' **TLO 4.5** Implement recursive functions in C Program	**4.1** Concept and need of functions, Predefined Functions: Library functions, Math function, **4.2** User defined function: Need, syntax, declaration, definition, return values and their types, calling a function.Scope of a variable. **4**.3 Category of functions: a)Function with no arguments and no return value, b)Function with no arguments and a return value, c)Function with arguments and no return value, d)Function with arguments and with return value. **4.4** Nesting of functions, recursion and function with arrays. **4.5** Dynamic Memory Allocation in C : malloc(), calloc(), realloc() , free()	Hands-on Demonstration Presentations	**CO4**
UNIT- V POINTERS IN C (CL Hrs-10, Marks-10)				
5	**TLO 5.1** Declare and Define Pointer Variable. **TLO 5.2** Initialization of pointers and pointer expressions. **TLO 5.3** Write C program to print the address and values of pointer variables. **TLO 5.4** Write C program to perform arithmetic operations using pointers. **TLO 5.5** Write C Program to perform operations on Arrays using Pointers. **TLO 5. 6** Demonstrate pointer as a function argument.	**5.1** Pointer**:** Introduction to pointer Concept. Accessing the address of a variable, declaration of Pointers, Initialization and Accessing of Pointers, chain of pointer, pointer expressions. **5.2** Pointer and Array: Array of pointers, Pointer to array, pointers as a function argument. Returning pointer **5.3** Returning pointer and passing addresses to Functions.	Hands-on Demonstration Presentations	**CO5**
UNIT- VI STRUCTURES (CL Hrs-10, Marks-12)				
6	**TLO 6.1** Define Structure. **TLO 6.2** Use the structure for solving the given problem. **TLO 6.3** Demonstrate arrays of structure. **TLO 6.4 U**nderstand and Implement Concept of Enumerated Data type	**6.1 Structure :** definition, declaring and accessing, structure initialization, copying and comparing structure variables, operations on structure members, array of structures, array within the structure, structure within structures ,structure and functions, size of structures **6.2** Enumerated Data Type: Create and Implement Enum in C Program.	Hands-on Demonstration Presentations	**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 1.1** Write logical steps for given program flow **LLO 1.2** Write the standard English like statements for programming flow of given Problem statement **LLO 1.3** Write Simple C program using constant and variables.	Write/compile/execute simple 'C' program: Develop a program using Constants, Variables for different data types.	2	CO1
2	**LLO 2.1** Use the Relational, Logical, Assignment, Increment and Decrement operators for developing C Program. **LLO 2.2** Use the various expressions in the C Program.	*Implementation of a 'C' program based on different operators and expressions. (ex. Arithmetic, Relational, Logical, Assignment, Increment and Decrement, etc.)	4	CO1
3	**LLO 3.1** Use the Conditional, bitwise operators for developing C Program	*Implementation of a C program based on Conditional, bitwise and special operators.	2	CO1
4	**LLO 4.1** Write code for access modifiers.	*Implementation of a simple C program to take input from the user at run time and display the output on the screen.	2	CO1
5	**LLO 5.1** Write the syntax for various if statements. **LLO 5.2** Write C program for any problem using If statements.	Implementation of minimum two C programs using simple If statement and if..else statement.	**2**	CO2
6	**LLO 6.1** Write syntax of if... else and if.. else if ladder statements.	*Implementation of minimum two C programs using nested If ...else statement and if.. else if ladder.	**2**	CO2
7	**LLO 7.1** Write C program using Switch statement.	*Develop a C program using Switch statements.	**2**	CO2
8	**LLO 8.1** Implement iterative solution to problem using for loop, while and do - - while loop	*Implementation of minimum two C programs using 'for loop', 'while' loop and 'do...while' loop control statements.	2	CO2
9	**LLO 9.**1Write the syntax -for statement. **LLO 9.2** Write C code for solving a given problem using For-loop with the help of break and continue keyword.	*Implementation of a C program to Print various patterns using for loop with break and continue statements.	**4**	CO2

10	**LLO 10.1** Declare and initialize the Array. **LLO 10.2** Write C program for implementation of one Dimensional array.	Write C programs based Operations on 1D arrays: i)Declaration of different data types of array. ii)Initialization of array elements. iii)Accessing array elements without loop and with loop.	**2**	**CO3**
11	**LLO 11.1** Develop Logic for Searching an element from an array. **LLO 11.2** Develop logic for sorting an array in ascending/descending order. **LLO 11.3** Write C programs to perform Searching and Sorting	*Implementation of a C programs based Operations on 1D arrays: Search an element, sorting array etc.	**2**	**CO3**
12	**LLO 12.1** Write a C program for operations on 2D Arrays	*Implementation of a C programs based Operations on 2D arrays: i)Declaration of different data types of array. ii)Initialization of array elements. iii)Accessing array elements without loop and with loop.	**2**	**CO3**
13	**LLO 13.1**Write C program for implementation of two Dimensional arrays. **LLO 13.2** Develop logic for performing operations on 2D arrays	Implementation of a C programs based Operations on 2D arrays : Addition , Multiplication etc.	**2**	**CO3**
14	**LLO 14.1** Write C programs for print string operations using string handling Functions	*Implementation of a C program using predefined string functions for string comparison, concatenation, copying etc.	2	**CO3**
15	**LLO 15.1** Write C programs for print string operations without using string handling Functions	*Implementation of a C program without using predefined string functions for string comparison, concatenation, copying etc.	2	**CO3**
16	**LLO 16.1** Use built-in library functions in C programs	Implementation of a C programs on Predefined Functions	2	CO4
17	**LLO 17.1** Write C programs using user defined functions	*Implementation of a programs on User defined functions for following a)Function with no arguments and no return value, b)Function with no arguments and a return value, c) Function with arguments and no return value, d) Function with arguments and with return value.	4	CO4
18	**LLO 18.1**Write Recursive functions in C. **LLO 18.2** Write nested functions in C.	*Implementation of a C programs based on i) Recursion ii) Nesting of functions.	2	CO4
19	**LLO 19.1** Write user defined functions in C.	*Develop a C programs on User defined functions for following i)Call by value. ii)Call by reference.	2	CO4

20	**LLO 20.1** Write a C program C program based on Pointers	Implementation of a C program based on declaration of Pointers, Initialization and Accessing pointers to pointers.	2	CO5
21	**LLO 21.1** Perform operations using pointers.	*Develop a C program based on i) Pointer Expressions ii) Array of Pointers	2	CO5
22	**LLO 22.1** Write a C program based on structure .	*Implementation of a C program based on structure definition and initialization.	2	CO6
23	**LLO 23.1** Write a C program using Structure within Structure.	Implementation of a C program based on structure within structure.	2	CO6
24	**LLO 24.1** Write a C program using an array of Structure.	Development of a C program based on an array of structure.	2	CO6
25	**LLO 25.1** Write a C program using Concept of Enumerated Data type.	Implementation of a C programs based on Enumerated Data Types	2	CO6
26	**LLO 26.1** Develop a micro project using concepts learned from C programming.	*Micro-project/SpringBoard certification for PIC. (Refer point 11 for micro project list)	4	ALL

*Write algorithm and draw flowchart for given problem statement in each practical .
* SpringBoard certification for PIC Example:Learn and Master C Programming For Absolute Beginners!
Free Certification : 14hrs 50 m:
Link:https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013094424590991360222 8_shared/overview

Note : Out of above suggestive LLOs -
'*' Marked Practicals (LLOs) Are mandatory.
Minimum 80% of the above list of lab experiments are to be performed.
Judicial mix of LLOs are to be performed to achieve desired outcomes.

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

Micro project

The micro project has to be Industry Application Based, Internet-based, Workshop-based, Laboratory-based or Field-based as suggested by Teacher.

1. Prepare a simple calculator to perform mathematical operations. Accept values and operations to be performed from the user. Allow only numeric values and otherwise show appropriate messages to users.

2. Prepare menu driven program for Bank management system.The functionality of the Bank Management System Application is mentioned below:Transfer Money to the Account,Creation of Account,Check Amount, Login Functionality.

3.Develop food menu cards for restaurant. Display food items. Accept food menu, quantity and generate bill for the same.

4. Develop a menu-driven program to perform Number System ConversionThe functionality of the Number System Conversion is mentioned below: Decimal to Binary, Binary to Decimal, Decimal to Octal, Octal to, Decimal,Hexadecimal to Binary,Binary to Hexadecimal.

5.Develop a menu-driven program to performQuiz Game:The Functionality of the Quiz Game is mentioned below: Insert questions,Check answer,Get Score.

6. Calendar:Create an application to check date, day, etc using an application that can be created with C using basic knowledge like arithmetic operations, strings, etc. The Functionality of the Calendar are mentioned below: Find Out the Day, Print all the days of the month, Add Note.

VII.

VIII. 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) d) C language IDE- Turbo/Borland / Dev C etc	ALL

IX. 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 PROGRAMMING	CO1	08	**4**	**2**	**4**	**10**
2	II	CONTROL STRUCTURES	CO2	08	**2**	**2**	**6**	**10**
3	III	ARRAYS AND STRINGS	CO3	12	**4**	**4**	**6**	**14**
4	IV	FUNCTIONS IN C	CO4	12	**4**	**4**	**6**	**14**
5	V	POINTERS IN C	CO5	10	**2**	**4**	**4**	**10**
6	VI	STRUCTURES	CO6	10	**2**	**4**	**6**	**12**
Grand Total				**60**	**18**	**20**	**32**	**70**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
Continuous assessment based on process and product related performance indicators Each practical will be assessed considering, Lab performance, Assignment, Self-learning and Seminar/Presentation	End semester examination ,Lab Performance, viva voce

XI. 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	2	2	1	-	-	2	2	-	3
CO2	2	2	3	2	-	1	2	-	-	3
CO3	2	3	2	3	1	1	2	-	-	3
CO4	3	3	2	3	1	1	3	-	-	3
CO5	3	3	3	3	1	1	3	2	-	3
CO6	3	3	2	3	1	2	3	-	-	3
Legends:- High:03, **Medium:**02, **Low:**01, **No Mapping:** - *PSOs are to be formulated at the institute level										

XII. SUGGESTED LEARNING MATERIALS/BOOKS

Sr. No	Author	Title	Publisher
1	E. Balaguruswamy	Programming in ANSI 'C'	Mcgraw Hill Publications ISBN 0070534772
2	Yashwant Kanetkar	Let us 'C'	BPB Publication ISBN 9788183331630
3	David Griffiths, Dawn Griffiths	Head First C	O'Reilly Media, Inc. ISBN: 9781449345013

XIII. LEARNING WEBSITES & PORTALS

Sr.No	Link/Portal	Description
1	https://nptel.ac.in/courses/106104128	C Programming
2	https://jsommers.github.io/cbook/control.html	Control structures, flow control statements in C
3	https://www.learn-c.org/en/Functions	Functions
4	https://www.simplilearn.com/tutorials/c-tutorial/pointers-in-c	Pointers
5	https://www.w3schools.com/c/	C Programming
6	https://www.javatpoint.com/c-programming-language- tutorial	C Programming tutorial
7	https://www.programiz.com/c-programming	C Programming
8	https://www.programiz.com/c-programming/online- compiler/	Online C compiler

Name & Signature:

Mrs. Khushboo S. Sathawane

Mrs. Snehal S. Ingavale

Lecturer in Computer Engineering.

Mrs. K. S. Gaikwad

Lecturer in Information Technology.

(Course Experts)

Name & Signature:	Name & Signature:
Dr.D N Rewadkar (Programme Head)	**Shri. S.B. Kulkarni** (CDC In-charge)

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GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	**DIPLOMA IN** CE/EE/ET/ME/MT/**CM/IT**/DDGM
PROGRAMME CODE	01/02/03/04/05/**06/07**/08
COURSE TITLE	**WEB PAGE DESIGNING USING HTML**
COURSE CODE	**CM21205**
PREREQUISITE COURSE CODE & TITLE	**NA**

I.LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme											
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
CM21205	Web Page Designing Using HTML	SEC	2	-	4	2	8	4	--	--	--	--	--	50	20	50@	20	50	20	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.

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. C**redit** 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:

Web Page Design is used to develop online applications for various organizations such as Organizational and Educational websites, Virtual Learning environments, Business Applications in various fields such as products, sales, banking railways reservation, services etc. Web pages are categorized into two namely: static and dynamic web page. This course introduces web page design using HTML5 and also give emphasis on learning Cascading Style Sheets (CSS) which is a style sheet language used for describing the presentation of a document written in a markup language for formatting and styling of content.

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

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

CO1:Use HTML formatting tags to develop a web page.

CO2:Develop web page using List and hyperlinks.

CO3:Create Web pages using Images, Colors and Backgrounds.

CO4:Design HTML forms.

CO5:Format web pages using CSS.

CO6:Host static websites.

IV.THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

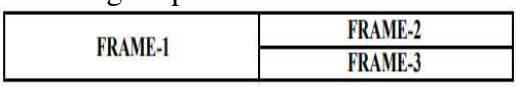
Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
UNIT-I INTRODUCTION TO HTML (CL Hrs-04, Marks-NIL)				
1.	**TLO 1.1** Differentiate characteristics of the given type of web sites. **TLO 1.2** Describe structure of the given HTML page. **TLO 1.3** Explain use of Head tag and body tag in the given web page. **TLO 1.4**Describe the procedure of using the given block level tag on a web page. **TLO 1.5** Describe the procedure of using the given Text level tag and use of special characters in web page.	**1.1** Introduction of HTML **1.2** Terminologies used in Web Design: World Wide Web (www), Web Pages and it'sypes, Web Site, Web Browsers, Web Servers and types of sites. Static vs. dynamic web sites, Search Engine. **1.3** Web page structure: DOCTYPE, HTML, TITLE, HEAD, BODY and other meta tags with attributes. **1.4** Block Level Elements: Headings, Paragraphs, Breaks, Divisions, Centered Text, Block Quotes, Preformatted text, types of Address, HR tag. Horizontal Rule,Block level tag. **1.5** Text Level Elements: Bold, Italic, Teletype, Underline, Strikethrough, Superscript, Subscript, displaying special characters, Comments.	Hands-on Demonstration Presentation	**CO1**
UNIT-II ELEMENTS OF HTML (CL Hrs-04, Marks-NIL)				
2	**TLO 2.1** Explain use of the given type of list in Web Pages. **TLO 2.2**Describe different types of Links.	**2.1**Lists: Ordered Lists, Unordered Lists, Definition Lists, Nested Lists. **2.2** Links: Absolute, Relative and Inline links, Use image as link, Link to an email address, Button as link, Types of Links, Linking various documents for Internal and external links, To link different web page of same site, link different location on the same web page, Specific location on different web page of same site. to specific section within the Document, Inserting E-mail link.	Hands-on Demonstration Presentation	**CO2**
UNIT-III IMAGES,COLORS AND BACKGROUND(CL Hrs-06, Marks-NIL)				
3	**TLO 3.1** Describe the given image attribute on a web page and describe HSPACE & VSPACE **TLO 3.2**. Explain process of using the given colors/images as page background on a Web Page.	**3.1** Image: Types of image format, jpg, bmp, png gif etc. IMG tag, alternate text, image alignment, HSPACE, VSPACE, wrapping text, height and width of images, Image as a link, Inserting Images, formatting image for sizing, alignment. Border and using other attributes with IMG tag. **3.2** Colors and Backgrounds: The text color, color attribute of FONT tag, text attribute of BODY tag. bgcolor attribute of BODY tag,	Hands-on Demonstration Presentation	**CO3**

		Changing link colors: link, alink, vlink, attributes of BODY tag, Backgrounds: Inserting image as page background, Background attributes of BODY tag, Creating solid color page background		
UNIT- IV TABLE,FRAMES AND FORMS (CL Hrs-06, Marks-NIL)				
4	**TLO 4.1:** Explain the given table attributes to organize data on a web page and table setting. **TLO 4.2:** Describe the table formatting in web pages. **TLO 4.3:** Describe the given type of 'frame' with examples and procedure to organize display as per given screen layout using frames. **TLO 4.4:** Create basic form using different form fields and Button tags.	**4.1** Table: Table tag with attributes. TABLE,<tr>,<th>,<td> tags. Border, cell spacing, cell padding, width, align, bgcolor attributes. Adding captions: CAPTION tag **4.2** Formatting contents in the table cells: align, valign, bgcolor, height, width, nowrap attributes. Spanning rows and columns: rowspan and colspan attributes. **4.3** Frames: Types of Frames with their attributes, Creating frames: FRAMESET tag – rows, cols attributes, FRAME tag – name, frame border, margin height, margin width, src, resize, scrolling Attributes, Use of NOFRAMES tag, Frame targeting. **4.4** Forms: Creating basic form: FORM tag, action and method attributes, Form fields: Single line text field, password field, multiple line text area, radio buttons, and check boxes. Pull down menus: SELECT and OPTION tags. Buttons: submit, reset and generalized buttons.Formatting technique: Using table to layout form.	Hands-on Demonstration Presentation	**CO4**
UNIT –V INTRODUCTION TO CASCADING STYLE SHEETS(CL Hrs-06, Marks-NIL)				
5	**TLO 5.1** Describe CSS code for the given type of formatting on a web page with different CSS properties. **TLO 5.2** Describe the procedure to create CSS for applying the given presentation scheme on a web page **TLO 5.3** Describe CSS advanced properties. And Enlist different types of CSS responsive attributes.	**5.1** Cascading Style Sheets: Different types of Style Sheets, Benefits of using CSS. Adding style to the document: Linking to style sheets, Embedding style sheets, Using inline style, Selectors: CLASS rules, ID rules. **5.2** Style sheet properties: Font, textbox, color and background properties; Creating and Using a simple external CSS file; Using the internal and inline CSS; background and color gradients in CSS Setting font and text in style sheet using table layout. **5.3.**CSS responsive attributes**:**CSS HYPERLINK Rounded Corners ,CSS Border Images, CSS Shadows, CSS Text Effects,CSS 2D Transforms, CSS 3D Transforms, CSS Transitions, CSS Animations, CSS Tooltips, CSS Style Images, CSS Image Reflection.	Hands-on Demonstration Presentation	**CO5**

UNIT –VI WEBSITE HOSTING (CL Hrs-04, Marks-NIL)				
6	**TLO 6.1** Describe the procedure to configure a web server and hosting the given website.	**6.1** Website Hosting: Concept of Internet and Intranet. Publishing website on Intranet, Installing and configuring web server, uploading files on intranet site, access intranet based website; Publishing website site on Internet, hiring Web space, uploading files using FTP, Virtual Hosting, access internet based website.	Hands-on Demonstration Presentation	**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 1.1** Working with basic HTML tags.	Create a web page using structure tags to display sample message	2	CO1*
2	**LLO2.1** Working with Font tags	Create a web page to provide an introduction to "Government Polytechnic, Pune"with the help of different font tags.	2	CO 1*
3	**LLO 3.1** Use of heading tags in web page	Display all branches of Government polytechnic Pune in <h1> to <h6> header tags.	2	CO 1*
4	**LLO 4.1** Working with text level tags	Design a web page with two paragraphs each of 8-10 lines. Assign title to web page. Practice formatting tags for bold, italics, underline, center, break, space,	4	CO 1*
5	**LLO 5.1** Working with block level tags	Create a web page for displaying a paragraph using block level tags and HR tags, pre tag, DIV tag ,span tag etc.	2	CO 1
6	**LLO 6.1**Implement the border properties in web page	Create a web page to insert a border property in html statements.i.e. ©, ®, ←	2	CO 1*
7	**LLO 7.1** Use of special character in webpage	Create a web page using special symols	2	CO 1
8	**LLO 8.1** Use of different character formatting in Web page.	Create a page to show different character formatting (SUB, SUP) tags: for eg: $log_b m^p = p\ log_b m$	2	CO 1*
9	**LLO 9.1** Working with ordered and unordered List.	Design a web page for implementing Ordered list and Unordered list.	2	CO 2*

10	**LLO 10.1** Use of different types or ordered and unordered list in web page	Design a web page for implementing • Ordered list within unordered list • Unordered list within ordered list • Ordered list within ordered list • Unordered list within unordered list	4	CO 2*
11	**LLO11.1** Create a web page link	Create a web page to link: • A different web page of same site • A different location on the same web page • A Specific location on different web page of same site	4	CO 2*
12	**LLO12.1** Use of links with images in web page.	Create a web page with an appropriate image towards the left hand side of the page, when user clicks on the image another web page should open.	4	CO 2*
13	**LLO13.1** Use of colors for links in web page	Demonstrate to change colors of links on web page.	2	CO 2*
14	**LLO14.1** Insert image on web page foreground and background with various attributes.	Create a web page with pink color background and display moving message in red color.	2	CO 3*
15	**LLO15.1** Insert images with hyperlink and set image width and height property of image	Create a webpage containing any image and add a hyperlink to another webpage. Use width and height property for an image.	2	CO 3*
16	**LLO16.1** Create table in web page	Create a webpage that displays first year timetable. Make effective use of row span and cols pan attributes. Make use of tag too.	2	CO 3*
17	**LLO17.1** Create table and use table properties in web page	Create a webpage that displays first year timetable. A) Make use of borders, margins and padding properties on table/table rows/table cells. B) Use tag to mark various divisions of webpages. Apply background, border, margin properties to different divisions.	4	CO 3*
18	**LLO18.1** Create table within table and Insert images in tables	Create table within table and also insert an image within the data elements of the table.	2	CO 4*
19	**LLO19.1** Create a frames in web pages	Create a web page which should generate following output: 	2	CO 4*
20	**LLO20.1** Create different elements in web pages.	Create a "registration form "with the following fields: 1)Name 2) Password 3)Email id 4)Phone no 5) Gender	2	CO 4*

		6)Language Known		
21	**LLO21.1** Create CSS by applying style sheets.	Design a webpage using CSS which includes the following: 1)Use different fonts and styles: In the style definition you define how each selector should work(font,color,etc).	4	CO 5*
22	**LLO22.1** Create CSS by applying animation	Create a web page for demonstration of CSS animation.	4	CO 5*
23	**LLO23.1** Hosting of website on open source platform.	Create a website and host on open source.	4	CO 6*
24	**LLO24.1** Create a website to represent portfolio	Create a website to represent personal portfolio.	2	CO 6
25	ALL	Micro-project	04	All COs*

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

Self-Learning

1. 1)"HTML & CSS For Beginners with HTML5" certification course of Infosys Springboard(TOC -HTML & CSS For Beginners with HTML5 | Infosys Springboard (onwingspan.com))
2. "Introduction to HTML: A Complete Beginner to Expert Course "certification course of Infosys Springboard(TOC - Introduction to HTML: A Complete Beginner to Expert Course | Infosys Springboard (onwingspan.com))
3. Completion Certification course of SWAYAM/NPTEL/MOOCS/OTHER LEARNING PLATFORM
4. Prepare a report on good design and bad design.
5. Prepare a report on best practices of web programming.

Suggested 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) To perform a survey on various websites available like IRCTC, Amazon and prepare report on different HTML controls used in it.
2) Prepare a Registration form for cultural event. (The course teacher shall assign a document to be prepared by each student)
3) To study and prepare a report on advanced HTML Tags (The subject teacher shall assign a presentation to be prepared by each student).

Assignment

Prepare a journal of practical 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 HTML	CO1	4	--	--	--	--
2	II	ELEMENTS OF HTML	CO2	4	--	--	--	--
3	III	IMAGES,COLORS AND BACKGROUND	CO3	6	--	--	--	--
4	IV	TABLE,FRAMES AND FORMS	CO4	6	--	--	--	--
5	V	INTRODUCTION TO CASCADING STYLE SHEETS	CO5	6	--	--	--	--
6	VI	WEBSITE HOSTING	CO6	4				
		Grand Total		**30**	--	--	--	--

IX.ASSESSMENTMETHODOLOGIES/ 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	PSO-3
CO1	1	-	-	-	-	-	1	2	-	3
CO2	-	-	-	3	-	-	1	-	-	3
CO3	-	2	1	3	-	-	1	-	-	3
CO4	-	-	-	3	-	-	1	-	-	3
CO5	1	-	-	3	-	-	3	2	-	3
CO6	1	2	3	2	-	-	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	HTML and CSS Complete Reference	Thomos Powell	Tata McGraw Hill
2	Web Publishing with HTML and CSS	Lemay Colburn	Pearson
3	HTML and CSS 3	Ivan Bayross	BPB
4	Learning Web Design	Robbins	O'Reilly
5	Teach Yourself HTML & CSS in 24 Hours	SAMS	Pearson

XII. LEARNING WEBSITES & PORTALS

Sr.No	Link/Portal
1	https://www.geeksforgeeks.org/
2	https://www.w3schools.com/html/
3	https://www.tutorialspoint.com/html/
4	https://www.javatpoint.com/

Name & Signature:

Mrs. Sheetal J. Siraskar

Mrs. Priya K. Zade

Lecturer in Computer Engineering

Miss. Poonam C. Fafat

Lecturer in Information Technology

(Course Experts)

Name & Signature:	Name & Signature:
Dr.D N Rewadkar (Programme Head)	**Shri. S.B. Kulkarni** (CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

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

I. LEARNING &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
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	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
	UNIT-I LIVING WITH CLIMATE CHANGE			
	SUBUNIT 1: CLIMATE CHANGE PHENOMENON AND SCIENCE			
1.1	**TLO 1.1.1** Able to articulate the fundamental differences between weather and climate **TLO 1.1.2** Understanding of the basic principles of climate change, including the greenhouse effect, human-induced factors, and the consequences of a warming planet. **TLO 1.1.3** Able to define the concept of a carbon footprint, understanding it as the total amount of greenhouse gases.	1.1.1 Understanding Climate: Weather versus Climate 1.1.2 Climate and the Greenhouse Effect 1.1.3 Natural and Human-induced Climate Change 1.1.4 Carbon footprint	Video Lectures (Online Mode: Link https://www.mahayouthnet.in/)	1
	SUB UNIT 2: CLIMATE CHANGE IMPACTS			
1.2	**TLO 1.2.1** Grasp the foundational science behind climate change, including the greenhouse effect, human-induced emissions, and the role of feedback mechanisms in global warming. **TLO 1.2.2** 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. **TLO 1.2.3** 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.	1.2.1Global impacts and uncertainties 1.2.2 Effects on India and its various biogeographic regions 1.2.3Impacts on livelihoods and economy: Agriculture and Horticulture 1.2.4Impacts on Vulnerable Communities: Fishing Communities	Video Lectures (Online Mode: Link https://www.mahayouthnet.in/)	1

SUB UNIT 3: CLIMATE ACTION				
1.3	**TLO1.3.1** Understand the concept of climate change mitigation and adaptation and its role in preparing for and responding to the impacts of climate change. **TLO1.3.2** Understand the concept of sustainable development and its three dimensions: economic, social, and environmental. **TLO1.3.3** Identify and articulate the connections between climate change impacts and existing social, economic, and environmental inequalities. **TLO1.3.4** Understand the importance of community-based climate action and initiatives led by local communities in India. **TLO 1.3.5** Understand the concepts of green skills and green work, emphasizing their role in promoting sustainability and environmentally conscious practices in various industries.	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	Video Lectures (Online Mode: Link https://www.mahayouthnet.in/)	2
UNIT-II WATER MANAGEMENT FOR CLIMATE CHANGE				
SUB UNIT 1: THE NEED OF WATER MANAGEMENT AND CONSERVATION				
2.1	**TLO 2.1.1** Understand the concept of water management and its significance in addressing water-related challenges. **TLO 2.1.2** Describe the water cycle and its role in the distribution and availability of water. **TLO 2.1.3** Identify regions facing water scarcity and understand the factors contributing to water shortages. **TLO 2.1.4** Analyze patterns of human water consumption and its impact on local and global water resources. **TLO 2.1.5**Examine water quality issues, including pollution sources, contaminants, and their effects on ecosystems and human health. **TLO 2.1.6** Recognize the role of community engagement in water conservation efforts and sustainable water management practices. **TLO 2.1.7** Understand the	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.	Video Lectures (Online Mode: Link https://www.mahayouthnet.in/)	2

	concept of wastewater and Identify and analyze the sources of pollutants in wastewater, including industrial discharges, agricultural runoff, and urban sewage.			
SUB UNIT 2: ISSUES AND CHALLENGES IN WATER MANAGEMENT				
2.2	**TLO 2.2.1** Understand the concept of water stress and its implications for a region's ability to meet water demand for various purposes. **TLO 2.2.2** Explore the role of agriculture in water stress, including irrigation practices, cropping patterns, and the impact of changing agricultural practices. **TLO 2.2.3** Understand the concept of water pollution and differentiate between various types of pollutants affecting water bodies. **TLO 2.2.4** Understand the environmental, ecological, and public health impacts of different pollutants in water, such as nutrients, heavy metals, pathogens, and synthetic chemicals. **TLO 2.2.5** Identify common waterborne diseases, such as cholera, typhoid, dysentery, and gastroenteritis, and understand their causative agents. **TLO 2.2.6** 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.	2.2.1 Water Stress in India. 2.2.2 Water resources limitation and increasing use. 2.2.3 Water stress in agriculture. 2.2.4 Water pollution and contamination. 2.2.5 Health impacts of poor water quality. 2.2.6 Water management and climate change. 2.2.7 The global challenge of water and sanitation. 2.2.8 Summary - causes of water stress.	Video Lectures (Online Mode: Link https://www.mahayouthnet.in/)	2
SUB UNIT 3:TOWARDS SUSTAINABLE WATER MANAGEMENT				
2.3	**TLO 2.3.1** Understand and define the concept of sustainable water management, considering its ecological, social, and economic dimensions. **TLO 2.3.2** Understand the significant initiatives launched by the Government of India/State government which focuses on water resources and management.	2.3.1 Towards sustainable water management 2.3.2 Swachh Bharat - The Mission for a Clean India 2.3.3 Jal Jeevan Mission - Water for All 2.3.4 Atal Bhujal Yojana - Replenish Groundwater 2.3.5 Mission Amrit Sarovar - Rejuvenate Water bodies 2.3.6 Jalyukt Shivar Abhiyan – Waterscapes.	Video Lectures (Online Mode: Link https://www.mahayouthnet.in/)	2

SUB UNIT 4: INDIVIDUAL AND COMMUNITY ACTIONS FOR WATER AND WASTEWATER MANAGEMENT				
2.4	**TLO 2.4.1** Understand the concept of a water audit and its significance in assessing water use, efficiency, and conservation. **TLO 2.4.2** Analyze water use patterns in common household activities, including bathing, washing dishes, laundry, and gardening. **TLO 2.4.3** Understand the definition of greywater and Recognize common sources of greywater in households, including bathroom sinks, showers, bathtubs, and washing machines. **TLO 2.4.4** promote awareness within communities about the benefits of greywater management and its potential impact on water conservation. **TLO 2.4.5** Understand the concept of rainwater harvesting and its significance in sustainable water management. **TLO 2.4.6** Learn different methods used to calculate rainwater harvesting potential	2.4.1 Conduct water audits 2.4.2 Save water at home 2.4.3 Promote greywater management at home and in the community 2.4.4 Spread the word on sustainable water management 2.4.5 Calculate Rainwater Harvesting Potential.		2
UNIT III: WASTE MANAGEMENT AND CLIMATE ACTION				
SUBUNIT 1: WHAT IS WASTE?				
3.1	**TLO 3.1.1** Understand the term "domestic waste" and distinguish it from other types of waste generated in different contexts. **TLO 3.1.2** Classify domestic waste into different categories such as organic waste, recyclables, hazardous waste, and non-recyclables. **TLO 3.1.3** Learn various methods used to quantify household waste, including direct measurement, sampling, and estimation techniques. **TLO 3.1.4** Identify specific waste patterns associated with different generations and lifestyles **TLO 3.1.5** Understand the Sustainable Development Goals (SDGs)	3.1.1 Define and enlist types of waste 3.1.2 List the components of domestic waste 3.1.3 Differentiate between biodegradable and non-biodegradable waste 3.1.4 Assess the quantum of waste generated at home 3.1.5 Changes in Waste generation over human generations 3.1.6 Review lifestyle choices 3.1.7 SDGs and Link of Waste with SDGs	Video Lectures (Online Mode: Link https://www.mahayouthnet.in/)	3

	TLO 3.1.6 Analyze the critical role of waste management in achieving multiple SDGs			
SUBUNIT 2: ISSUES IN WASTE MANAGEMENT				
3.2	**TLO 3.2.1 E**mphasizing waste impact on the environment, human health, and overall sustainability. **TLO 3.2.2** Identify health risks associated with improper waste disposal, such as the spread of diseases and exposure to hazardous materials. **TLO 3.2.3** Analyze how waste, particularly organic waste in landfills, contributes to greenhouse gas emissions and climate change.	3.2.1 Why is waste an issue? 3.2.2 Health impacts from mismanagement of waste 3.2.3 Work conditions of waste workers 3.2.4 Waste of natural resources and increased greenhouse gas emissions	Video Lectures (Online Mode: Link https://www.mahayouthnet.in/)	3
SUBUNIT 3: APPROACHES TO WASTE MANAGEMENT				
3.3	**TLO 3.3.1** Clearly define the waste management hierarchy **TLO 3.3.2 W**aste management hierarchy role in guiding sustainable waste management practices such as source reduction, reuse, recycling, energy recovery, and disposal.	3.3.1 Hierarchy of waste management 3.3.2 Waste segregation at source 3.3.3 Reduce, Reuse, Recycle and Recover 3.3.4 Recycling of waste materials 3.3.5 Principle of circular economy 3.3.6 Avoiding waste by design 3.3.7 Composting	Video Lectures (Online Mode: Link https://www.mahayouthnet.in/)	3
SUBUNIT 4: LEGISLATIONS RELATED TO WASTE MANAGEMENT				
3.4	**TLO 3.4.1** Familiarize yourself with major national and international legislation related to waste management. **TLO 3.4.2** Define Extended Producer Responsibility (EPR) and explain its concept in the context of environmental management. **TLO 3.4.3** Define biomedical waste and distinguish it from other types of waste. Identify the various sources and types of biomedical waste generated in healthcare facilities.	4.1 Municipal Solid Waste Management Rules 2016 4.2 Plastic Waste Management Rules 4.3 Extended Producer Responsibility (EPR) 4.4 Biomedical Waste Management 4.5 Preventive Measures for Manual Scavenging	Video Lectures (Online Mode: Link https://www.mahayouthnet.in/)	3
SUBUNIT 5: ACTION FOR IMPROVING WASTE MANAGEMENT				
3.5	**TLO 3.5.1** Develop skills in data collection methods for waste assessment, such as waste audits, surveys, and interviews.	5.1 Waste assessment in your community or town 5.2 Setting up a compost unit	Video Lectures (Online Mode: Link https://www.mahayouthnet.in/)	3

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

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

	diverse ecosystems for survival and well-being. **TLO 5.1.4** Develop the ability to identify and categorize the various forms of biodiversity present in the specific landscape, including plants, animals, microorganisms, and their interactions.			
SUBUNIT 2: THREATS TO BIODIVERSITY				
5.2	**TLO 5.2.1** Categorize and differentiate between natural and anthropogenic threats to biodiversity, including habitat loss, pollution, climate change, invasive species, and overexploitation. **TLO 5.2.2** Clearly define the concepts of biocultural diversity and climate change, highlighting the interconnectedness between biological diversity, cultural diversity, and changing climatic conditions.	**5.2.1 Threats to biodiversity** **2.2.2 Biocultural diversity and climate change**	Video Lectures (Online Mode: Link https://www.mahayouthnet.in/)	6
SUBUNIT 3: CONSERVING BIODIVERSITY				
5.3	**TLO 5.3.1** Clearly define the concept of biodiversity conservation, emphasizing its importance in maintaining ecological balance and supporting human well-being. **TLO 5.3.2** 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. **TLO 5.3.3** Clearly define the concept of biodiversity conservation actions, emphasizing the multifaceted approaches and strategies employed to protect and sustain biodiversity.	**5.3.1** Approaches to conservation of biodiversity. **5.3.** Key legislations for biodiversity conservation **5.3.3** Actions for biodiversity conservation at various levels, including awareness raising and advocacy in the community	Video Lectures (Online Mode: Link https://www.mahayouthnet.in/)	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 https://www.unfccc.int/ https://www.carbonfootprint.com/ 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 weekAnalyze 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. **1. Lighting:** • Turn off lights in unoccupied rooms. • Replace incandescent bulbs with LEDs • Utilize natural light whenever possible **2. Heating and Cooling:** • Set your thermostat to energy-efficient temperatures (25°C in summer, 20°C in winter) • Seal air leaks around windows and doors. • Clean or replace air filters regularly. **3. Appliances:** • Unplug electronics and chargers when not in use. • Wash clothes and dishes in cold water whenever possible. • Use energy-efficient appliances when purchasing new ones **4. Insulation:** • Check your attic and basement for proper insulation. • Seal any gaps or cracks around pipes and vents. **5.** Suggest corrective actions.

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 : **a) Introduction** 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) Biodiversity resources in your landscape -:** List of trees, plants, and shrubs in the village/ town outskirts, their classification, occurrence, and usage study. **c) Understand a tree as an ecosystem and the biodiversity associated with the tree.**

Note: (1) Individual activities:

The student should complete **any Three activities** among the list given in Table No. 01. above. **(Total Marks: 30 i.e. 10 Marks for each activity)**

(2) Group activity:

Students should complete **any One Community Project** among the list given in Table No. 02 above. **(Total Marks: 20)**

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

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
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

Sr.No	Description	Mode	Remarks
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

Sr.No	Web Link /Portal	Description
1	(Online Mode: Link https://www.mahayouthnet.in/)	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:		
(Shri. Nitin D. Toradmal) Lecturer in Electronics Govt. Polytechnic, Pune	**(Shri. Balaji Vharkat)** UNICEF, Maharashtra	**(Shri. Girish W. Sonone)** Lecturer in Electronics Govt. Polytechnic, Mumbai
Name & Signature: **Dr.D N Rewadkar** (Programme Head)	Name & Signature: **Shri. S.B. Kulkarni** (CDC In-charge)	

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMA IN CM/IT
PROGRAMME CODE	06/07
COURSE TITLE	OBJECT ORIENTED PROGRAMMING
COURSE CODE	CM31203
PREREQUISITE COURSE CODE & TITLE	NA
CLASS DECLARATION COURSE	NO

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme										
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
CM31203	OBJECT ORIENTED PROGRAMMING	SEC	3	--	4	1	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.

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 course.
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 provides students with an introduction to entry-level fundamentals of Object Oriented Programming. The goals of the course are to develop the programming ability of students and to improve their proficiency in applying the fundamentals of Object Oriented Programming. To achieve this goal high-level programming language used is C++. The topics include different programming paradigms in computer programming, limitations of procedural approaches and solutions given by object-oriented programming.

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 Understand procedural and object-oriented paradigms.
- CO2 Implement different functions in OOP.
- CO3 Develop programs using classes and objects.
- CO4 Implement programs on inheritance.
- CO5 Apply concepts of polymorphism and type conversion.
- CO6 Develop applications for file handling.

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
UNIT-I FUNDAMENTALS OF OBJECT ORIENTED PROGRAMMING (CL Hrs-4, Marks-8)				
1	**TLO1.1** Differentiate between OOP and POP **TLO1.2** Explain the Features of OOP **TLO1.3** Use of control Structures, Arrays, Functions, Structures	**1.1** Different programming paradigms **1.2** Limitations of Procedural Programming and Need of OOP **1.3** Features of OOP **1.4** Beginning with C++: Tokens, Expressions, Control Structures, Array, Functions, Structures	Hands-on Demonstration Presentations	CO1, CO2
UNIT-II FUNCTIONS IN C++ (CL Hrs-6, Marks-12)				
2	**TLO2.1** Structure of C++ Program **TLO2.2** functions using different function approaches. **TLO2.3** Use of Call by value and Call by reference	**2.1** Functions in C++ **2.2** The main function **2.3** Function Prototyping **2.4** Call by Reference, Return by Reference **2.5** Inline Functions **2.6** Default Argument and const Arguments	Hands-on Demonstration Presentations	CO2
UNIT-III CLASSES AND OBJECTS (CL Hrs-10, Marks-14)				
3	**TLO3.1:** Define Class and object **TLO3.2:** Understand memory allocation concepts. **TLO3.3:** Differentiate between constructors and destructors.	**Classes & Objects** **3.1** Specifying a class, Defining member functions, Nesting of Member Functions, Private Member Functions **3.2** Creating objects, Memory allocation for objects, Static data and member function, Array of objects and Objects as function arguments **3.3** Constructors and their types, Constructor Overloading, Constructors with Default Arguments, Dynamic Initialization Of Objects **3.4** Destructors **3.5** String Class and objects, manipulating string objects, Relational Operations, string characteristics, accessing characters in strings, Comparing and swapping strings	Hands-on Demonstration Presentations	CO3
UNIT- IV INHERITANCE (CL Hrs-08, Marks-12)				
4	**TLO4.1:** Define inheritance. **TLO4.2:** Explain the need for inheritance. **TLO4.3:** Implement various types of inheritances.	**4.1** Introduction Base Classes, Derived classes Member declaration: Public, Private, protected **4.2** Types Of Inheritance Single, Multilevel, Multiple, Hierarchical, Hybrid **4.3** Virtual base classes **4.4** Abstract classes **4.5** Constructors in derived classes	Hands-on Demonstration Presentations	CO4

UNIT –V POLYMORPHISM AND TYPE CONVERSION (CL Hrs-10, Marks-14)				
5	**TLO 5.1:** Explain the concept of operator overloading. **TLO 5.2:** Understand and implement object-oriented programming language key features like polymorphism. **TLO 5.3:** Describe pointers in C++. **TLO 5.4:** Implement type conversion for various data types.	**5.1** Compile Time Polymorphism Functions overloading Operator Overloading (unary and binary) Overloading Vs Overriding **5.2** Run Time Polymorphism Pointers in C++, Pointers to Objects 'This' Pointer, Pointers to Derived Classes, Virtual functions, Static and dynamic binding **5.3** Type Conversion: Introduction, basic to class type, class to basic type, one class to another type, data conversion example	Hands-on Demonstration Presentations	CO5
UNIT –VI FILES AND EXCEPTION HANDLING (CL Hrs-7, Marks-10)				
6.	**TLO 6.1:** Define files in C++. **TLO 6.2:** Implement various operations that can be performed on files. **TLO 6.3:** 6c. Execute a program to handle exceptions in the programs	Files: **6.1.** C++ Streams and Stream Classes **6.2.** Unformatted IO Operations **6.3.** File Stream Classes **6.4.** Opening and Closing a File **6.5.** Deleting a File **6.6.** File Modes Exception Handling: **6.7.** Introduction, basics of exception handling, types of exceptions, **6.8.** Structure to handle an exception, exception handling mechanism **6.9.** Throwing mechanism, catching mechanism, re-throwing an exception, specifying exceptions.	Hands-on Demonstration Presentations	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 1.1:** Write Simple C program using constant and variables. **LLO1.2:** Use of different operators. **LLO1.3:** Use the various expressions in the C Program.	*Write a Program using Input and Output Statements.	2	CO1
2	**LLO 2.1:** Write a C program based on arrays and structure. **LLO 2.1:** Write a C program using an array of Structure.	*Write a Program using structure and array of structure.	2	CO1
3	**LLO 3.1:** Write user defined functions in C++.	*Write a Program using call by value.	2	CO2
4	**LLO 4.1:** Write user defined functions in C++.	*Write a Program using call by reference.	2	CO2

5	**LLO 5.1:** Understand the concept of polymorphism. **LLO 5.2:** Write a programs to implement the concept of function Overloading.	*Write a Program using Function Overloading.	2	CO3
6	**LLO 6.1:** Define Class and create objects. **LLO 6.2:** Write a program using class and objects.	*Write a Program using Class and Objects.	4	CO3
7	**LLO 7.1:** Write a program using class and array of objects.	Write a Program using array of Objects.	2	CO3
8	**LLO 8.1:** Implement the concept of object as function argument.	*Write a Program using object as function argument.	2	CO3
9	**LLO 9.1:** Use of static data members and member functions.	*Write a Program using static members. (variables and functions)	2	CO3
10	**LLO 10.1:** Write a Program using friend functions.	*Write a Program using Friend Function.	2	CO3
11	**LLO 11.1:** Use of constructor to initialize objects. **LLO11.2:** write a Program using constructors and destructors.	*Write a Program using Constructor and Destructor.	4	CO3
12	**LLO 12.1:** Apply the logic to implement different types of constructor in single program.	Write a Program using Constructor Overloading.	2	CO3
13	**LLO 13.1:** Understand various predefined string functions. **LLO 13.2:** Implement program using predefined string functions.	Write a program to perform following string operations using pre-defined string functions:- a) String concatenation b) String Comparison c) Find position of an character in a given string d) String reversing	4	CO3
14	**LLO 14.1:** Understand various predefined string functions. **LLO 14.2:** Implement program using predefined string functions.	*Write a program to perform following string operations without using pre-defined string functions :- a) String concatenation b) String Comparison c) Find position of an character in a given string d) String reversing	4	CO3
15	**LLO 15.1:** Understand the concept of Inheritance. **LLO 15.2:** Implement single inheritance.	*Write a Program using single Inheritance.	2	CO4
16	**LLO 16.1:** Understand the concept of Inheritance. **LLO 16.2:** Implement multilevel inheritance.	*Write a Program using multilevel Inheritance.	2	CO4

17	**LLO 17.1:** Understand the concept of Inheritance. **LLO17.2**: Implement multiple inheritance.	*Write a Program using Multiple Inheritance.	2	CO4
18	**LLO 18.1:** Understand the concept of diamond problem. **LLO17.2**: Implement hybrid inheritance.	*Write a Program using Virtual Base Class.	2	CO4
19	**LLO 19.1:** Understand the concept of polymorphism. **LLO 19.2:** Write programs to implement the concept of operator overloading.	*Write a Program for Operator Overloading. (Unary and Binary operator)	4	CO5
20	**LLO 20.1:** Understand the concept of polymorphism. **LLO 20.2:** Write a programs to implement the concept of operator overloading using friend function.	Write a Program for Operator Overloading using friend function. (Unary and Binary operator)	4	CO5
21	**LLO 21.1:** Understand the concept of Pointer. **LLO 21.2**: Implement this pointer.	*Write a Program using 'this' Pointer.	2	CO5
22	**LLO 22.1:** Understand the concept of function Overriding. **LLO 22.2**: Implement virtual functions.	*Write a Program using Virtual Function.	2	CO5
23	**LLO 23.1:** Understand conversion of basic to class type, class type to basic type, class type to class type.	*Write a program to implement type conversion concept.	2	CO5
24	**LLO 24.1:** Understand the concept of file processing. **LLO 24.2**: Implement various file operations. **LLO 24.3:** Write a program for exception handling.	*Write a Program For File Processing.	2	CO6

Note: Out of the above suggestive LLOs –

1. '*' Marked Practicals (LLOs) Are mandatory.
2. A judicial mix of LLOs is to be performed to achieve the desired outcomes

VI. SUGGESTED MICRO PROJECT/ASSIGNMENT/CASE STUDIES /ACTIVITIES FOR SPECIFIC LEARNING/SKILLS

Self Learning Assessment- Yes

Suggestive list of Case studies for SLA:

1. **Expense Tracker and Savings Calculator**
   i. A boy gets the same amount of pocket money every month. I use the pocket money for bought some college necessities and snacks. However, he also wanted to save some of the remaining money pocket that he has, although not necessarily every month. He asked his friend who studied Informatics to make an application to calculate it all by displaying monthly expenses.

total expenses, and current savings this.

ii. Notes:

- Display data iteratively
- Using Class

2. **Gas Station Price Calculation System**
   i. At a gas station, you want to make a program that can calculate the total price which will be issued for two types of gasoline, namely ABC and XYZ. ABC has a price of Rs. 7,000/liter, while XYZ is Rs. 9,000/liter.
   - Output from the program is expected to be in the form of a receipt that has buyer details
     i. (Total liters, type gasoline, customer name, total price)
3. **Restaurant Menu and Delivery System**
   i. Develop a system where a restaurant has a menu and provides delivery order services for customers whose homes are more than 4 KM will be charged a delivery fees of Rs.500, if it is less than that distance, it will be charged delivery fees of Rs.100. If the total purchase is more than Rs.4000 will get a discounted fee Rs.400. If the total purchase exceeds Rs.6000, discount will be given 25%.
   ii. -The output that comes out is expected in the form of a payment slip.
4. **Library Management System**: Develop a program to handle basic banking operations such as account creation, deposits, withdrawals, and balance inquiries.
5. **Bank Management System**: Develop a system for creating and managing customers, accounts and transactions as well as performing banking services such as withdrawals, deposits, and transfers. It also allows customer to view their account information including balances, recent transaction.
6. **Student Management System**: Create a system to manage student information, including adding new students, updating records, and generating reports.
7. **Hospital Management System:** Design a program to manage patient information, doctor schedules, and appointment bookings.
8. **Inventory Management System:** Implement a system to track information about products, including their quantity, price and other details and generate reports.
9. **Hotel Booking System:** Create a program to handle hotel room bookings, cancellations, and availability checks, make different packages including activities for kids and adults, apply discount charges on activities and generate final bill report.
10. **Payroll System:** Develop a system to manage employee records, tracking hours worked and calculating tax and generate reports.
11. **Online Quiz System:** Design an application to conduct online quizzes, store results, and provide instant feedback.
12. **Car Rental System**: Implement a program to manage car rentals, including booking, returning cars, and calculating rental fees.
13. **Bus Reservation System**: Create a system to manage bus reservations, including seat selection, booking, and cancellations.
14. **Shopping Cart System**: Develop an e-commerce shopping cart system that allows users to add items to their cart, view the cart, and proceed to checkout.
15. **Ticket Booking System**: Implement a system for booking tickets for events such as movies, concerts, or travel.
16. **Flight Reservation System:** Develop a program to handle flight bookings, cancellations, and check-ins.
17. **Medical Information System:** Implement a system to store and organize patient medical information such as clinical data, lab results.
18. **Tic Tac Toe game:** Design a game for layers take turns putting their marks in empty squares. The first player to get 3 of her marks in a row (up, down, across, or diagonally) is the winner.

19. **E-Learning Management System:** The University of ABC, a large public institution, faced challenges related to providing quality education to a diverse student population spread across different geographical locations. Traditional classroom-based teaching methods struggled to accommodate the needs of working professionals and students with varied schedules. The primary objectives included providing tools for course creation, student enrollment, assessments, and progress tracking to facilitate a seamless transition to online education.
20. **Unit Converter:** Design a system to convert different physical quantities like Mass, Length, Area, Temperature, Time, Currency etc. to be converted one unit into another.
21. **Supermarket Billing System:** Design a system in a place where customer come to purchase their daily products and pay for that. So, there is need to calculate how many products are sold and generate the bill for the customer. The system will be able to generate the bill. Store how many products are sold, store products and their prices with other information, and see the rates of discounts on the products.
22. **Food Bank Management System:** Develop a system to manage and organize data including adding donors, receivers, and staff profiles, update the pantry capacity, and generate report.
23. **Error detection and correction code System:** Design a system for different error detection and correction methods.
24. **Calculator for Scientific Operations:** Design a code to perform different scientific calculations.
25. **Book Donation System:** Develop a system to manage and organize data including adding details of donors and details of book, receivers, and staff profiles, update the book capacity, and generate report.

Note:

1. The above is suggestive list of case studies for SLA
2. The faculty must allocate any 1 Case study to individual student. Considering the students technical skills.

Activities

- Students are encouraged to use online tools to improve their learning, such as the e-Kumbh from AICTE and the virtual Labs from IIT.
- Students should be encouraged to participate in various coding competitions, such as hackathons, and online coding contests on websites like Hackerrank, Codechef etc.
- At the department level, encourage students to start a coding club
- Students are encouraged to register themselves in various MOOCs such as Infosys Springboard, Swayam etc. to further enhance their learning.

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	Basic configuration systems with editor supporting C++ language program execution.	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	Fundamentals Of Object Oriented Programming	CO1	4	-	4	4	8
2	II	Functions In C++	CO2	6	4	4	4	12
3	III	Classes And Objects	CO3	10	4	2	8	14
4	IV	Inheritance	CO4	8	6	4	2	12
5	V	Polymorphism And Type Conversion	CO5	10	4	4	6	14
6	VI	Files And Exception Handling	CO6	7	2	4	4	10
			Grand Total	**45**	**20**	**22**	**28**	**70**

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	PSO-3
CO1	3	2	1	2	-	2	3	-	1	2
CO2	3	2	3	3	2	2	3	-	2	3
CO3	3	2	3	3	-	-	3	-	-	3
CO4	3	2	3	3	-	2	3	-	-	3
CO5	3	2	3	3	-	2	3	-	2	3
CO6	3	2	3	3	-	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	E. Balagurusamy	Object Oriented Programming with C++	McGraw Hill Education (India) Private Limited, New Delhi
2	Herbert Schildt	C++ The Complete Reference, 4th Edition	McGraw Hill/ Oshome, New Delhi
3	Yashwant P. Kanetkar	Let Us C++, 2nd Edition	BPB Publication

XII. LEARNING WEBSITES & PORTALS

1. www.nptel.com
2. https://www.quora.com
3. https://www.softwaretestinghelp.com
4. https://www.cplusplus.com
5. https://www.learncpp.com

Name & Signature:

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Lecturer in Computer Engineering

Mrs. Lalita S. Korde
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Mrs. Heena F. Khan
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(Course Experts)

Name & Signature:

Dr.D N Rewadkar
(Programme Head)

Name & Signature:

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

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMA IN CM/IT
PROGRAMME CODE	06/07
COURSE TITLE	DIGITAL TECHNIQUES AND MICROPROCESSOR PROGRAMMING
COURSE CODE	CM31204
PREREQUISITE COURSE CODE & TITLE	NA
CLASS DECLARATION COURSE	NO

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme										
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
CM31204	DIGITAL TECHNIQUES AND MICROPROCESSOR PROGRAMMING	AEC	3	1	2	2	8	4	3	30	70	100	40	25	10	25@	10	25	10	175

Total IKS Hrs for Term: 1 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 course.
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:

As a computer engineering student, it is essential to know the fundamentals of digital electronics to understand the concept of microprocessor and its application. The microprocessor is challenging, to meet the challenges of growing advanced microprocessor technology. The student should be conversant with microprocessor programming

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 the number system and codes of the digital system.
CO2: Simplify Boolean expressions for logic circuit.
CO3: Analyze 8086 microprocessor functionality.
CO4: Develop assembly language programs.
CO5: Use procedure and macro in assembly language programs.

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
UNIT-I NUMBER SYSTEM, CODES & LOGIC GATES AND BOOLEAN ALGEBRA (CL Hrs-10, Marks-18)				
1.	**TLO1.1** Convert codes from one number system to another. **TLO1.2-** Perform arithmetic operations with different number systems. **TLO1.3** Differentiate various logic gates and apply the logic on Boolean algebra. **TLO1.4** Explain theorems for Boolean algebra. **TLO1.5** Create simplified logic circuits	**1.1** Introduction to Number systems: Decimal, Binary, Octal, hexadecimal **1.2** Binary arithmetic: Addition, subtraction, multiplication, Division **1.3** One's complement, Two's Complement, Signed Numbers, Codes, Error code. **1.4** LogicGates: Introduction, Working principles and Truth of AND, OR, NOT, NOR, NAND, EX-OR, EX-NOR Gates, Universal Gates. **1.5** Boolean Algebra: Basic Boolean Operations, Basic Laws of Boolean Algebra, Duality Theorem, De-Morgan's Theorems	Classroom Learning/ Flipped Classroom/ Collaborative Learning/ Use of logic simulator like Virtual Labs/online converters etc	**CO1**
UNIT-II COMBINATIONAL AND SEQUENTIAL LOGIC CIRCUITS (CL Hrs-10, Marks-16)				
2	**TLO2.1** Construct K-MAP using logic functions and vice versa. **TLO2.2** Simplify equations in the minterms/maxterms. **TLO2.3** Design Multiplexer and De-Multiplexer. **TLO2.4:**Implement combinational logic design with multiplexers. **TLO2.5:**Implement combinational logic design with demultiplexers.	**2.1** KARNAUGH map representation, Simplification of logic function using K-MAP. **2.2** Minimization of logical function specified in minterms/maxterms or truth table Don't care conditions. **2.3** Multiplexers and their use in combinational, logic design **2.4** De-multiplexer/decoders and their use in combinational logic design **2.5** De-multiplexer: 4 to 16-line DEMUX. Demux design using the sop method. 1:4, 1:8, 1:16 DEMUX. **2.6** Clock signal, flipflop, latches, counter, buffer and tri-state buffer (only concept)	Lecture Using Chalk-Board Flipped Classroom Collaborative Learning Virtual Lab	**CO2**
UNIT- III MICROPROCESSOR ARCHITECTURE & MICROCOMPUTER SYSTEMS(CL Hrs-08, Marks-10)				
3	**TLO3.1:** Describe Microprocessor architecture. **TLO 3.2:** Understand 8086 registers and instruction format. **TLO 3.3:** Draw a timing diagram for the read/write memory cycle.	**3.1** Microprocessor – Introduction, Features, and its Operations **3.2** 8086 Microprocessor - Introduction, Architecture, and Working, Pin configuration, Memory segmentation in 8086. **3.3** Minimum mode and Maximum mode configuration of 8086, Timing diagram Minimum mode and Maximum mode 8086.	Classroom Learning Flipped Classroom Cooperative Learning	**CO3**
UNIT –IV 8086 ASSEMBLY LANGUAGE PROGRAMMING (CL Hrs-10 Marks-16)				

4	**TLO 4.1** Write and execute 8086 programs for addition and subtraction. **TLO 4.2** Write programs implementing branching.	**4.1** Instruction format and Addressing modes in 8086, Assembler and Directives. **4.2** 8086 Instructions set and classification of instructions - Arithmetic, Logical, Data transfer, String, Bit manipulation, Flag manipulation, Branching, Machine Control.	Classroom Learning Collaborative Learning Flipped Classroom Program development tools and simulators	CO4
UNIT V –PROCEDURE AND MACRO IN ASSEMBLY LANGUAGE PROGRAM (CL Hrs-07, Marks-10)				
5	**TLO 5.1** Write and execute assembly language programs using procedures. **TLO 5.2** Write and execute assembly language programs using macros.	**5.1** Procedures - Defining Procedure, Directives used, FAR and NEAR, CALL and RET instructions, Assembly Language Programs using Procedure. **5.2** Macros - Defining Macros, Assembly Language Programs using Macros, Directives used.	Classroom Learning Collaborative Learning Flipped Classroom Program development tools and simulators	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:**Describe the basic component of digital lab.	*Know the Digital Lab IC Tester, Multimeter, Bread Board, Trainer Kit.	2	CO1
2	**LLO 2.1:** Implement the basic Gate	*Study of Basic Gates ICs (7400, 7404, 7408, 7486, 7432) and verification of Truth tables by monitoring the output of ICs on BreadBoard.	4	CO1
3	**LLO 3.1**: Implement the Derived Gate	*To derive AND, OR, NOT gates using universal gates by forming circuits on the Breadboard.	4	CO1
4	**LLO 4.1:** Verify De-Morgan's Theorem using the basic gate.	*Verify De-Morgan's Theorem by forming the circuit on BreadBoard.	2	CO1
5	**LLO 5.1:** Desing K map for SOP and POS forms, minimized it and designed circuit.	*Minimization and realization of function using K-maps and its implementation by constructing the circuit on the breadboard.	4	CO2
6	**LLO 6.1:** Develop an assembly language program to addition and subtraction 8 bit/16-bit signed/ unsigned numbers	* Write an Assembly language Program(ALP) for Addition and subtraction of two 16-bit numbers.	2	CO4

c) Design a Burglar alarm using electronic components and digital ICs.
d) Design Half adder /Full adder using the basic gate.
e) Design a Half Subtractor /Full Subtractor using the basic gate.

Assignment

a) Write an assembly language program using 8086 to generate the Fibonacci series.
b) Build a Circuit for the LED Flasher.
c) Build a Circuit for Seven Segment Display

IKS: Invention of Zero

https://sites.tufts.edu/tquinto/files/2021/01/HistoryOfZero.pdf

Self-Learning Activity

a) Develop an assembly language program to add 8-bit and 16-bit Unsigned numbers (using procedure).
b) Write an assembly language program to add and subtract two BCD numbers(using MACRO).
c) Write an ALP to multiply two BCD numbers (using MACRO).

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	1) Digital Multimeter: 3 and 1/2 digit 2) Pulse Generator/Function Generator: TTL Pulse Generator 20mA per Channel(max), 0 to 5.0 V (max) 3) DC Regulated Power Supply: 2 x 0-30 V; 0-2 AAutomatic Overload (Current Protection) Constant Voltage and Constant Current Operation Digital Display for Voltage and Current Adjustable Current Limiter Excellent Line and Load Regulation 4) Basic logic gates (AND-7408, OR- 7432, NOT- 7404), Universal gates (NAND7400, NOR-7402) EX-OR-7486, EX-NOR-74266 5) 4:1 Multiplexer IC-74LS153 6) Demultiplexer IC -74139 7) Breadboards, connecting wires, Stripper, Soldering Gun, Soldering Metal, Flux, IC Tester, LEDs, Digital ICs, Data sheets of ICs used in Lab.	1,2,3,4,5
2	1) Personal Computer Intel Pentium Onwards Minimum 2GB RAM. 500Gbyte HDD) installed with Windows 2000 onwards 2) Any Editor to write/edit programs 3) Turbo/Macro Assembler (TASM / MASM) 4) Turbo Linker (LINK/LINK 5) Turbo Debugger (ID/Debug), (DOSBOX utility for higher-end operating systems)	6,7,8,9,10,11,12

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	NUMBER SYSTEM, CODES & LOGIC GATES AND BOOLEAN ALGEBRA	CO1	10	04	04	10	18
2	II	COMBINATIONAL AND SEQUENTIAL LOGIC CIRCUITS	CO2	10	03	03	10	16
3	III	MICROPROCESSOR ARCHITECTURE & MICROCOMPUTER SYSTEMS	CO3	8	02	02	06	10
4	IV	8086 ASSEMBLY LANGUAGE PROGRAMMING	CO4	10	04	04	08	16
5	V	PROCEDURE AND MACRO IN ASSEMBLY LANGUAGE PROGRAM	CO5	7	02	04	04	10
Grand Total				**45**	**15**	**17**	**38**	**70**

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	PSO-3
CO1	2	2	1	1	-	1	1	1		-
CO2	2	2	2	2	-	1	1	2		-
CO3	2	2		1	-	1	1	1		1
CO4	2	2	2	2	-	1	1	-		2
CO5	2	2	2	2	-	1	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	R P Jain	Modern Digital Electronics	McGraw Hill Education; 4th edition
2	Douglas Hall	Microprocessors and Interfacing: Programming and Hardware, Intel Version	McGraw-Hill Education; 2nd edition
3	Bhurchandi K. M., Roy A. K	Advanced microprocessors and peripherals 3/E	Tata McGraw Hill Education, New Delhi, 2016, ISBN:9781259006135

XII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	http://www.nptel.ac.in	All practicals
2	https://www.falstad.com/circuit/	All practicals
3	https://logic.ly/	All practicals

Name & Signature:

Mrs. Archana S. Paike
Lecturer in Computer Engineering

Mrs. Shubhangi P. Dudhe
Lecturer in Information Technology

Mrs. Snehal S. Ingavale
Lecturer in Computer Engineering

(Course Experts)

Name & Signature:

Dr.D.N.Rewadkar
(Programme Head)

Name & Signature:

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

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMA IN CM/IT
PROGRAMME CODE	06/07
COURSE TITLE	RELATIONAL DATABASE MANAGEMENT SYSTEM
COURSE CODE	CM41201
PREREQUISITE COURSE CODE & TITLE	NA
CLASS DECLARATION COURSE	NO

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme											
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
CM41201	RELATIONAL DATABASE MANAGEMENT SYSTEM	DSC	3	-	4	1	8	4	3 Hrs	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.

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 course.
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:

The objectives of this course are to provide a strong formal foundation in Database Concepts, technology and practice to the students to enhance them into well-informed application developers. After learning this subject, the students will be able to understand the designing of RDBMS and can use any RDBMS package as a backend for developing database 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: Understand Database Management System concepts
CO2: Design a database for a given problem
CO3: Execute SQL commands on the database
CO4: Use performance-tuning objects in SQL
CO5: Implement PL/SQL code on a given database
CO6: Apply security and backup techniques on the database

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
	UNIT-I INTRODUCTION TO DATABASE SYSTEM (CL Hrs-8, Marks-12)			
1.	**TLO1.1**: State the importance of a database management system. **TLO1.2**: Define data, database, DBMS, data independence, data abstraction, and schema. **TLO1.2.1**: State Codd's laws. **TLO1.2.2**: Describe the Overall structure of DBMS. **TLO1.3**: Describe the architecture of DBMS. **TLO1.4**: Distinguish Hierarchical, networking and relational data model. **TLO1.5**: Describe advanced database concepts	**1.1** Database concepts: Data, Database, Database management system, File system versus DBMS, Applications of DBMS, Data Abstraction, Data Independence, Database Schema **1.2** The Codd's rules, the Overall structure of DBMS **1.3** Architecture: Two-tier andThree-tier architecture of DBMS. **1.4** Data Models: Hierarchical, Networking, and Relational Data Models **1.5** Introduction to advanced database concepts: Data mining, Data Warehousing, Big data	Hands-on Demonstration Presentations	CO1
	UNIT-II 2 RELATIONAL DATA MODEL (CL Hrs-6, Marks-10)			
2.	**TLO2.1**: Define table, row, column, domain, attribute **TLO2.2**: State types of keys and give examples of each. **TLO2.3**: Describe data constraints. **TLO2.4**: Draw an ER diagrams **TLO2.5**: Describe database design in terms of 1NF, 2NF and 3NF	**2.1** Relational Structure- Tables (Relations), Rows(Tuples), Domains, attributes **2.2** Keys: Super Keys, Candidate Key, Primary Key, Foreign Key **2.3** Data Constraints: Not Null, Unique, Primary Key, Foreign Key, Check, Default. **2.4** Entity Relationship Model,- Strong Entity set, Weak Entity set, Types of Attributes, E-R Diagrams **2.5** Normalization -Normalization based on functional dependencies, Normal forms: 1NF, 2NF, 3NF	Hands-on Demonstration Presentations	CO2

UNIT-III INTERACTIVE SQL (CL Hrs-10, Marks-14)				
3.	**TLO3.1.1**: Enlist Oracle data types. **TLO3.1.2**: Compare DDL, DML, DCL and TCL. **TLO3.1.3:** Write SQL queries on DDL, DML, DCL and TCL. **TLO3.2:** Describe and write SQL queries on GROUP BY, ORDER BY, and HAVING clauses **TLO3.3.1**: Enlist operators and compare between Relational, Arithmetic, Logical, and set operators. **TLO3.3.2**: Write SQL queries to evaluate the use of operators. **TLO3.4.1**: Enlist functions and compare Date, time, String functions and Aggregate Functions. **TLO3.4.2**: Write SQL queries to evaluate the use of functions. **TLO3.5:** Describe INNER and OUTER JOINS and Write SQL queries to evaluate the use of Join	**3.1** SQL: Invoking SQL*PLUS, The Oracle Data- types, Data Definition Language (DDL), Data Manipulation Language (DML), Data Control Language (DCL), Transaction control language (TCL). **3.2** Clauses: Different types of clauses in SQL **3.3** Operators: Relational, Arithmetic, Logical, set operators. **3.4** Functions: Date and time, String functions, Aggregate Functions. **3.5** Joins: Types of Joins, Nested queries	Hands-on Demonstration Presentations	**CO3**
UNIT- IV ADVANCED SQL: PERFORMANCE TUNING (CL Hrs-06, Marks-10)				
4.	**TLO4.1.1:** Define view, sequence and index. **TLO4.1.2:** Describe the view with its types. **TLO4.1.3:** Write SQL queries to create a view and perform different operations on it. **TLO4.2:** Write SQL queries to create a sequence and perform different operations on it. **TLO4.3.1:** Describe types of indexes. **TLO4.3.2:** Write SQL queries to create an index and perform different operations on it.	**4.1** Creating Views, Views: Types of Views: Read Only View and Updatable Views, Dropping Views. **4.2** Sequences: Creating Sequences, Altering Sequences, Dropping Sequences **4.3** Indexes: Index Types, Creating of an Index: Simple Unique, and Composite Index, Dropping Indexes.	Hands-on Demonstration Presentations	**CO4**
UNIT –V PL/SQL PROGRAMMING (CL Hrs-12, Marks-14)				
5.	**TLO5.1:** Enlist PL/SQL data types and State the advantages of PL/SQL. **TLO5.2.1:** Describe the control	**5.1** Introduction of PL/SQL: The PL/SQL Syntax, The PL/SQL Block Structure, PL/SQL data types, and Advantages of PL/SQL.	Hands-on Demonstration Presentations	**CO5**

	structure with its types. **TLO5.2.2:** Write PL/SQL block to evaluate the use of different control structures. **TLO5.3.1:** Describe exception handling with its types. **TLO5.3.2:** Write PL/SQL block to create different types of Exception. **TLO5.4.1:** Describe the working of cursors. **TLO5.4.2:** Distinguish between Implicit and Explicit cursors. **TLO5.4.3:** Write PL/SQL block to create different types of cursors. **TLO5.5:** Define Procedure, Function Trigger and State advantages. **TLO5.6:** Write PL/SQL block to create stored procedures and function **TLO5.7:** Describe the working of triggers	**5.2** Control Structure: Conditional Control, Iterative Control, Sequential Control. **5.3** Exception handling: Predefined Exception, User defined Exception. **5.4** Cursors: Implicit and Explicit Cursor **5.5** Procedures: Advantages, Creating, Executing and Deleting a Stored Procedure **5.6** Functions: Advantages, Creating, Executing and Deleting a Function. **5.7** Database Triggers: Use of Database Triggers, Types of Triggers, Syntax for Creating Triggers, Deleting Trigger.		
UNIT –VI NoSQL AND DATABASE ADMINISTRATION OVERVIEW (CL Hrs-06, Marks-10)				
6.	**TLO6.1.1:** Compare SQL with NoSQL **TLO6.1.2:** Enlist Benefits of NoSQL **TLO6.2:** Write basic NoSQL queries with MongoDB **TLO6.3.1:** Explain types of failure and its types **TLO6.3.2:** Describe the procedure to take database backup **TLO6.4.:** Describe Database Recovery and its types	**6.1** Introduction to NoSQL-comparison between SQL and NoSQL database system, Benefits of NoSQL, Types of NoSQL databases **6.2** MongoDB: Installation of MongoDB, Quering with MongoDB **6.3** Database Backup-Types offailure, Causes of failure and database backup introduction, Types of database Backup-Physical and logical **6.4** Database Recovery-Recovery Concepts, Recovery Techniques- Roll forward and Rollback	Hands-on Demonstration Presentations	CO6

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

Sr. No	Practical/Tutorial/ Laboratory Learning Outcome (LLO)	Laboratory Experiment/ Practical Titles /Tutorial Titles	Relevant COs	Number of hrs
1.	**LLO 1.1:** Create a database schema for a given application	*Draw an ER diagram for a given database.	1	2
2.	**LLO 2.1:** Execute queries using DDL commands.	*Applying Constraints on relation.	2	2
3.	**LLO 3.1:** Execute queries using DDL commands.	*Create and execute queries using DDL commands.	3	4

Sr. No	Practical/Tutorial/ Laboratory Learning Outcome (LLO)	Laboratory Experiment/ Practical Titles /Tutorial Titles	Relevant COs	Number of hrs
4.	**LLO 4.1:** Execute queries using DML commands.	*Create and execute queries using DML commands	3	4
5.	**LLO 5.1:** Execute queries using DCL commands.	*Create and execute queries using DCL and TCL commands.	3	4
6.	**LLO 6.1:** Implement queries using causes	*Write Queries using different types of clauses.	3	2
7.	**LLO 7.1:** Implement queries using different operators	*Write Queries using various types of operators like (Set, Relational, Arithmetic and Logical)	3	4
8.	**LLO 8.1:** Implement queries using different functions in SQL	*Write Queries using various Functions like (Date, Time, String, and Aggregate).	3	4
9.	**LLO 9.1:** Execute queries based on inner-outer joins	*Write Queries using different types of Joins.	3	2
10.	**LLO 10.1:** Implement queries using Views	*Write Queries to Create, Insert, Update and Drop View	4	2
11.	**LLO 11.1:** Implement queries using Sequence	*Write Queries to Create, Alter and Drop Sequence	4	2
12.	**LLO 12.1:** Write queries for Index	*Write Queries to Create Simple and composite Indexes and Drop them.	4	4
13.	**LLO 13.1:** Implement PL/SQL program using Conditional Statement	*Write the PL/SQL Program using 1. IF...THEN...ELSE 2, NESTED IF..THEN ELSE 3. IF THEN ELSEIF	5	2
14.	**LLO 14.1:** Implement PL/SQL program using Iterative Statement	*Write the PL/SQL Program using 1. FOR LOOP 2. REVERSE FOR LOOP	5	2
15.	**LLO 15.1:** Implement PL/SQL program using Iterative WHILE Statement	*Write the PL/SQL Program using WHILE LOOP	5	2
16.	**LLO 16.1:** Implement PL/SQL program using Sequential Statement	*Write the PL/SQL Program using 1. GOTO 2. EXIT 3. CONTINUE	5	2
17.	**LLO 17.1:** Implement PL/SQL program based on Pre-define Exception	*Write the PL/SQL Program using pre-defined	5	2
18.	**LLO 18.1:** Implement PL/SQL program based on User defined Exception	*Write the PL/SQL Program using user-defined Exceptions	5	2
19.	**LLO 19.1:** Create implicit and explicit cursor	*Write the PL/SQL Program to implement Implicit and Explicit Cursor	5	2
20.	**LLO 20.1:** Implement PL/SQL programs using Procedure	*Write the PL/SQL Program to implement the Stored Procedure	5	2
21.	**LLO 21.1:** Implement PL/SQL programs using Function	*Write the PL/SQL Program to implement the Function	5	2

Sr. No	Practical/Tutorial/ Laboratory Learning Outcome (LLO)	Laboratory Experiment/ Practical Titles /Tutorial Titles	Relevant COs	Number of hrs
22.	**LLO 22.1:** Implement trigger for a given database	*Write the PL/SQL Program for Creating Trigger, Deleting Trigger	5	2
23.	**LLO 23.1:** Install MongoDB	*Installing NoSQL database: MongoDB	6	2
24.	**LLO 24.1:** Implement basic NoSQL queries on MongoDB	*Perform Basic queries-Create, Insert, Update, and Delete commands on MongoDB	6	2
			Total Hrs	**60**

Note: Out of the above suggestive LLOs –

1. All Practical's (LLOs) are mandatory.
2. A judicial mix of LLOs is to be performed to achieve the desired outcomes

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

Self-Learning

Draw ER Diagram and design database with the help of DDL, DML, DCL, TCL, Index, Sequence,View, PL/SQL, Procedure, Function, Trigger concepts.

Following are some suggestive topics for Self-learning:

1. Library Management System:
2. Student Management System
3. Employee Management system
4. Product Inventory System
5. Hotel Management System
6. Bus reservation Management System
7. Travel agency Management System
8. Bank Management System
9. Airline Management System
10. Blood bank Management System
11. Hospital Management
12. Payroll Management
13. Hostel Management
14. Movie Ticket Reservation system
15. Electricity Bill Management System
16. Insurance Management System
17. ATM Management System
18. Patient health record
19. Online bookstore management
20. Car rental Management System
21. Student Grade database
22. Food Delivery Order Management System
23. Charity Donation Management
24. Online Exam Management System
25. Train Reservation Management System

Activities

- Students are encouraged to use online tools to improve their learning, such as the e-Kumbh from AICTE and the virtual Labs from IIT.
- Students should be encouraged to participate in various coding competitions, such as hackathons, and online coding contests on websites like Hackerrank, Codechef etc.
- The department level, encourage students to start a coding club
- Students are encouraged to register themselves in various MOOCs such as Infosys Springboard, Swayam etc. to further enhance their learning.

Note:

1. The above is suggestive list of topics for SLA
2. The faculty must allocate any 1 topic to individual student. Considering the students technical skills.

Assignment

Prepare a journal of practical 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) SQL/Oracle software c) Mongo DB software	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 Database System	CO1	7	06	06	00	12
2	II	Relational Data Model	CO2	6	02	04	04	10
3	III	Interactive SQL	CO3	12	04	04	06	14
4	IV	Advanced SQL: Performance Tunning	CO4	4	02	04	04	10
5	V	PL/SQL Programming	CO5	12	04	04	06	14
6	VI	NoSQL and Database Administration Overview	CO6	4	02	02	06	10
		Grand Total		**45**	**20**	**24**	**26**	**70**

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	PSO-3
CO1	3	2	3	3	3	3	3	-	2	1
CO2	3	2	3	2	2	2	3	-	3	1
CO3	2	3	3	3	2	2	3	-	3	1
CO4	2	3	3	3	2	3	3	-	3	1
CO5	2	3	3	3	2	3	3	-	3	1
CO6	3	2	2	2	2	3	3	-	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 SUGGESTED LEARNING MATERIALS/BOOKS

Sr.No.	Author	Title	Publisher
1	Abraham Silberschtz, Henry Korth and S.Sudharshan	Introduction to Database System	Tata McGraw Hill, 3rd edition,
2	Ivan Bayross	PLSQL	BPB Publication, 3rd edition SQL,
3	Kogent Learning Solutions Inc	Database Management Systems Application	Dreamtech Press 2014

XII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://nptel.ac.in/courses/106105175/ ,	All practicals
2	https://www.w3schools.com/sql ,	All practicals
3	https://www.tutorialspoint.com/sql,	All practicals
4	https://www.studytonight.com/dbms,	All practicals
5	https://docs.mongodb.com/manual/tutorial/install-mongodb-on-windows/	To study advance databases.

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Smt. Sonali B. Gosavi
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Smt. Priyanka. L. Sonawane
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(Course Experts)

Name & Signature:

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

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMA IN CE/EE/ET/ME/MT/CM/IT/DDGM
PROGRAMME CODE	01/02/03/04/05/06/07/08
COURSE TITLE	INDIAN CONSTITUTION: CORE CONCEPTS AND VALUES
COURSE CODE	HU21203
PREREQUISITE COURSE CODE & TITLE	NA
CLASS DECLARATION COURSE	NO

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme										
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory Practical				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
HU21203	INDIAN CONSTITUTION: CORE CONCEPTS AND VALUES	VEC	1	–	–	1	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,@S - 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 course.
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.
1. **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:

Introducing a course on the Indian Constitution can provide students with a comprehensive understanding of the country's legal framework and democratic principles. Such a course could cover the historical context of its creation, the structure and functions of the government it establishes, and the fundamental rights and duties of citizens. It could also explore the significant amendments and judicial interpretations that have shaped its evolution over time. This foundational knowledge is not only for fostering informed and engaged citizens who can contribute to the nation's democratic processes but also enriches the educational experience by fostering a sense of national identity and ethical responsibility among future engineers. Furthermore, embedding Electoral Literacy and Voter Education in diploma engineering programs strategically empowers these future professionals with an awareness of their electoral privileges and the workings of democracy.

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: Foster comprehension of the fundamental principles and goals embedded in the Indian constitution.
CO2: Elaborate on the core rights and duties conferred upon Indian citizens by the Constitution.
CO3: Comprehend the distribution of legislative, executive, and financial powers between the Union and the States.
CO4: Understand the functioning of Indian democracy, encompassing its frameworks and mechanisms at local, state, and national levels.
CO5: Cultivate the skills and perspectives required for active participation in electoral processes, the conscientious exercise of voting rights, and the promotion of informed democratic participation within society.

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
UNIT-I INTRODUCTION TO INDIAN CONSTITUTION(CL Hrs-03, Marks-NIL)				
1.	**TLO 1.1** Understand the historical context and events leading to the drafting of the Indian Constitution. **TLO 1.2** Comprehend the essential features and understand the significance of the Indian Constitution in shaping India's democratic governance and societal ethos. **TLO 1.3** Analyze the vision and ideals articulated in the Preamble and their relevance in contemporary Indian society.	1.1 Historical background and making of the Indian Constitution 1.2 Salient features and significance of the Indian Constitution 1.3 Preamble: Vision and Ideals of the Indian Constitution	Presentations Case Studies and Analysis Role-Playing and Simulations Project-Based Learning	**CO1**
UNIT - II FUNDAMENTAL RIGHTS, FUNDAMENTAL DUTIES AND DIRECTIVE PRINCIPLES (CL Hrs-04, Marks-NIL)				
2	**TLO2.1** Understand the introduction and structure of Fundamental Rights in Part III of the Indian Constitution. **TLO2.2** Understand the principles of the Right to Equality, Right to Freedom, and Right to Life.	**2.1** Fundamental Rights: Introduction & its Scheme under Part -III **2.2** Right to Equality (Article 14-18) **2.3** Right to Freedom (Article 19-22) **2.4** Right to Life (Article 21) **2.5** Fundamental Duties and their Significance under Part IV-A **2.6** Directive Principles of State Policy under Part – IV: importance and	Presentations Case Studies and Analysis Role-Playing and Simulations Project-Based Learning	**CO2**

	TLO2.3 Identify fundamental duties in general and in particular with the engineering field. **TLO2.4**: Grasp the significance and practical application of Directive Principles of State Policy outlined in Part IV of the Indian Constitution.	implementation.		
UNIT- III UNION AND STATE EXECUTIVE(CL Hrs-03, Marks-NIL)				
3	**TLO 3.1** 3.1: Gain insight into the structure and functions of the Union executives and the jurisdiction of the Supreme Court. **TLO 3.2** 3.2: Understand the organization and responsibilities of the State Executives and the functions of the State Judiciary(High Courts).	**3.1** Union Government, Union Legislature (Parliament), Lok Sabha and Rajya Sabha (with Powers and Functions), Union Executive, President of India (with Powers and Functions), Prime Minister of India (with Powers and Functions), Union Judiciary (Supreme Court), Jurisdiction of the Supreme Court. **3.2** State Government, State Legislature (Legislative Assembly/ Vidhan Sabha, Legislative Council / Vidhan Parishad), Powers and Functions of the State Legislature, State Executive, Governor Of the State (with Powers and Functions), The Chief Minister Of the State (With Powers and Functions) State Judiciary (High Courts).	Presentations Case Studies and Analysis Role-Playing and Simulations Project-Based Learning	**CO3**
UNIT-IV AMENDMENTS AND EMERGENCY PROVISIONS(CL Hrs-03, Marks-NIL)				
4	**TLO 4.1** Comprehend the meaning and significance of constitutional amendments, as well as the procedural rules detailed in Article 368 of the Indian Constitution. **TLO 4.2** Recognize the roles of various branches of government in the amendment process, **TLO 4.3** Examine the significant procedures and historical context of major constitutional amendments	**4.1 Introduction to Constitutional Amendments:** Definition and significance of constitutional amendments. Constitutional provisions governing the amendment procedure (Article 368). **4.2 Types of Amendments:** Simple majority amendments, Special majority amendments, Amendments requiring ratification by states. **4.3 Role of the Executives Amendments**: Role of Parliament: Lok Sabha and Rajya Sabha, Role of President: Assent to amendments, Role of State Legislatures: Ratification of certain amendments. **4.4 Major Constitutional**	Presentations Case Studies and Analysis Role-Playing and Simulations Project-Based Learning	**CO4**

		Amendment procedures: Major Constitutional Amendment procedures - 1st, 7th,42nd, 44th, 73rd & 74th, 76th, 86th, 52nd & 91st, 102nd		
UNIT –V ELECTORAL LITERACY (CL Hrs-02, Marks-NIL)				
5	**TLO5.** Electoral Literacy: Develop understanding and proficiency in electoral processes, voter registration, rights and responsibilities of voters, electoral reforms, and initiatives promoting electoral literacy.	**5.1 Understanding the Electoral Process :** Overview of the electoral process: registration, voting, counting, and declaration of results, Role and functions of the Election Commission of India Types of elections: Lok Sabha, Rajya Sabha, State Legislative Assembly, Local Body elections **5.2 Voter Registration and Electoral Rolls:** Importance of voter registration Eligibility criteria for voter registration Process of voter registration: online, offline, and special drives Checking and updating voter details in electoral rolls **5.3 Rights and Responsibilities of Voters:** Understanding fundamental rights related to elections Responsibilities of voters towards ensuring free and fair elections Consequences of electoral malpractices and non-participation **5.4 Electoral Reforms and Initiatives:** Overview of electoral reforms aimed at enhancing transparency, inclusivity, and integrity of elections Role of technology in improving electoral processes: Voter Verifiable Paper Audit Trail (VVPAT), Online voter registration, e-voting Initiatives by the Election Commission and civil society organizations to promote electoral literacy	Presentations Case Studies and Analysis Role-Playing and Simulations Project-Based Learning	CO5

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

NOT APPLICABLE

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

i) **Case Study Analysis:** Select a few landmark Supreme Court cases related to Fundamental Rights (e.g., Kesavananda Bharati v. State of Kerala, Maneka Gandhi v. Union of India) and analyze the court's interpretation and impact on these rights.

ii) **Comparative Analysis**: Compare the provisions of the Right to Equality under Articles 14-18 with similar provisions in the constitutions of other countries. Highlight similarities, differences, and the reasoning behind them.

iii) **Public Awareness Campaign**: Design a public awareness campaign to educate citizens about their Fundamental Rights and Duties. Create informative posters, social media content, and interactive workshops to engage people in discussions about constitutional rights and responsibilities.

iv) Write a reflective essay discussing the historical context and debates surrounding the inclusion of Fundamental Rights in the Indian Constitution.

v) Create a visual timeline depicting the evolution of laws related to equality in India, from independence to the present day. Include major legislative reforms and judicial decisions.

vi) Conduct a comparative analysis of the implementation of Directive Principles in different states of India, identifying successful initiatives and areas needing improvement.

vii) **Case Study Analysis:** Choose a recent constitutional or political issue that has been debated in Parliament. Analyze the roles played by the Loksabha and Rajya Sabha in addressing the issue and the impact of their decisions.

viii) **Case Study Analysis: Analyze a landmark constitutional amendment in India (e.g., the 42nd Amendment) and its impact on governance, fundamental rights, and the balance of power between different branches of government.**

ix) **Infographic Creation:** Create an infographic illustrating the process of amending the Indian Constitution as outlined in Article 368. Highlight key steps and requirements for different types of amendments.

x) **Timeline Project:** Create a timeline highlighting major constitutional amendments in India, such as the 1st, 7th, 42nd, 44th, 73rd & 74th, 76th, 86th, 52nd & 91st, and 102nd amendments. Include key provisions and the political context surrounding each amendment.

xi) **Debate:** Organize a debate on the topic "Should the President have the power to refuse assent to constitutional amendments?" Encourage students to research and present arguments from legal, political, and ethical perspectives.

xi) **Campaign Design:** Design a social media campaign to raise awareness about the importance of voter participation and responsible voting. Create visually engaging posters, infographics, and videos highlighting the consequences of electoral malpractices and non-participation.

xii) **Online Tutorial:** Create a step-by-step tutorial video or guide demonstrating the voter registration process, both online and offline. Include instructions for checking and updating voter details in electoral rolls.

xiii) **Survey Project:** Conduct a survey to assess the awareness and accessibility of voter registration

facilities among different demographic groups in your locality. Analyze the results and propose strategies to improve voter registration rates.

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

NOT APPLICABLE

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)
Assignment, Self-learning and Terms work 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
CO1	--	--	--	--	2	--	2		
CO2	--	--	--	--	3	--	2		
CO3	--	--	--	--	3	--	2		
CO4	--	--	--	--	3	--	2		
CO5	--	--	--	--	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	M. Laxmikanth	"Indian Polity"	McGraw Hill Education: ISBN-13: 978-9352603633
2	D. D. Basu	Introduction to the Constitution of India	LexisNexis: ISBN-13: 978-8180386477
3	Subhash C. Kashyap	Our Constitution: An Introduction to India's Constitution and Constitutional Law	National Book Trust, India ISBN-13: 78-8123748462
4	Arun K. Thiruvengadam	The Constitution of India: A Contextual Analysis	Oxford University Press ISBN-1 3:978-0199467078
5	Oxford University Press	The Making of India's Constitution	Oxford University Press Oxford UniversityPress

XI. LEARNING WEBSITES & PORTALS

Sr.No.	Link/Portal	Description
1	https://prsindia.org/.	In-depth analysis of parliamentary affairs, legislative processes, and policy Issues in India.
2	https://awmin.gov.in	Official repository providing access to the full text of the Indian Constitution.
3	https://constitution.org.in	Interactive platform offering the text of the Constitution along with annotations and historical context.
4	https://indiankanoon.org	Legal search engine offering a vast database of Indian case law, including constitutional judgments.
5	https://nptel.ac.in	Offers video lectures and course materials on studies of law and the constitution.

Name & Signature: **Mr. S.B. Kulkarni** Lecturer in Mechanical Engineering **(Course Experts)**	
Name & Signature: **Dr.D N Rewadkar** (Programme Head)	Name & Signature: **Shri. S.B. Kulkarni** (CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMA IN IT
PROGRAMME CODE	01/02/03/04/05/06/07/08
COURSE TITLE	DATA STRUCTURE USING C
COURSE CODE	IT31205
PREREQUISITE COURSE CODE & TITLE	PROGRAMMING IN C-CM21204
CLASS DECLARATION	YES

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme										
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
IT31205	DATA STRUCTURE USING C	DSC	3	1	4	0	8	4	3	30	70	100	40	50	20	25#	10	0	0	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.

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:

Data structures is an important aspect of Computer engineering and Information technology. Data structures are mathematical and logical model of storing and organizing data in particular way in computer. After studying this course student will be able to understand and identify different types of data structures, use algorithms with appropriate data structures to solve real life 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 Describe Data structures, Complexity and Array operations.
CO2 Use algorithms for searching and sorting techniques with arrays.
CO3 Implement programs for Stack, Queue and Recursion using Arrays.
CO4 Write programs to perform operations on Linked List.
CO5 Write algorithms to implement Tree data structure.
CO6 Describe Graph and its traversing methods

IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No.	Theory Learning Outcomes(TLO's) aligned to CO's.	Learning content mappedwith TLO's	Suggested Learning Pedagogies	Relevant Cos
	UNIT 1 – Introduction to data structures and Arrays (CL Hrs.- 05 , Marks -10)			
1	**TLO 1.1** Define data structure terminologies. **TLO 1.2** Enlist various data structure Operations. **TLO 1.3** Differentiate between various complexities. **TLO 1.4** Use dynamic memory allocation in programs. **TLO 1.5** Write algorithms to perform operations on array.	1.1 Introduction, Basic Terminology, Organization, Classification of data structure. 1.2 Operations on data structures Traversing, Inserting, deleting Searching, sorting, and Merging. 1.3 Complexity: Time Complexity, Space Complexity, Big 'O' Notation. 1.4 Dynamic memory Allocation. 1.5 Arrays: Introduction, Representation of linear arrays in memory. 1.6 Traversing linear Arrays, Inserting and Deleting. 1.7 Multidimensional Arrays.	Presentations, Chalk , Board	CO1
	UNIT 2 Searching and Sorting Techniques (CL Hrs. -08, Marks-12)			
2	**TLO 2.1** Write algorithm and programs for various searching and sorting techniques **TLO 2.2** Apply Hashing techniques to store and retrieve element from given data set. **TLO 2.3** Use sorting methods to sort data set.	2.1 Searching: Basic search techniques, Linear Search, Binary search. 2.2 Hashing: Hash functions, Collision Resolution, Linear probing, Chaining. 2.3 Sorting: General background. 2.4 Sorting Techniques: Bubble sort, Selection sort, Insertion sort, Merge sort, Radix sort, Quick sort.	Presentations, Chalk , Board	CO2

UNIT 3 Stacks, Queues & Recursion (CL Hrs-10, Marks-13)				
3	**TLO 3.1** Implement Stack and Queue data structure to carry out various data structure operation. **TLO 3.2** Use stack and queues to solve various problem(likes prefix to postfix conversion, evaluation of expression, Tower of Hanoi etc). **TLO 3.3** Differentiate between stack and queue.	3.1 Stacks: Concept, representing stacks in 'C', Applications of stacks. 3.2 Polish Notations (Prefix, postfix, Infix). 3.3 Recursion: Recursive definitions and processes, Recursion in 'C', writing recursive programs factorial, Fibonacci. 3.4 Tower of Hanoi, Implementation of recursive, procedures by means of stack. 3.5 Queues: The queue and its sequential representation, concept of queues, Operation on Queue : Queue is Full, Queue is Empty 3.6 Types of Queue : Linear , Circular , Priority Queue	Presentations, Chalk , Board	CO3
SECTION II				
UNIT 4 Linked Lists (CL Hrs-08, Marks-14)				
4	**TLO 4.1** Implement linked list data structure to carry out various data structure operations. **TLO 4.2** Use Linked list to implement other data structures.	4.1 Introduction singly link list Representation of link list in memory. 4.2 Creating, Traversing, and Searching in Sorted and Unsorted Linked List. 4.3 Memory allocation, garbage Collection. 4.4 Inserting into linked list, Deleting from a linked list. 4.5 Circular singly linked list: Insertion and deletion of node. 4.6 Doubly linked list: Insertion and deletion of node.	Presentations, Chalk , Board	CO4
UNIT 5 . Tree (CL Hrs-09, Marks-14)				

	TLO 5.1 Draw binary tree for given data set. **TLO 5.2** Write algorithm for binary tree traversal. **TLO 5.3** Write algorithms to perform given operation on Binary Search Tree. **TLO 5.4** Create Heap tree for given dataset.	5.1 Tree Terminologies: Degree of node, level of node, leaf node, Depth/Height of tree, In-degree and Out-degree, path, Ancestor and Descendant node. 5.2 Tree Types: General Trees, Binary trees, Binary Search Trees 5.3 Binary Tree Traversal methods: Inorder, Preorder, Postorder traversal using stack. 5.4 Binary search tree (BST), searching and inserting BST, deleting from BST. 5.5 Heap: Inserting into a Heap, Deleting the root of Heap, Heap sort.	Presentations, Chalk , Board	
UNIT 6 . Graphs (CL Hrs-05, Marks-12)					
	TLO 6.1 Define terminologies related to Graph. **TLO 6.2** Represent graph using adjacency list and adjacency matrix **TLO 6.3** Solve problems to find out shortest path using Warshall's algorithm. **TLO 6.4** Write algorithm to traverse the given graph.	6.1 Introduction o Graph Terminologies: Graph, Node(Vertices), Arcs(Edges), Directed Graph, Undirected Graph, In-degree and Out-degree, Adjacent, Successor, Predecessor, relation, path, sink. 6.2 Linear Representation of Graph: Adjacency List, Adjacency Matrix of directed graph. 6.3 Warshall's Algorithm; Shortest Paths. Linked representation of graph, traversing a graph (BFS,DFS). 6.4 Applications of Graph.	Presentations, Chalk , Board	

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

Sr. No.	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment/Practical Titles/Tutorial Titles	No. of Hrs.	Releva ntCOs
1	LLO1.1Write a program to allocate Dynamic Memory.	*Implement Programs based on: Structures & Dynamic Memory allocation	2	1

2	LLO2.1 Write a program to perform operations on One Dimensional Array.	*Implement Program to perform insertion and deletion operations on One Dimensional Array.	2	1
3	LLO3.1 Write a program to perform operations on Multidimensional Arrays	Implement Program for matrix operations using Multidimensional Arrays. (Eg. Matrix Addition, Subtraction and Multiplication)	2	1
4	LLO 4.1 Write a program to perform searching technique on given number.	*Implement program to search given number using Linear search technique.	2	2
5	LLO 5.1 Write a program to perform searching techniques on given number.	*Implement program to search given number using Binary search technique.	2	2
6	LLO 6.1 Write a program to perform Bubble sorting technique on given array.	*Implement programs to sort an array using Bubble sort technique.	2	2
7	LLO 7.1 Write a program to perform Selection sort technique on given array.	*Implement programs to sort an array using Selection sort technique.	2	2
8	LLO 8.1 Write a program to perform Insertion sort technique on given array.	*Implement programs to sort an array using Insertion sort technique.	2	2
9	LLO 9.1 Write a program to perform Merge sorting technique on given array.	Implement programs to sort an array using Merge sort technique.	2	2
10	LLO 10.1 Write Program to perform Stack operations on array.	* Implement a Program to perform Push and Pop operations on Stack using array.	2	3

11	LLO 11.1 Write Program to implement Tower of Hanoi.	Implement a Program for Tower of Hanoi using stack.	2	3
12	LLO 12.1 Write Program to perform operations on Linear Queue using array.	*Implement a Program to perform Insert and Delete operations on Linear Queue using array.	4	3
13	LLO 13.1 Write Program to perform operations on Circular Queue using array.	*Implement a Program to perform Insert and Delete operations on Circular Queue using array.	2	3
14	LLO 14.1 Write Programs to traverse single link list	Implement a Program to traverse single link list.	2	4
15	LLO 15.1 Write Programs to search in sorted and unsorted linked list.	Implement a Program to search in sorted and unsorted linked list.	2	4
16	LLO 16.1 Write Programs to perform insert and delete operations on Single link list.	* Implement a Program to perform following operations on Single link list. i. To insert a node at beginning and at given location. ii. To delete a node.	4	4
17	LLO 17.1 Write Programs to perform insert and delete operations on Circular Singly link list.	Implement a Program to perform following operations on Circular Single link list. i. To insert a node at beginning and at given location. ii. To delete a node.	4	4
18	LLO 18.1 Write Programs to perform insert and delete operations on Double link list.	Implement a Program to perform following operations on Double link list. i. To insert a node at beginning ii. To delete a node.	4	4
19	LLO 19.1 Write Programs to implement stack using link list.	Implement stack using Link list.	4	4

20	LLO 20.1 Write Programs to implement Queue using link list.	Implement Queue using Link list.		
21	LLO 21.1 Write Program to create Binary Search Tree and perform given operations	*Implement a Program to create Binary Search Tree and perform Inorder, Preorder and Postorder traversal.	4	5
22	LLO 22.1 Write Program to traverse graph in DFS and BFS.	*Implement a Program to traverse graph in DFS.	4	6
23	LLO 23.1 Write Program to traverse graph in BFS.	Implement a Program to traverse graph in BFS.	4	6
Total Hrs			60	

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

Self-Learning NA

Micro project:

a. Develop program in C/C++ to evaluate an arithmetic expression using stack with linked list representation.
b. Develop a program in C/C++ to create a Queue of given persons. Shift the original position of person to a new position based on its changed priority or remove a person from the queue using linked list representation.
c. Develop a program in C/C++ that create tree to store given data set using linked list representation. Locate and display a specific data from data set.
d. Develop a program in C/C++ for performing following banking operations: Deposit, Withdraw and Balance Enquiry. Select appropriate data structures for the same.

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

The major equipment with broad specification mentioned here will usher in uniformity in conduct of practical, as well as aid to procure equipment by authorities concerned.

Sr. No.	Equipment Name with Broad Specifications/Instrument Required	Experiment Sr.No.
1	Hardware: Personal computer Pentium IV,2 GHz minimum (i3-i5 preferable), RAM minimum 2 GB.	For all experiments
2	C/C++ Compiler.	

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

Unit	Unit Title	Aligned Cos	Learning Hours	R Level	U Level	A Level	Total marks
			SECTION I				
1	Introduction to data structures and Arrays	CO1	**05**	4	4	2	**10**
2	Searching and Sorting Techniques	CO2	**08**	2	4	6	**12**
3	Stacks, Queues & Recursion	CO3	**10**	2	4	7	**13**
		Total	**23**	**08**	**12**	**15**	**35**
			SECTION II				
4	Linked Lists	CO4	**08**	2	4	6	**12**
5	Trees	CO5	**09**	2	4	6	**12**
6	Graphs	CO6	**05**	2	3	6	**11**
		Total	**22**	**06**	**11**	**18**	**35**
		Grand Total	**45**	**14**	**23**	**33**	**70**

IX. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
Each Practical will be assessed considering 60% weightage to the process, 40% weightage to the product.	End Semester Exam based on Practical performance and 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	PSO-3
CO1	3	3	3	2	1	1	-	-	1	2
CO2	3	3	3	2	1	1	3	-	2	3
CO3	3	3	3	2	1	1	3	-	2	3
CO4	3	3	3	2	1	1	3	-	2	3
CO5	3	3	3	2	1	1	3	-	2	3
CO6	3	3	3	-	1	1	3	-	2	3
Summary	**3**	**3**	**3**	**2**	**1**	**1**	**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	Lipschultz	Data Structures Schaum Outline Series	McGraw Hill Education, New Delhi.2013, ISBN-13: 978-0070701984
2	ISRD Group	Data Structures Using 'C'	McGraw Hill Education, New Delhi.2013,ISBN-13:978-12590006401
3	S K Shriwastva	Data Structures through C in Depth	BPB Publications ISBN:-13: 978-81-7656-741-1

XII. LEARNING WEBSITES & PORTALS

Sr. No.	Link/Portal	Description
1	https://www.w3schools.in/data-structures-tutorial	All practicals
2	https://www.geeksforgeeks.org/data-structures/	All practicals
3	https://www.tutorialspoint.com/data_structures_algorithms/index.htm	All practicals

Name & Signature: **Mrs. S R Hande** Lecturer in Information Technology **(Course Experts)**	
Name & Signature: **Dr.D N Rewadkar** (Programme Head)	Name & Signature: **Shri. S.B. Kulkarni** (CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMA IN IT
PROGRAMME CODE	07
COURSE TITLE	CLIENT-SIDE SCRIPTING USING JAVASCRIPT
COURSE CODE	IT41203
PREREQUISITE COURSE CODE & TITLE	NA
CLASS DECLARATION	NO

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme											
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
IT41203	CLIENT-SIDE SCRIPTING USING JAVASCRIPT	DSC	1	--	4	1	6	3	--	--	--	--	--	50	20	25@	10	25	10	100

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.

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 course.
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:

Client-side scripting includes faster response times, a more interactive application, and less overhead on the web server. As web applications become larger and more complex, combined with the increasing popularity of mobile applications that run on smartphones and other mobile devices, the need for client-side scripting, JavaScript will continue to grow.

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 Write JavaScript using basic syntactical constructs
- CO2 Create forms and Control browser window features through Scripts
- CO3 Write and Execute JavaScript for handling cookies and regular expressions for validations
- CO4 Create Web pages with Rollovers, Status Bar, Banners and Slideshow
- CO5 Create web page application using Angular JS

IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No.	Theory Learning Outcomes(TLO's) aligned to CO's.	Learning content mappedwith TLO's	Suggested Learning Pedagogies	Relevant COs
	UNIT 1: BASICS OF JAVASCRIPT PROGRAMMING (CL Hrs. -02, Marks - Nil)			
1	**TLO 1.1** Create an object to solve a given problem. **TLO 1.2** Develop JavaScript to implement programs using different operators and expressions. **TLO 1.3** Develop a JavaScript page using various control and looping structures.	1.1 Features of JavaScript 1.2 Object Name, Property, Method, Dot Syntax 1.3 Values and Variables 1.4 Operators and Expressions: Primary Expressions, Object and Array initializers, Function definition expression 1.5 If Statement, if…else, if...else if, nested if statement 1.6 Switch…case Statement 1.7 Loop Statement- for loop, for...in loop, while loop, do...while loop, continue statement.	Hands-on Demonstration Presentations, Chalk, Board	CO1
	UNIT 2: ARRAYS, FUNCTIONS AND STRING(CL Hrs. -04, Marks - Nil)			
2	**TLO 2.1** Write a JavaScript usingarray and Function. **TLO 2.2** Perform specified string manipulation operation on a given string	2.1 Array: Declaring an Array, Initializing an Array, defining an array element, Looping an Array, adding an array Element, sorting an array Element, Combining Array Elements into a String, Changing Elements of the Array, Objects as an associative array. 2.2 Function: Defining a function, Adding an argument, the scope of variables and arguments. 2.3 Calling a function- calling a function with or without argument, function Calling Another Function, Returning Values from a Function. 2.4 String: Joining Strings, Dividing Text, Converting Numbers and Strings, Changing the Case of the Strings, Strings and Unicode.	Hands-on Demonstration Presentations, Chalk, Board	CO2
	UNIT 3: FORMS AND EVENT HANDLING, COOKIES AND BROWSER WINDOWS (CL Hrs-04, Marks - Nil)			
3	**TLO 3.1** Develop JavaScript to handle given events. **TLO 3.2** Develop JavaScript to dynamically assign specified attribute values to the given	3.1 Building Block of a Form, Properties and methods of forms, Button, Text, Text area, Checkbox, Radio button, Select element. 3.2 Form Events: Mouse event, key event.	Hands-on Demonstration Presentations, Chalk, Board	CO3

	form control. TLO 3.3 Write JavaScript to handle forms using intrinsic function. TLO 3.4 Manage cookies using JavaScript in a given manner.	3.3 Form Objects and Elements, Changing Attribute Values Dynamically, Changing Option List Dynamically, Evaluating Check Box Selections, Manipulating Elements Before the Form, Disabling Elements, Read-Only Elements, Using Intrinsic JavaScript Functions, Changing Labels Dynamically 3.4 Cookie Basics, Creating, Reading, Setting the Expiration Date, Deleting Personalizing and Experience Using a Cookie. 3.5 Opening a New Window Focus, placing a Window into Position on the Screen, Changing the Contents of a Window, Closing the Window, scrolling a Web Page, Opening Multiple Windows at Once, Creating a Web Page in a New Window		
UNIT 4: REGULAR EXPRESSIONS, FRAMES AND ROLLOVERS (CL Hrs-03, Marks - Nil)				
4	TLO 4.1 Validate form using regularexpressions. TLO 4.2 Implement banners slideshow and rollovers to makeits website come alive.	4.1 Regular Expression: The Language of a Regular Expression, Return the Matched Characters, Matching punctuations and symbols, matching words, replacing the text using a Regular Expression. 4.2 Aa Frames: Create a frame, invisible borders of frame, Calling a Child Windows JavaScript Function, Changing the Content of a Child Window, Changing the Focus of a Child Window, writing to a Child Window from a JavaScript, Accessing Elements of Another Child Window. 4.3 Rollovers: Creating a Rollover, Text Rollovers, Multiple Actions for a Rollover, More Efficient Rollovers, 4.4 Making Magic Using the Status Bar, Banner Advertisements, and creating a slideshow.	Hands-on Demonstration Presentations, Chalk, Board	CO4

UNIT V: INTRODUCTION TO ANGULAR JS (CL Hrs-02, Marks-Nil)				
	TLO 5.1 Develop a sample web pageusing Angular JS	5.1 Introduction of Angular JS, Core features of Angular JSAngular JS as MVC Architecture. 5.2 Angular JS components: directives, expressions, controls,functions, filters 5.3 Creating and executing basic applications using Angular JSAngular JS with tables and forms.	Hands-on Demonstration Presentations, Chalk, Board	CO5

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

Sr. No.	Practical/Tutorial/LaboratoryLearning Outcome (LLO)	Laboratory Experiment/Practical Titles/Tutorial Titles	Number of Hrs.	Relevant COs
1	LLO 1.1 Write simple JavaScript with HTML for arithmetic expression evaluation and message printing.	Implement simple JavaScript with HTML for arithmetic expression evaluation.	2	1
2	LLO2.1 Develop JavaScript based on decision-making statement.	*Develop JavaScript based on decision-making statements.	2	1
3	LLO3.1 Develop JavaScript based on the looping statement.	Implement JavaScript based on the looping statement.	2	1
4	LLO 4.1 Develop JavaScript to implement array functionalities.	Implement JavaScript to implement array functionalities.	2	2
5	LLO 5.1 Develop JavaScript to implement functions.	*Implement JavaScript to implement functions.	2	2
6	LLO 6.1 Develop JavaScript to implement strings operations.	*Implement JavaScript to implement string operations.	2	2
7	LLO 7.1 Create a web page using different form objects.	Implement web pages using form objects and form elements.	2	3
8	LLO 8.1 Create a web page using Form Events.	*Implement web page using different Form Events.	2	3
9	LLO 9.1 Develop web page using Intrinsic Java Functions.	Implement web page using Intrinsic Java Functions.	2	3
10	LLO 10.1 Develop a web page for creating session and persistent cookies.	*Implement a web page for creating session and persistent cookies.	2	3
11	LLO 11.1 Create a web page for placing the Window on the screen and working with the child Window.	Implement a web page for placing the Window on the screen and working with the child Window.	2	3

Sr. No.	Practical/Tutorial/LaboratoryLearning Outcome (LLO)	Laboratory Experiment/Practical Titles/Tutorial Titles	Number of Hrs.	Relevant COs
12	LLO 12.1 Develop a web page for implementing the status bar and Banner.	*Implement web page for implementing status bar and Banner.	2	4
13	LLO 13.1 Create a web page for implementing Rollovers.	*Implement a web page for implementing Rollovers.	2	4
14	LLO 14.1 Create a basic application for demonstrating Angular JS expressions and directives (Any 2).	Write and implement basic applications for demonstrating Angular JS expressions and directives (Any 2).	2	5
15	LLO 15.1 Develop Simple applications using Angular JS andForms (Any 2).	*Write and implement Simple applications using Angular JS and Forms (Any 2).	2	5

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

Self-Learning

a. Prepare a journal based on practicals performed in the laboratory.
b. Follow Coding Standards.
c. Undertake micro-projects.
d. Develop a variety of programs to improve logical skills.
e. Develop Application-oriented real-world programs.

VII. Micro project:

1. Password pattern matching

Design a web page that accepts Username and Password. Provide appropriate validation to Username. Use regular expression only, to validate the password with the following pattern:

i. password must have at least 8 characters
ii. at least an upper-case letter,
iii. a lowercase letter,
iv. a number
v. and probably a symbol.If invalid display accordingly.

2. Control Window Locations

Create a basic page in HTML that includes a single image.
When the image is clicked, it should open 5 new windows in the following locations on the screen:

- one in the top left corner of the screenone in the top right corner
- one in the lower left corner one in the lower right corner one in the center of the screen

The URLs displayed for each window can be of your choosing.

3. Multiple Rollovers -

vi. Create a basic page in HTML that displays 3 unique images.
vii. Create a separate rollover for each of these images, i.e., onMouseOver displays a new, unique image, and onMouseOut returns it to the original image.
viii. Add a fourth image to your page.
ix. The fourth image when mouse over will not change. Instead, it will change the other three images on the page (these images do not have to be unique).
x. Then, onMouseOut of the fourth image, return the other 3 images to their original images.

a) Preload all necessary images.
b) Disable hyperlinks on the images if using the <a> tag to complete this.

VIII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr. No.	Equipment Name with Broad Specifications/Instrument Required	Experiment Sr. No.
1	Hardware: Personal computer Pentium IV,2 GHz minimum (i3-i5 preferable), RAM minimum 2 GB.	For all experiments
2	Notepad / Notepad++	

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

Unit	Unit Title	Aligned Cos	Learning Hours	R Level	U Level	A Level	Total marks
1	BASICS OF JAVASCRIPT PROGRAMMING	CO1	2	--	--	--	--
2	ARRAYS, FUNCTIONS AND STRING	CO2	4	--	--	--	--
3	FORMS AND EVENT HANDLING, COOKIES AND BROWSER WINDOWS	CO3	4	--	--	--	--
4	REGULAR EXPRESSIONS, FRAMES AND ROLLOVERS	CO4	3	--	--	--	--
5	INTRODUCTION TO ANGULAR JS	CO5	2	--	--	--	--

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment forLearning)	Summative Assessment (Assessment ofLearning)
Each Practical will be assessed considering 60% weightage to the process, and 40% weightage to the product.	End Semester Exam based on Practical performance and Viva-voce.

3. Multiple Rollovers -

vi. Create a basic page in HTML that displays 3 unique images.

vii. Create a separate rollover for each of these images, i.e., onMouseOver displays a new, unique image, and onMouseOut returns it to the original image.

viii. Add a fourth image to your page.

ix. The fourth image when mouse over will not change. Instead, it will change the other three images on the page (these images do not have to be unique).

x. Then, onMouseOut of the fourth image, return the other 3 images to their original images.

a) Preload all necessary images.

b) Disable hyperlinks on the images if using the <a> tag to complete this.

VIII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr. No.	Equipment Name with Broad Specifications/Instrument Required	Experiment Sr. No.
1	Hardware: Personal computer Pentium IV,2 GHz minimum (i3-i5 preferable), RAM minimum 2 GB.	For all experiments
2	Notepad / Notepad++	

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

Unit	Unit Title	Aligned Cos	Learning Hours	R Level	U Level	A Level	Total marks
1	BASICS OF JAVASCRIPT PROGRAMMING	CO1	2	--	--	--	--
2	ARRAYS, FUNCTIONS AND STRING	CO2	4	--	--	--	--
3	FORMS AND EVENT HANDLING, COOKIES AND BROWSER WINDOWS	CO3	4	--	--	--	--
4	REGULAR EXPRESSIONS, FRAMES AND ROLLOVERS	CO4	3	--	--	--	--
5	INTRODUCTION TO ANGULAR JS	CO5	2	--	--	--	--

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment forLearning)	Summative Assessment (Assessment ofLearning)
Each Practical will be assessed considering 60% weightage to the process, and 40% weightage to the product.	End Semester Exam based on Practical performance and Viva-voce.

XI. 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	1	--	1	1	--	3
CO2	3	2	3	3	1	2	1	--	--	2
CO3	3	2	3	3	1	2	2	--	--	2
CO4	3	2	3	3	1	2	1	--	1	2
CO5	3	2	3	3	1	2	2	1	-	3
Legends:- High:03, Medium:02, Low:01, No Mapping: -- *PSOs are to be formulated at the institute level										

XII. SUGGESTED LEARNING MATERIALS/BOOKS

Sr. No.	AUTHOR	TITLE	PUBLISHER
1	Jim Keogh	JavaScript Demystified	Tata McGraw Hill, First Edition - June 2005, ISBN: 0072254548
2	Michael Moncur	JavaScript in 24 hours	Sam's Publishing; 7th edition – February 2019, ISBN-10: 0672338092 ISBN-13: 978-0672338090
3	Shyam Seshadri, Brad Green	AngularJS: Up and Running - Enhanced Productivity with Structured Web Apps	Shroff/O'Reilly; First edition - October 2014, ISBN-10: 9789351108016 ISBN-13: 978-9351108016

XIII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	http://www.nptel.ac.in	All practicals
2	https://www.tutorialspoint.com/	All practicals

Name & Signature:

Mrs.S R Hande
Lecturer in Information Technology

Ms.P C Fafat
Lecturer in Information Technology

(Course Experts)

Name & Signature:	Name & Signature:
Dr.D N Rewadkar (Programme Head)	**Shri. S.B. Kulkarni** (CDC In-charge)

GOVERNMENTPOLYTECHNIC,PUNE

'120– NEP'SCHEME

PROGRAMME	DIPLOMA IN CM/IT
PROGRAMMECODE	06/07
COURSE TITLE	OPERATING SYSTEM
COURSE CODE	CM31201
PREREQUISITE COURSE CODE& TITLE	NA
CLASS DECLARATION COURSE	YES

I. LEARNING&ASSESSMENTSCHEME

CourseCode	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme										
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL&TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
CM31201	OPERATING SYSTEM	DSC	4	-	2	-	6	3	3 Hrs	30	70	100	40	25	10	25#	10	-	-	150

Total IKS Hrs for Term: 0Hrs

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:@-InternalAssessment,#-ExternalAssessment,*#-OnlineExamination,@$-InternalOnlineExamination

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 course.
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.*15Weeks**
4. **1credit** is equivalent to**30 Notional hours.**
5. *Self-learning hours shall not be reflected in the Timetable.
6. *Self-learningincludesmicro-projects/assignments/otheractivities.

II. RATIONALE:

Operating Systems are system programs, which are very essential components of Computer system. Two primary aims of operating systems are to manage resources (e.g. CPU time, memory) and to control users and software. Operating system design goals are often contradictory and vary depending on user, software, and hardware criteria. This course describes the fundamental concepts behind operating systems, and examines the ways that design goals can be achieved and practice the concept of Operating System design.

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

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

1. Identify types of operating system
2. Describe services of operating system.
3. Execute process management commands.
4. Apply process scheduling algorithms and deadlock handling techniques.
5. Understand memory management techniques
6. Describe organization of file system.

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
		SECTION-I		
		UNIT-I INTRODUCTION TO OPEN SOURCE (CLHrs-08,Marks-10)		
1	**TLO1.1** Explain the functioning of given component of OS. **TLO1.2** Explain characteristics of the given type of operating system. **TLO1.3** Identify type of operating system suitable for the given type of application. **TLO1.4**Execute command on command line for the given task.	1.1Operating System: Evaluation of operating system, concept, Functions of Operating system. 1.2ViewsofOS: User View, System View 1.3Types of operating systems: Batch operating system, Multiprogramming operating system, Multitasking operating system, Real-Time Embedded Systems, Multimedia Systems, Distributed System, Mobile OS(Android, iOS) 1.4Open-Source Operating System: Linux, BSD Unix. 1.5Booting Process of operating systems	Hands-on Demonstration Presentations	**CO1**
		UNIT-II SERVICES AND COMPONENT (CLHrs-10,Marks-10)		
2	**TLO1.2** Start, stop and restart the given service in Linux. **TLO2.2**Explain use of given system call of specified OS. **TLO2.3**Explain process that follows in managing the given resource. **TLO2.4** Explain use of the given operating system tool..	2.1DifferentServicesofOperating System. 2.2Component of operating system: Process Management, Main memory Management, file Management, I/O system management, secondary storage management 2.3SystemCalls-Concept,typesof operating system calls 2.4Useofoperatingsystemtools,user management, security policy, device management, performance monitor, task manager.	Hands-on Demonstration Presentations	**CO2**
		UNIT-III PROCESS MANAGEMENT (CLHrs-10,Marks-12)		
3	**TLO3.1**Explain functions carried out in the given process state. **TLO3.2** Describe the function of the given component of process stack in PCB. **TLO3.3**Explain the characteristics of the given multithreading model. **TLO3.4**Describe method of Executing the given process command with example..	3.1Process-Processstates, Process Control Block (PCB). 3.2ProcessScheduling-Scheduling Queues Schedulers, Context switch. 3.3OperationsonProcess:Creation, Termination 3.4Inter-Process Communication (IPC): Introduction, shared memory system and message passing system. 3.5Multithreading Models 3.6Thread Libraries, Threading Issues	Hands-on Demonstration Presentations	**CO3**

SECTION-II				
UNIT-IV CPU SCHEDULING AND DEADLICK (CLHrs-12, Marks-14)				
4	**TLO4.1:**Justify the need and objective of given job scheduling criteria with relevant example. **TLO4.2**Explain with example the procedure of allocating CPU to the given process using the specified OS. **TLO4.3**Calculate turnaround time and average waiting time of the given scheduling algorithm. **TLO4.4**Explain functioning of the given necessary condition leading to deadlock.	4.1Scheduling types-Scheduling objective, CPU and I/O burst cycles, Pre- emptive, Non-Per-emptive. 4.2Scheduling criteria, Types of scheduling algorithms-First come first served (FCFS), shortest job first (SJF), Shortest Remaining Time(SRTN),Round Robin (RR) Priority scheduling, multilevel queue scheduling. 4.3Criticalsection problem. 4.4Deadlock- system, Models, Necessary condition leading to Deadlocks, Deadlock Handling- Preventions, avoidance and Recovery.	Hands-on Demonstration Presentations	**CO4**
UNIT–V MEMORY MANAGEMENT(CLIIrs-10,Marks-14)				
5	**TLO5.1**Describe the working of specified memory management function. **TLO5.2**Explain characteristic of the given memory management techniques. **TLO5.3**Write algorithm for the given page replacement technique. **TLO5.4**Calculate page fault for the given page reference string.	5.1Basic Memory Management-Partitioning, Fixed and variable, 5.2Free space management techniques-Bitmap, Linked List. 5.3Introduction to page tables. 5.4Segmentation, Fragmentation, Page Fault 5.5Virtual memory-Introduction to paging, Demand Paging 5.6Page replacement Algorithm-FIFO, LRU, Optimal.	Hands-on Demonstration Presentations	**CO5**
UNIT–VI FILE MANAGEMENT(CLIIrs-10,Marks-10)				
6	**TLO6.1**Explain the structure of the given file system with example. **TLO 6.2** Describe mechanism of the given file access method. **TLO 6.3**Explain procedure to create and access method.	6.1File-concept, Attributes, Operations, types and File System Structure. 6.2AccessMethods-Sequential, Direct, Swapping, File Allocation Methods-Contiguous, Linked, Indexed. 6.3Directory Structure-Single level, two level, tree-structured directory, Disk organization and Disk Structure-Physical structure , Logical structure, Raid structure of Disk, RAID level 0 to 6. 6.4File System Implementation: Partitions and Mounting, Virtual File Systems	Hands-on Demonstration Presentations	**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:** Understand Operating system installation	*Advanced Linux Installation: Network and Dual Boot	02	CO1
2	**LLO2.1:** Understand the concept of disk partitioning.	*Linux Disk Management using fdisk utility to create, delete and change the partitions on the disk.	02	CO2
3	**LLO3.1**Understand to change the permissions of file and directories.	*Setting/Changing file and directory related permissions chmod and umask command.	02	CO2,CO6
4	**LLO4.1** Understand the various commands to display information about file and directories.	*Displaying File Information : inodes, inodes and directories, cp and inodes, mv and inodes, rm and inodes, ls –l	02	CO2,CO6
5	**LLO5.1** Explore the concept of Mount and unmount	*Working with Linux-supported File Systems: Mounting and Unmounting to be tested with external drives	02	CO2
6	**LLO6.1** Recognize different commands related to process Management **LLO6.2** Practice all process commands	*Linux Process Management : Jobs: Background, Kills and Interruptions and setting process priority Get Process status, Find Processes by Pattern or User, Display the Most Active Processes, wait for a process, sleep processes, Kill processes, kill all processes(Executing commands for process management–ps, fg, sleep, exit, bg, kill ,killall, nice, at, jobs)	04	CO3
7	**LLO7.1**Understand the concept of system states. **LLO7.2**Explore User management and group management. **LLO7.3**Practice group management activities.	*A. System states :init Shutting down and changing Run levels, Managing Users and Groups: Adding and Removing users with adduser, usermod and userdel commands B. Adding and Removing groups with group add, groupmod and groupdel commands, Superuser-The root UserDesktop, System Time and Date	02	CO3
8	**LLO8.1** Explore Job scheduling commands	*Scheduling jobs with crontab: cron daemon, crontab options, The format of crontab file, Environment variable settings, crontab command lines	02	CO4
9	**LLO9.1** Understand the Memory Management related commands	*Linux: Memory Management Practicing top, htop, vmstat and free command	02	CO5
10	**LLO10.1**Understand the working of scheduling algorithms **LLO10.2**Develop a program for	*Write a C program to calculate total waiting time and turnaround time of n processes with FCFC algorithm and Priority Algorithm.	04	CO4

	different scheduling algorithm			
11	**LLO11.1**Understand the concept of page replacement algorithm	*Write a c Program to implement FIFO page replacement algorithm.	02	CO5
12	**LLO 12.1** Explore all shell commands	*Executing various Shell commands Creating shell variables, writing shell scripts using decision making and various control structures., Executing various shell utilities, using file test and string test conditions in scripts, Making use of Positional Parameters. Configuring your own login shell using Functions in Shell scripts.	02	ALL
13	**Micro project**	Develop a micro project.	02	ALL

Note: Out of the above suggestive LLOs–

1. '*'Marked Practicals (LLOs) are mandatory.
2. A judicial mix of LLOs is to be performed to achieve the desired outcomes.

VI. SUGGESTEDMICROPROJECT/ASSIGNMENT/ACTIVITIESFORSPECIFIC LEARNING/SKILLS DEVELOPMENT (SELF-LEARNING)

Self-Learning NA

| Creating shell variables, writing shell scripts |

Micro Project

Suggestive list of micro-project:

1. Create a report depicting features of different types of Operating system–Batch operating system, Multi-Programmed, Time shared, multiprocessor system, Real time System, Mobile Operating system etc. with example.
2. Make a comparative chart to calculate total waiting time and turn-around time of n processes with different CPU scheduling algorithm.
3. Implement a CPU scheduling algorithm for Shortest Remaining Time First and shortest Job First algorithm.
4. Compare FCFS,SJF, Priority and Round Robin with respect to turn around time and average waiting time. Give the reason of problems arises in FCFS.
5. Write a shell script that tests the connectivity of group of computers.
6. Write a shell script that counts number of files and number of directories in a directory.
7. Prepare a help guide using shell script for all the major Linux commands.
8. Write a shell script to find out-Whether given file exists.
9. Create a simple FAT file system using C programming.
10. Develop a simple memory allocation in c.
11. Implementing Demand paging in Operating system.
12. Create report on Linux Utilities in detail.
13. Prepare report on various generations of computer system and operating system.

Note:

1. The above is suggestive list of case studies for Micro project.
2. The faculty must allocate any 1case study in group of 2 students. Considering the students technical skills.

Assignment

Prepare a journal of practical 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) Linux like anyOperatingsystemSoftwarec)AnyBrowser(AnyGeneralPurposeComputeravailable 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	CO1	08	04	04	02	10
2	II	OS Services and components	CO2	10	02	04	04	10
3	III	Process Management	CO3	10	02	04	06	12
4	IV	CPU Scheduling and Deadlock	CO4	12	02	04	08	14
5	V	Memory Management	CO5	10	04	06	04	14
6	VI	File Management	CO6	10	04	04	02	10
Grand Total				60	18	26	26	70

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. SUGGESTEDCOS-POSMATRIXFORM

Course Outcome	Programme Outcomes(Pos)	Programme Specific Outcomes *(PSOs)	

IX. ASSESSMENT METHODOLOGIES /TOOLS

	PO-1Basic 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	-	-	1	-	1	-
CO3	1	1	1	1	1	1	2	1	1	-
CO4	1	2	2	-	-	1	3	1	1	2
CO5	1	1	1	-	-	2	3	3	2	2
CO6	1	1	1	-	-	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	Silberschatz Galvin, Gagne,John Wisley&Sons	Operating System Concepts	Wiley and Sons, Ninth Edition, Galvin. 2015, ISBN: 978-5 1-265-5427-0 2 **ISBN-13:**978-0470128725
2	Achyut S. Godbole, Tata McGraw-Hill	Operating Systems	TataMcGrawHillEducation,2015, ISBN: 97800705911343
3	D.M. Dhamdhere, TMH	System Programming &Operating System	McGraw-Hill Education;ISBN:9780074635797
4	Milan Milenkovic, TMH	Operating System Concept &Design	McGraw Hill Education **ISBN-10:**0074632728 **ISBN-13:**978-0074632727

XII. LEARNINGWEBSITES& PORTALS

1. www.cs.wisc.edu/~bart/537lecturenotes-UniversityofWisconsin Madison.
2. www.cs.kent.edu/osf03/notes/index.html-ViliniusGediminasTechnicalUniversity
3. http://www.howstuffworks.com/operating-system1.htm
4. www.tutorialspoint.com/opeartingsystem
5. www.geeksforgeeks.org/operatingsystem

Name&Signature:

Dr.Shankar B.Nikam
Lecturer in Computer Engineering

Smt.PriyaK.Zade
Lecturer in Computer Engineering
(CourseExperts)

Smt.V.M.Khanapure
Lecturer in Information Technology

Name&Signature:

Dr.D.N.Rewadkar
(Programme Head)

Name&Signature:

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

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	**DIPLOMA IN CM/IT**
PROGRAMME CODE	**06/07**
COURSE TITLE	**PYTHON PROGRAMMING**
COURSE CODE	**CM41202**
PREREQUISITE COURSE CODE & TITLE	**NA**
CLASS DECLARATION COURSE	**YES**

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme											
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
CM41202	PYTHON PROGRAMMING	SEC	2	-	4	2	8	4	2	15	35*#	50	20	50	20	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:

1. **FA-TH** represents an average of two class tests of 30 marks each conducted during the semester.
2. 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 course.
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**.
5. * Self-learning hours shall not be reflected in the Timetable.
6. * Self-learning includes micro-projects/assignments/other activities.

II. RATIONALE:

Python is a powerful programming language. It has efficient high-level data structures and a simple but effective approach to object-oriented programming. Python code is simple, short, readable, intuitive and powerful and thus it is effective for introducing computing and problem-solving for beginners. Its elegant syntax and dynamic typing together with its interpreted nature, make it an ideal language for scripting and rapid application development in many areas on most platforms.

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: Develop Python programs using control flow statements.
CO2: Perform operations on various data structures.
CO3: Use packages to solve real-time problems
CO4: Apply an object-oriented approach to problem-solving
CO5: Write code for File and Exception Handling.
CO6: Develop Python applications using database connectivity

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
	SECTION -I			
	UNIT-I INTRODUCTION TO PYTHON AND CONTROL FLOW STATEMENTS (CL-5 Hrs, Marks- 5)			
1	**TLO 1.1** Explain the given feature of Python. **TLO 1.2** Write a Python program to perform basic input-output operations. **TLO 1.3** Write a Python program to solve a given expression. **TLO 1.4** Implement given decision-making statements and looping statements in the Python program. **TLO 1.5:** Write a Python program using control statements.	**1.1** Introduction: Features, History and Applications of Python, Python IDE's **1.2** Pythn on building blocks: Indentation, Identifiers, Variable, Comments, Keywords **1.3** Basic input output operations: input(),print() **1.4** Operators: Arithmetic, Relational, Assignment, Logical, Bitwise, Membership and Identity operator **1.5** Control flow statements: Conditional statements (if, if-else, if-elif-else, nested if), Loops in Python (while, for, nested loops), Loop manipulation statements (continue, pass, break, else)	Hands-on Demonstration Presentations	**CO1**
	UNIT-II DATA STRUCTURES IN PYTHON (CL -6 Hrs , Marks-7)			
2	**TLO 2.1** Write a Python program to manipulate lists. **TLO 2.2** Write a Python program to manipulate tuples. **TLO 2.3** Write a Python program to manipulate sets. **TLO 2.4** Write a Python program to manipulate dictionaries.	**2.1** Lists: Defining Lists, Accessing values in lists, deleting values from lists, updating lists. Basic List Operations, Built-in List Functions. **2.2** Tuples: Accessing values in Tuples, deleting values from Tuples and updating Tuples. Basic Tuple operations, Built-in Tuple Functions. **2.3** Sets: Accessing values in Set, deleting values from Set and updating Sets. Basic Set operations, Built-in Set Functions. **2.4** Dictionaries: Accessing values in Dictionary, deleting values from Dictionary and updating Dictionary. Basic Dictionary operations and built-in Dictionary Functions.	Hands-on Demonstration Presentations	**CO2**
	UNIT-III PYTHON FUNCTIONS, MODULES AND PACKAGES (CL-5 Hrs , Marks- 5)			

3	**TLO 3.1** Write relevant user-defined functions for the given problem. **TLO 3.2** Write a relevant user-defined module for the given problem. **TLO 3.3** Write packages for the given problem	**3.1** Use of Python built-in functions (Eg. type/data conversion functions, math functions etc.). **3.2** User-defined functions: Function definition, Function call, function arguments and parameter passing, return statement, scope of variable: Global variable and Local variable. **3.3** Modules: Writing modules, importing modules, importing objects from modules, Python built-in modules, (Eg. Numerical and mathematical module, Functional programming module, statistic module), Namespace and Scoping. **3.4** Python Packages: Introduction, Writing Python Packages, using standard (Eg.math, scipy, Numpy, matplotlib, pandas, pandas series etc.) and user-defined Packages.	Hands-on Demonstration Presentations	**CO3**
	SECTION II			
	UNIT- IV OBJECT ORIENTED PROGRAMMING IN PYTHON (CL-4 Hrs , Marks-6)			
4	**TLO 4.1** Write a Python program using classes and objects to solve a given problem. **TLO 4.2** Implement Python program using different types of constructors. **TLO 4.3** Write a program to demonstrate polymorphism. **TLO 4.4** Write Python code using data abstraction for a given problem. **TLO 4.5** Apply inheritance for the given problem.	**4.1** Object-oriented Concepts: Creating class, Creating object **4.2** Constructors in Python (Parameterized & Non-Parameterized), the self parameter **4.3** Polymorphism: Method Overloading and Overriding **4.4** Data Hiding / Abstraction **4.5** Inheritance: Single Inheritance, Multiple Inheritance, Multilevel Inheritance	Hands-on Demonstration Presentations	**CO4**
	UNIT –V FILE HANDLING AND EXCEPTION HANDLING (CL-4 Hrs , Marks-4)			
5	**TLO 5.1** Write Python code for the given reading values from the keyboard. **TLO 5.2** Read data from the given file. **TLO 5.3.1** Write the given data to a file. **TLO 5.3.2** Handle the given exceptions through the Python program.	**5.1** I/O operations: Reading keyboard input, printing to screen. **5.2** File Handling: Opening files in different modes, accessing file contents using standard library functions, reading and writing files, closing files renaming and deleting files. **5.3** Exception Handling: Introduction, 'try: except:' statement, 'raise' statement, user-defined exceptions.	Hands-on Demonstration Presentations	**CO5**

UNIT -VI BUILT-IN GUI PACKAGES AND DATABASE CONNECTIVITY (CL-6 Hrs , Marks-8)				
	TLO 6.1 Create a GUI application using the Tkinter package for the given problem. **TLO 6.2** Create a Python application to connect with the database.	**6.1** Creating GUI using Tkinter: Introduction to Tkinter, Widgets (Entry, Label, Button, RadioButton, Checkbutton), Creating a simple GUI application **6.2** Connecting to Database using MySQL: Installing mysql-connector, cursor() object, execute() method, fetchall() method, Creating simple program to connect database	Hands-on Demonstration Presentations	**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** Install the given Python IDE.	*Install the given Python IDE.	2	CO1
2	**LLO2.1** Write a Python program for performing basic input and output operations in a given problem.	*1. Write a Python program that displays a welcome message on the screen. 2. Implement the Python program to read data from the user and display data on the screen.	2	CO1
3	**LLO3.1** Write a Python program to solve a given expression.	*Implement a Python program using the following operators: 1. Arithmetic 2. Relational & Logical 3. Assignment 4. Bitwise 5. Membership 6. Identity	2	CO1
4	**LLO4.1** a. Write a Python program for solving a given problem using various If statements b. Write a Python program for solving a given problem using various Looping statements.	*1.Implement a Python program to demonstrate the use of the following conditional statements: a. Simple IF b. IF..ELSE c. IF..ELIF..ELSE d. nested IF 2. Implement a Python program to demonstrate the use of the following looping statements: a. while loop b. for loop c. nested loop	4	CO1
5	**LLO5.1** Use loop control statements in Python to solve a given problem.	Implement a Python program to demonstrate the use of loop control statements. [continue, pass, break, else]	2	CO1
6	**LLO6.1** Write a Python program to perform operations on a list.	*Create an account on wikipedia.Implement a Python program to perform the following operations on the List: 1. Create a List 2. Access List 3. Update List 4. Delete List	2	CO2
7	**LLO7.1** Write a Python program to use built-in functions on the list. Implement Python program to demonstrate the use of built-in functions/methods on List (Any Eight Functions/methods)	Implement Python program to demonstrate the use of built-in functions/methods on List (Any Eight Functions/methods) Implement Python program to demonstrate the use of built-in functions/methods on List (Any Eight Functions/methods)	2	CO2

	Implement Python program to demonstrate the use of built-in functions/methods on List (Any Eight Functions/methods)			
8	**LLO 8.1** Write a Python program to perform operations on a tuple.	*Implement a Python program to perform the following operations on the Tuple: 1. Create a Tuple 2. Access Tuple 3. Print Tuple 4. Delete Tuple 5. Convert the tuple into a list and vice-versa	2	CO2
9	**LLO 9.1** Write a Python program to manipulate the set.	*Implement a Python program to perform the following operations on the Set: 1. Create a Set 2. Access Set 3. Update Set 4. Delete Set	2	CO2
10	**LLO 10.1** Use built-in functions/methods on sets in Python for solving given problems.	*Implement a Python program to perform the following functions on Set: 1. Union 2. Intersection 3. Difference 4. Symmetric Difference	2	CO2
11	**LLO 11.1** Write a Python program to perform operations on a dictionary.	*Implement a Python program to perform the following operations on the Dictionary: 1. Create Dictionary 2. Access Dictionary 3. Update Dictionary 4. Delete Dictionary 5. Looping through Dictionary 6. Create a Dictionary from a list	2	CO2
12	**LLO 12.1** Write a function to solve a given problem.	*Write a user-defined function to implement the following features: 1. Function without argument 2. Function with argument 3. Function returning value 4. Function positional/required argument 5. Function with keyword argument 6. Function with default argument 7. Function with a variable length argument	2	CO3
13	**LLO 13.1** Write a Python program using an anonymous function. LLO 13.2 Write a Python program to use the function in the argument.	*Write a Python program to demonstrate the use of the following advanced functions: 1. Lambda 2. Map 3. Reduce	2	CO3
14	**LLO 14.1** Write user user-defined module to solve a given problem.	Write a Python program to create and use a user-defined module for a given problem.	2	CO3
15	**LLO 15.1** Select the appropriate module to solve the given problem. **LLO 15.2** Use the given module to solve the problem.	*Write a Python program to demonstrate the use of the following module: 1. math module 2. random module 3. os module 4. static module	2	CO3
16	**LLO 16.1** Write a user-defined package to solve a given problem	*Write a Python program to create and use a user-defined package for a given problem.	2	CO3
17	**LLO 17.1** Write a Python program using classes and objects to solve a given problem.	*Develop a Python program to perform the following operations: 1. Creating a Class with the method 2. Creating Objects of class	2	CO4

		3. Accessing method using object		
18	**LLO18.1** Write a Python program to initialize objects of class using various types of constructors.	*Write a Python program to demonstrate the use of constructors: 1. Default 2. Parameterized 3. Constructor Overloading	2	CO4
19	**LLO19.1** Write a Python program to implement polymorphism.	*Implement a Python program to demonstrate 1. Method Overloading 2. Method Overriding	2	CO4
20	**LLO20.1** Write a Python program that uses data-hiding concepts in Python.	Write a Python program to demonstrate data hiding.	2	CO4
21	**LLO 21.1** Select the appropriate type of inheritance to solve a given problem. **LLO 21.2** Write a Python program using inheritance to solve a given problem.	*Write a Python program to implement 1. Single inheritance 2. Multiple Inheritance 3. Multilevel inheritance	2	CO4
22	**LLO 22.1** Write a Python program using file handling to solve a given problem. **LLO22.2** Write a Python program to implement exceptions.	*Write a Python Program to demonstrate File Handling through: 1. Opening files in different modes 2. Accessing file Reading and Writing file 3. Closing file 4. Renaming and Deleting file	2	CO5
23	**LLO23.1** Write a Python program to implement exceptions.	Implement Python program to demonstrate 1. user-defined exception	2	CO5
24	**LLO24.1** Use appropriate packages in a Python program to create GUI applications.	*1. Write a Python GUI program to import the Tkinter package create a window and set its title. 2. Write a Python GUI program that adds labels and buttons to the Tkinter window.	4	CO6
25	**LLO25.1** Write a Python program to connect the database.	*Write a program to create a connection between the database and Python.	4	CO6
26	**LLO26.1** Write a Python program to display the content from the database.	*Implement a Python program to select records from the database table and display the result.	4	CO6

Note: Out of the above suggestive LLOs –

1. '*' Marked Practicals (LLOs) Are mandatory.
2. A judicial mix of LLOs is to be performed to achieve the desired outcomes

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

Self Learning: Yes

Suggestive list of case studies for self learning:

1. Manage small online book store and create a program to manage inventory. Implement a system where store information about each book, such as its title, author, genre, and price. Additionally, Perform

operations such as adding new books, removing books, updating book information, and searching for books by title or author.

2. Develop a program to store information about students in a class. Each student has a unique ID, name, age, and grade. create a system to manage this information efficiently.
3. Developing a project where students need to store unique employee IDs. Each employee has a unique ID assigned to them, and ensure that there are no duplicate IDs in your system.
4. Create a simple dice rolling game where a player rolls two dice, and the sum of the numbers rolled determines their score. The player can continue rolling until they decide to stop, at which point their total score is calculated.
5. Develop an application that calculates the area of different geometric shapes such as rectangles, squares, circles, and triangles.
6. Develop an application that analyzes the frequency of words in a text file and provides basic statistics about the text.
7. Dataset containing information about students' grades in different subjects, and perform various data analysis tasks such as calculating averages, finding the highest and lowest scores, and filtering data based on specific criteria.
8. A Text file containing a list of student names and their corresponding scores. Read this data, calculate the average score for each student, and write the results to another file.
9. Develop an application to detects whether a given phrase or sentence is a palindrome, ignoring spaces, punctuation, and capitalization.
10. Develop a graphical user interface (GUI) application for managing a to-do list. The application should allow users to add tasks, view tasks, mark tasks as completed, and remove tasks from the list.
11. Create a graphical user interface (GUI) calculator application that performs basic arithmetic operations such as addition, subtraction, multiplication, and division.
12. Develop a graphical user interface (GUI) weather application that allows users to enter a city name and get the current weather conditions for that city.
13. Build application that acts as an alarm clock. Allow users to set alarms with specific times and optional messages.
14. Develop an application that generates a random strong password based on user-defined criteria (length, inclusion of numbers/symbols).
15. Develop a basic chatbot that can engage in simple conversations, answer questions, and provide information on specific topics.
16. Create a Hangman Game. where the computer selects a word and the player has to guess it letter by letter.Display the progress of the word and the number of guesses remaining.
17. Create a command-line version of the Tic-Tac-Toe game where two players can play against each other.
18. Develop a command-line tool that fetches weather data from an API (like Open Weather Map) based on user input (city name).
19. Create a simple quiz game with multiple-choice questions. Keep track of scores and provide feedback on answers.
20. Develop a contact management system that allows users to add contacts with details like name, phone number, and email address. Implement basic CRUD operations (Create, Read, Update, Delete).
21. Develop a application to generate home automation dash board.

22. Build a COVID-19 tracker that fetches data from a COVID-19 API (such as the one provided bykaggle).Display statistics such as total cases, deaths, and recoveries globally or for a specific country.
23. Build a stock price checker that retrieves real-time stock prices and information from a financial data API (e.g., Alpha Vantage or Yahoo Finance).Display stock prices, historical data, and trends for specified stocks.
24. Develop a recipe management system that stores recipes (name, ingredients, instructions) in a database. Users can add new recipes, search for recipes by name or ingredients, and update existing recipes.
25. Build an expense tracking application that stores expense records (date, category, amount) in a database. Users can add new expenses, categorize them, and view expense summaries.

Activities

- Students are encouraged to use online tools to improve their learning, such as the e-Kumbh from AICTE and the virtual Labs from IIT.
- Students should be encouraged to participate in various coding competitions, such as hackathons, and online coding contests on websites like Hackerrank, Codechef etc.
- At the department level, encourage students to start a coding club
- Students are encouraged to register themselves in various MOOCs such as Infosys Springboard, Swayam etc. to further enhance their learning.

Note:

1. The above is suggestive list of case studies for SLA
2. The faculty must allocate any 2 case studies to individual student. Considering the students technical skills.

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	Computer System with all necessary Peripherals and Internet connectivity (Any General Purpose Computer available in the Institute)	ALL
2	Any open-source tool (SPYDER / Eclipse IDE), Python Interpreter	
3	Any database software	25,26

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
SECTION-I								
1	I	Introduction to Python and control flow statement	CO1	5	2	3	0	5
2	II	Data Structures in Python	CO2	6	2	2	3	7
3	III	Python Functions, Modules and Packages	CO3	5	0	2	3	5
		Grand Total		**16**	**4**	**7**	**6**	**17**

		SECTION-II						
4	IV	Object Oriented Programming in Python	CO4	4	0	2	4	6
5	V	File Handling and Exception Handling	CO5	4	0	2	2	4
6	VI	Built-in GUI packages and Database connectivity	CO6	6	2	2	4	8
Grand Total				**14**	**2**	**6**	**10**	**18**

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, Sustainabilityand Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	2	1	1	1	-	-	1	-	2	3
CO2	2	1	1	1	-	-	1	-	2	3
CO3	3	3	3	2	2	-	2	-	3	3
CO4	2	2	3	2	-	-	1	-	3	3
CO5	2	2	2	2	-	-	1	-	2	3
CO6	3	2	3	3	2	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	K. Nageswara Rao, Shaikh Akbar	Python Programming	Scitech Publications (India) Pvt.Ltd ISBN:9789385983450
2	Mark Lutz	Learning Python	O'Reilly Publication, 5th Edition ISBN13:9781449355739
3	Paul, Barry	Head First Python	O'Reilly Publication, 2nd Edition ISBN: 1491919531
4	David Amos, Dan Bader, Joanna,Jablonski, Fletcher Heisler	Python Basics	Real Python ISBN-13: 9781775093329

XI. LEARNING WEBSITES & PORTALS

1 https://ekumbh.aicte-india.org/allbook.php Python Programming
2 https://Python-iitk.vlabs.ac.in/ Python Programming Lab
3 https://spoken-tutorial.org/watch/Python+3.4.3/Input-output/English/
Introduction to Python and control flow statements, Data Structures in Python, Function and module
4 https://onlinecourses.nptel.ac.in/noc19_cs41/preview Python Programming Course
5https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013094439793500160259 2_shared/overview Python for Beginners
6 https://wiki.Python.org/moin/BeginnersGuide Basics of Python
7 https://www.geeksforgeeks.org/Python-gui-tkinter/ Python GUI Programming
8https://www.w3schools.com/Python/Python_mysql_getstarted.asp Python MySQL Database Connectivity
9 https://www.tutorialspoint.com/Python_pandas/index.htm Python pandas package

Name & Signature:		
Smt. S. A. Ade Lecturer in Computer Engineering	**Smt. H. S. Pawar** Lecturer in Computer Engineering	**Smt.S.D.Raut** Lecturer in Information Technology
	(Course Experts)	
Name & Signature: **Dr.B.N.Rewadkar** (Programme Head)		Name & Signature: **Shri. S.B. Kulkarni** (CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMA IN CE/EE/ET/ME/MT/CM/IT/DDGM
PROGRAMME CODE	01/02/03/04/05/06/07/08
COURSE TITLE	SOCIAL AND LIFE SKILLS
COURSE CODE	HU21204
PREREQUISITE COURSE CODE & TITLE	NA
CLASS DECLARATION COURSE	NO

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme										
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
HU21204	SOCIAL AND LIFE SKILLS	VEC	1	--	2	1	4	2	--	--	--	--	--	25	10	--	--	25	10	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,@S - 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 course.
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.
1. **Notional learning hours** for the semester are **(CL + LL + TL + SL) hrs. * 15 Weeks**
3. **1 credit** is equivalent to **30 Notional hours**.
4. * Self-learning hours shall not be reflected in the Timetable.

6.* Self-learning includes micro-projects/assignments/other activities.

II. RATIONALE:

The introduction of a social and life skills course for diploma engineers is indeed a significant step forward in shaping well-rounded professionals. By integrating soft skills training with technical education, this curriculum addresses the growing need for engineers who are not only experts in their field but also adept in interpersonal communication, collaboration, and leadership. Such skills are crucial for success in the modern workforce, where the ability to navigate complex social dynamics can be just as important as technical know-how. Moreover, the emphasis on ethical decision-making prepares engineers to approach their work with integrity and responsibility. As these professionals progress in their careers, the benefits of this comprehensive education will manifest in their ability to innovate, lead, and contribute positively to their communities and the broader society. This forward-thinking approach ensures that the engineers of tomorrow are equipped not just with the tools to excel in their careers, but also with the vision to drive societal progress.

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: Achieve shared goals through effective teamwork in executing sustainable community development projects.
CO2: Improve cooperation and understanding through refined communication skills.
CO3: Encourage ethical choices and compassionate behaviour by nurturing moral values.
CO4: Foster ethical judgment, honesty, and societal accountability to shape principled and conscientious professionals.
CO5: Equip students with practical financial literacy skills for efficient financial management.

IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT:

Sr. No	TheoryLearning Outcomes (TLO's) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
	UNIT-I ENGAGEMENTS WITHIN UNNAT MAHARASHTRA ABHIYAN (UMA) (CL Hrs-03, Marks-NIL)			
1.	**TLO1.1:** Recognize the importance of addressing societal needs and involving relevant stakeholders in problem-solving efforts. **TLO1.2:** Integrate academia, society, and technology to devise comprehensive solutions for complex societal issues. **TLO1.3:**Enhance communication and negotiation skills to effectively engage stakeholders, ensuring diverse perspectives and productive collaboration in problem-solving. **TLO1.4:** Utilize critical data sources such as economic surveys, and environmental data to guide decision-making and solution development in problem-solving endeavours. **TLO1.5:** Identify key stakeholders and delineate their roles and interests in addressing societal challenges. **TLO1.6:** Identify essential attributes for measurement in the problem-solving process. **TLO1.7:** Explore diverse	**1.1 Identifying Regional Societal Challenges:** Recognizing Community Needs Requiring Engineering Solutions. **1.2Integrating Multidisciplinary Approaches:** Linking Academia, Society, and Technology **1.3 Involving Diverse Stakeholders:** Engaging Various Actors in the Problem-Solving Process **1.4Accessing Secondary Data Sources:** Utilizing Resources like Census and Economic Surveys **1.5Mapping Problems and Stakeholders:** Understanding Activities' Relevance to System Components and Key Stakeholders **1.6Defining Measurement Metrics:** Identifying Essential Attributes for Evaluation **1.7 Employing Data Collection Tools:** Exploring Surveys and Measurement Equipment **1.8Establishing Measurement Standards:** Developing Survey Forms and Piloting Processes **1.9Conducting Field Surveys:** Quantifying Local Systems such as Agriculture and Transportation **1.10Analyzing Data and Creating**	Considering the unit design, it's vital to consider the following factors during the implementation of the unit: i) Organize students into smaller groups of 5-6 members to carry out fieldwork within the larger cohort. ii) Allocate multiple student groups evenly among all faculty members involved in the course. iii) A team of course faculty will visit local governing bodies like Municipal Corporations, Villages, Panchayats, Zilla Parishads, and Panchayat Samitis to assess small-scale technological or engineering needs within their jurisdiction. iv) The team of course instructors will conduct initial field visits to explore various	**CO1**

	tools and templates for data collection, including surveys and measurement equipment. **TLO1.8:** Establish a structured framework for measuring identified attributes, including the development of survey forms and piloting the measurement process. **TLO1.9:** Gain practical experience in conducting fieldwork to gather primary data, such as agricultural output, rainfall, and transportation networks. **TLO1.10:** Develop proficiency in data analysis to draw meaningful conclusions, informing decision-making and solution development processes.	**Reports:** Summarizing Data and Reflections in Reports, Utilizing Various Formats like Tables and Graphs	scenarios and options for student-led fieldwork to assess and quantify different parameters and characteristics. **a) Session I** will introduce the development approach, fieldwork methodology, and the utilization of case studies as instructional tools. **b) Sessions II** - VII will cover topics such as societal dynamics, stakeholder engagement, value creation, establishing metrics, basic analysis, and preliminary reporting. **c) Session VIII** will wrap up the program with feedback collection and assessment. **d) Field Work:** **1. Pilot Visit** - Testing the survey instrument **2. Survey Visit 1** - Gathering data/information Survey. **3. Visit 2-** Further data collection. **4.SummaryVisit-** Concluding activities post-analysis.	
UNIT - II NATIONAL SERVICE SCHEME (NSS) (CL Hrs-03, Marks- NIL)				
2	**TLO2.1:** Enhance communication and leadership abilities to effectively interact with local leaders. **TLO2.2:** Develop proficiency in conducting socio-economic surveys using appropriate data collection techniques and analysis methods to understand community needs. **TLO2.3:** Identify suitable villages and devise activity	2.1 Engaging with Village/Area 2.2 Conducting initial socio-economic surveys in nearby villages. 2.3 Selecting villages for adoption and initiating project activities. 2.4 Conducting thorough socio-economic surveys in the adopted village or area. 2.5 Identifying key issues and challenges within the community. 2.6 Raising awareness about advancements in agriculture, watershed management, wasteland reclamation, renewable energy,	Considering the unit design, it's vital to consider the following factors during the implementation of the unit: i) Organize students into smaller groups of 5-6 members to carry out fieldwork within the larger cohort. ii) Allocate multiple student groups evenly among all faculty members involved in the	**CO2**

	plans based on community needs and available resources. **TLO2.4:** Analyze survey findings to discern socio-economic patterns, obstacles, and potential avenues for progress. **TLO2.5:**Prioritize community issues according to their significance and impact on community welfare. **TLO2.6:** Communicate information on agriculture, watershed management, renewable energy, housing, sanitation, nutrition, and hygiene effectively. **TLO2.7:** Cultivate networking and advocacy skills to foster collaboration among government agencies, development organizations, and the community.	affordable housing, sanitation, nutrition, and personal hygiene. Also, informing about skill enhancement programs, income generation opportunities, government initiatives, legal aid, consumer rights, and related topics. 2.7 Facilitating collaboration between the government and development agencies to implement various schemes in the adopted village or slum.	course. iii) Before selecting a village or slum for NSS activities, it's advisable for teachers to conduct an initial visit. iv)The selected area should have a dense population. iv)Community members should exhibit a willingness to improve their living conditions and actively engage in projects initiated by the NSS for their benefit. vi) NSS units should avoid areas with a history of political conflicts. vii) The chosen area should be conveniently accessible for NSS volunteers to conduct regular visits to the slums.	
UNIT - III UNIVERSAL HUMAN VALUES (CL Hrs-03, Marks- NIL)				
3	**TL03.1:** Apply love and compassion to promote harmony and well-being. **TL03.2:** Demonstrate honesty and transparency to build trust and authenticity. **TL03.3:** Utilize non-violent approaches to resolve conflicts and enhance empathy. **TL03.4:** Align actions with moral principles to promote justice and fairness. **TL03.5:** Employ peace-building strategies for harmony and reconciliation. **TL03.6:** Engage in acts of service to cultivate empathy and social responsibility. **TL03.7:** Prioritize others' needs to foster altruism and	**4.1 Exploring Love and Compassion (Prem and Karuna):** Learning about and embodying the principles of love and compassion in daily life. **4.2 Embracing Truth (Satya):** Understanding the significance of truthfulness and integrating it into one's actions and interactions. **4.3 Embracing Non-Violence (Ahimsa):** Understanding the importance of non-violence and applying it in personal and societal contexts. **4.4 Upholding Righteousness (Dharma):** Exploring the concept of righteousness and practising it through ethical conduct and moral values. **4.5 Cultivating Peace (Shanti):** Reflecting on the	Proposed Learning Approaches for: i) Lecture Delivery ii) Demonstrations iii) Case Studies iv)Role-playing exercises v)Observational Learning vi)Portfolio Development vii) Simulations viii) Inspirational Talks from Industry Professionals ix) On-site Visits to sites or Industries	**CO3**

	generosity. **TL03.8:** Exhibit behaviours that uphold gender equality and respect for diversity to create an inclusive	essence of peace and cultivating inner tranquillity while promoting harmony in relationships and communities. **4.6 Embracing Service (Seva):** Understanding the value of selfless service and actively engaging in acts of kindness and support for others. **4.7 Embracing Renunciation (Sacrifice) Tyaga**: Understanding the concept of renunciation and willingly **letting go of self-interest for the greater good. and attitudes.** **4.8 Promoting Gender Equality and Sensitivity:** Recognizing the importance of gender equality and fostering an environment of inclusivity and respect for all genders through actions and attitudes.		
UNIT - IV VALUE EDUCATION (UNNATI FOUNDATION) (CL Hrs-03, Marks- NIL)				
4	**TLO4.1:** Display comprehension of one's own identity, values, and beliefs. **TLO4.2**: Recognize and express personal strengths and weaknesses effectively. **TLO4.3:**Demonstrate adeptness in active listening by providing feedback and demonstrating empathy. **TLO4.4:**Acquire strategies for handling conflicts constructively and respectfully. **TLO4.5:** Assess and reflect on moral values and principles that influence personal actions and choices. **TLO4.6:** Analyze and assess the moral values and principles guiding individual actions and decisions.	**4.1. Self-awareness and Personal Development** Self-understanding, Identification of strengths and weaknesses, Setting goals and devising plans, Building self-esteem and confidence **4.2.Interpersonal Skills and Effective Communication** Engaging in active listening, Resolving conflicts, Cultivating healthy relationships **4.3. Ethics and Morality** Grasping ethical concepts, Upholding moral values and principles, Making ethical decisions, Demonstrating integrity and honesty **4.4. Social Values and Responsibility** Being punctual and initiating conversation, Managing emotions effectively, Introducing oneself and others, Maintaining a positive attitude Valuing family bonds, Creating	i)Video Demonstrations ii)Flipped Learning Environment iii) Case Studies iv)Role-playing Activities v)Group-based Learning vi)Team-based Learning vii)Utilization of Chalkboard	**CO4**

		favourable impressions, Communicating effectively, Emphasizing cleanliness, hygiene, and organization. Expressing preferences, Fostering confidence Enhancing listening skills, Demonstrating appropriate greetings, Promoting gender equality and sensitivity, Exercising responsibility, Integrating visual and verbal learning, Establishing and pursuing goals, Observing social media etiquette, Efficiently managing time and daily routines		
UNIT - V FINANCIAL LITERACY(CL Hrs-03, Marks- NIL)				
5	**TLO5.1:**Comprehending Savings and Investment Practices. **TLO5.2:**Cultivating Proficiency in Financial Planning. **TLO 5.3:**Developing Competence in Transaction Handling. **TLO5.4:**Achieving Proficiency in Income, Spending, and Budget Management. **TLO 5.5:**Attaining Understanding of Inflation Concepts. **TLO 5.6:** Fostering Competence in Loan Administration. **TLO5.7:** Acknowledging the Significance of Insurance.	**5.1. Fundamentals of Finances:** Grasping concepts of income, expenses, and savings, Employing budgeting techniques, Understanding assets and liabilities, and Recognizing the significance of emergency funds. **5.2. Banking Essentials** Initiating and managing bank accounts, Familiarizing oneself with various account types (savings, checking, etc.), Comprehending interest rates, and Safely utilizing ATMs. **5.3. Management of Credit and Debt** Interpreting credit scores and reports, Identifying different credit types (credit cards, loans, etc.), Responsible debt management, and Preventing involvement in predatory lending. **5.4. Foundations of Investment** Understanding investment types (stocks, bonds, mutual funds, etc.), Assessing risk and return, Implementing diversification strategies, and Formulating investment approaches. **5.5. Financial Planning and Goal Establishment** Establishing financial objectives, Crafting a personalized financial blueprint, Continuously monitoring and adjusting financial goals, and	i) Video Demonstrations ii) Presentations iii) Case Studies iv) Chalkboard Utilization v) Collaborative Learning	**CO5**

		Engaging in long-term financial strategizing. **5.6. Consumer Rights and Duties** Familiarizing oneself with consumer entitlements, Safeguarding against financial scams and fraudulent activities Exercising responsible borrowing and spending practices, Upholding financial privacy and security measures. **5.7. Essentials of Insurance** Exploring different insurance categories (health, life, auto, home, etc.), Understanding insurance policy specifics, Recognizing the importance of insurance coverage, and Navigating the insurance claims process. **5.8. Economic Literacy** Grasping fundamental economic principles, Understanding the concepts of inflation and deflation, Analyzing market trends, and Interpreting economic indicators.		

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	**LLOI.1.1:** Communicating and interacting with residents or children with compassion and empathy, demonstrating an understanding of their needs and emotions.	1.1 Encouraging empathy and kindness through volunteer work at: i) a nearby nursing home ii)a care centre for children from disadvantaged families or similar types of facilities.	2	CO3
2	**LLO 2.1** Enhance goal-setting abilities by engaging in collaborative planning, analyzing obstacles, and reflecting on personal aspirations to align them with broader academic or career goals.	2.1 Pathway to Success: Goal-Setting Exercise	2	CO4
3	**LLO3.1:** Develop effective communication skills by demonstrating compassion, empathy, and understanding towards residents or children, while acknowledging and addressing their needs and emotions.	3.1 Exploring Your Inner World: Self-Reflection Activity	2	CO4

4	**LLO4.1:** Laboratory Learning Outcome: Cultivate structured self-reflection skills to assess personal strengths and weaknesses.	4.1 Strengths and Weaknesses Identification and Analysis Exercise	2	CO4
5	**LLO 5.1:** Display proficiency in time management through the creation and adherence to structured timelines for task coordination.	5.1 Time Management Simulation for Coordinating Industrial Visits	2	CO4
6	**LLO 6.1**: Demonstrate competency in social media etiquette through engaging in activities and adhering to established norms and guidelines.	6.1 Activity on Social Media Etiquette	2	CO4
7	**LLO 7.1:** Develop skills in mapping and analyzing family income and expenses through structured exercises.	7.1. Exercise on Mapping and Analyzing Family Income and Expenses	2	CO5
8	**LLO 8.1**: Apply their knowledge of interest rate calculation to real-world financial situations, improving decision-making skills.	8.1 Exploring Simple and Compound Interest: A Hands-On Exercise on Interest Rate Calculation and Its Impact on Savings and Loans.	2	CO5
9	**LLO9.1:** Enhance comprehension of interest rates and their impact on financial dealings, encompassing savings accounts, Fixed Deposits (FDs), and loans.	9.1 Interest Rate Comparison Exercise: Analyzing Rates for Savings, Fixed Deposits, and Loans.	2	CO5
10	**LLO10.1:** Mastering and implementing safety protocols for ensuring secure ATM transactions.	10.1 Safety Precautions for ATM Usage: Exploring Tips for Secure Transactions	2	CO5

Note: Out of the above suggestive LLOs –

1. A judicial mix of LLOs is to be performed to achieve the desired outcomes

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

SELF-LEARNING - MICRO PROJECT/ASSIGNMENT/ACTIVITIES (ANYONE)

The following list provides examples of activities that can be pursued under the program. Each group has the flexibility to choose from these options or undertake any other activity deemed suitable based on local requirements. The group focuses on the holistic development of the selected area, whether it is a village or a slum.

a) Community clean-up drives

Group tasks for community clean-up drives are,

1. Site Survey and Planning: Identify areas needing attention and plan tasks.
2. Logistics Management: Coordinate supply distribution to volunteers.

3. Volunteer Coordination: Welcome, register, and assign tasks to volunteers.
4. Trash Collection and Segregation: Collect and sort waste into categories.
5. Street Sweeping and Cleaning: Sweep and clean streets, sidewalks, and public areas.
6. Beautification and Landscaping: Enhance aesthetics by planting and trimming.
7. Safety and First Aid: Ensure volunteer safety and manage emergencies.
8. Documentation and Reporting: Capture progress through photos and reports.
9. Community Engagement: Educate and raise awareness among residents.
10. Post-Clean-up Evaluation: Review success and plan future initiatives.

b) Tree plantation initiatives

Group tasks for Tree plantation initiatives,

1. Community Awareness: Workshops to educate on tree benefits.
2. Community Participation: Engage locals in all planting
3. Team Building: Group activities to strengthen community bonds.
4. Leadership Development: Empower individuals to lead initiatives.
5. Communication Workshops: Enhance effective messaging.
6. Problem-solving Discussions: Address planting challenges.
7. Environmental Responsibility: Foster care for green spaces.
8. Cultural Integration: Incorporate local traditions into initiatives.
9. Sustainability Education: Teach sustainable planting practices.
10. Monitoring and Evaluation: Assess impact and plan improvements.

c) Environmental conservation awareness

Group tasks for Environmental conservation awareness

1. Educational Workshops: Teach about conservation methods.
2. Art Competitions: Promote environmental themes through art.
3. Street Plays: Perform interactive skits in public spaces.
4. Awareness Walks: Organize marches with environmental messages.
5. Tree Plantation: Plant trees to enhance green spaces.
6. Clean-up Campaigns: Remove litter from local areas.
7. Guest Lectures: Invite experts to discuss environmental issues.
8. Film Screenings: Show documentaries on conservation topics.
9. Social Media Campaigns: Spread awareness through online platforms.
10. Community Workshops: Educate on waste management and sustainability.

d) Health and sanitation programs

1. Health Education Sessions: Conduct informative sessions on hygiene, disease prevention, and nutrition.
2. Sanitation Infrastructure Evaluation: Assess the effectiveness of existing sanitation facilities and propose improvements.
3. Community Clean-up Events: Organize collective efforts to clean and maintain public spaces for better health outcomes.
4. Distribution of Hygiene Kits: Provide essential hygiene items such as soap, toothpaste, and sanitary products to community members.
5. Vaccination Drives: Coordinate vaccination campaigns to protect against prevalent diseases and promote community health.

6. Water Quality Testing: Conduct regular testing of water sources to ensure safe drinking water for residents.
8. Personal Hygiene Workshops: Offer workshops focusing on personal grooming, handwashing techniques, and menstrual hygiene.
9. First Aid Training: Provide basic first aid training to community members to equip them with life-saving skills.
10. Community Health Surveys: Conduct surveys to assess health needs and gather feedback for future program planning.

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr. No.	Equipment Name with Broad Specifications	Relevant LLO Number
1	Basic engineering measurement instruments, GPS data collection devices, and open-sour GIS software like Google Earth and QGIS, along with the Microsoft Office suite.	ALL

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)
Formative assessment (Assessment for Learning) Report and presentation of fieldwork activities, Self- Learning (Assignment)	--

X. SUGGESTED COS- POS MATRIX FORM

NOT APPLICABLE

XI. SUGGESTED LEARNING MATERIALS/BOOKS

Sr.No	Author	Title	Publisher
1	Mark Stafford Smith and Pamela Matson	Sustainable Development: Principles, Frameworks, and Case Studies	Oxford University Press, ISBN: 9780199588952
2	Katar Singh	Rural Development: Principles, Policies and Management	SAGE Publications Pvt. Ltd, ISBN:978-9351502867.
3	Anand Kumar, Asim Kumar Mandal, and R. Venkata Rao	Maharashtra: Governance and Development"	Routledge India, ISBN: 978-0367709133
4	Dalai Lama and Howard C. Cutler	The Art of Happiness	Riverhead Books, and the ISBN: 978-1594488894.
5	Stephen R. Covey	The 7 Habits of Highly Effective People	Simon & Schuster, ISBN : 978-1982137274.

6	Local college students, UMA staff	Sample Case Studies on the UMA website	IITB-UMA team

XI. LEARNING WEBSITES & PORTALS

Sr.No.	Link/Portal	Description
1	https://www.ugc.gov.in/pdfnews/4371304_LifeSKill_JeevanKaushal_2023.pdf	UHV: UGC Course on life skills. Unit 4 i.e. Course 4 is to be referred
2	https://nss.gov.in/	The National Service Scheme (NSS) website provides information about the NSS program in India. It includes details about the objectives, history, and structure of NSS. Additionally, the website offers resources for NSS volunteers and coordinators, such as program guidelines, training materials, and reports.
3	https://gr.maharashtra.gov.in/Site/Upload/Government%20Resolutions/English/201601131501523808.pdf	Government Resolution of Government of Maharashtra regarding Unnat Maharashtra Abhiyan
4	https://gr.maharashtra.gov.in/Site/Upload/Government%20Resolutions/English/201606151454073708.pdf	Government Resolution of Government of Maharashtra regarding Unnat Maharashtra Abhiyan Guidelines
5	https://www.humanvaluesfoundation.com/.	The Human Values Foundation website offers educators resources for teaching human values and social-emotional learning to children and youth. It provides curriculum-based programs, lesson plans, and activities to foster character development, resilience, and positive behaviour. Additionally, the website shares insights into the foundation's mission, values, and the global impact of its programs in schools.

Name & Signature:

Mr. S.B.Kulkarni
Lecturer in Mechanical Engineering
(Course Experts)

Name & Signature:	Name & Signature:
Dr.D.N.Rewadkar (Programme Head)	**Shri. S.B. Kulkarni** (CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMA IN INFORMATION TECHNOLOGY
PROGRAMME CODE	07
COURSE TITLE	DATA COMMUNICATION AND NETWORKING
COURSE CODE	IT31203
PREREQUISITE COURSE CODE & TITLE	NA
CLASS DECLARATION	NA

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme										
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
IT31203	DATA COMMUNICATION AND NETWORKING	DSC	3	--	4	1	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

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 course.
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:

Data communication is the transmission of digital data through a network or to a device external to the sending device. It is the basis of modern Computer networks, which is growing with rapid technological progress. Computer communication through networking becomes essential part of our life. The Information technology diploma pass outs are required to handle the data communication related problems. By considering importance of concepts and techniques related to data communication and networking enable students to have an insight in to technology involved to make the network

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 Set up a small network using various transmission media.
- CO2 Describe various Analog and Digital signal transmissions.
- CO3 Identify various Multiplexing and Switching techniques in digital communication.
- CO4 Describe error detection and correction techniques.

CO5 Describe various internetworking devices and TCP/IP protocol suits.
CO6 Describe various IEEE wireless standards

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
		SECTION I		
		UNIT 1. INTRODUCTION TO DATA COMMUNICATION AND NETWORKING (CL Hrs- 06, Marks-10)		
1	**TLO1.1** Describe the data communication process and its components. **TLO1.2** Enlist various categories of networks. **TLO1.3** Describe different modes of data transmission **TLO1.4** Describe various Network Models	**1.1** Data communication process and its components: Transmitter, Receiver, Medium, Message, Protocol. **1.2** Data Representation: Text, Image, Numbers, Video. **1.3** Categories of Networks. LAN, MAN, WAN. **1.4** Communication Media: Guided Transmission Media, Twisted-Pair Cable, Coaxial Cable, Fiber-Optic Cable. **1.5** Unguided Transmission Media: Radio Waves, Microwaves, Infrared, Satellite. **1.6** Line-of-Sight Transmission, Point to Point, Broadcast. **1.7** Modes of Communication: Simplex, Half duplex, Full Duplex. **1.8** Protocols and Standards	Hands-on Demonstration Presentations	**CO1**
		UNIT 2: SIGNAL TRANSMISSION & CONVERSION (CL Hrs- 08, Marks-12)		
2	**TLO2.1** Explain Various Transmission Impairments **TLO2.2** Describe various coding schemes **TLO2.3** State various network performance criteria **TLO2.4**Compare ASK, FSK, PSK	2.1 Analog and Digital Data: Analog Signal and Digital Signal, Periodic and non-periodic signals. 2.2 Analog Signals: Sine Wave, Phase, Wavelength, Time and Frequency domain, Composite Signals, Bandwidth. 2.3 Digital Signals: Bit Rate, Bit Length, 2.4 Transmission Impairment: Attenuation, Distortion, Noise. 2.4 Performance: Bandwidth, Throughput, Latency.	Hands-on Demonstration Presentations	**CO2**
		UNIT 3: MULTIPLEXING & SWITCHING (CL Hrs- 08, Marks-14)		
3	**TLO3.1** Describe types of Multiplexing **TLO3.2** Describe Spread Spectrum Technique **TLO3.3** Compare various Switching techniques	3.1 THE OSI MODEL: Layered Architecture, Layers in OSI Model. 3.2 Multiplexing: Introduction, Categories of Multiplexing: Frequency- Division Multiplexing, Wavelength-Division Multiplexing, Synchronous Time-Division Multiplexing, Statistical Time-Division Multiplexing. 3.3 Spread Spectrum: Frequency Hopping Spread Spectrum (FHSS), Direct Sequence Spread Spectrum (DSSS). 3.4 Switching: Circuit-switched networks, Datagram networks, Virtual-circuit networks.	Hands-on Demonstration Presentations	**CO3**

		SECTION II		
		UNIT 4:ERROR DETECTION, CORRECTION AND OSI MODEL(CL Hrs- 08, Marks-12)		
4	TLO 4.1 Identify the major functions of the OSI Reference Model. TLO4.2 Describe Error detection and correction methods with examples. TLO4.3 Describe the process of fixed and variable types of Framing. TLO4. Identify characteristics of the flow control technique	4.1 Types of Errors, Forward Error Correction Versus Retransmission. 4.2 Error Detection: Repetition codes,Parity bits, Checksums, CRC. 4.3 Error Correction: Automatic repeat request (ARQ), Error-correcting code. 4.4 Framing: Fixed-Size Framing, Variable-Size Framing. 4.5 Flow and error control techniques: stop and wait, sliding window, Go-back-n ARQ, Selective Reject ARQ.	Hands-on Demonstration Presentations	
		UNIT 5: NETWORKING PROTOCOL AND INTERNETWORKING BASICS (CL Hrs- 09, Marks-12)		
5	**TLO 5.1** Describe the TCP/IP protocol suite. **TLO 5.2** Describe IPV4 and IPV6 packet format. **TLO 5.3** List and explain classes of IP address. **TLO 5.4** Identify problems in internetworking. **TLO 5.5** Describe given networking devices.	5.1 TCP/IP PROTOCOL SUITE, IPv4, IPv6. Addressing: physical addresses, logical addresses, port addresses, and specific Addresses. 5.1 IPv4 Addresses: Addresses, Notations, Classless, Classful, NAT. 5.2 IPv6 Addresses: Structure, Address Space. 5.3 Internetworking, Problems in Internetworking, internetworking Devices, Repeaters, Bridges, Routers, Gateways.	Hands-on Demonstration Presentations	**CO5**
		UNIT 6: WIRELESS COMMUNICATION (CL Hrs- 06, Marks-10)		
6.	**TLO 6.1** Illustrate the given IEEE standard of communication. **TLO 6.2** Identify the Characteristics of a given layer in IEEE 802.11 Architecture **TLO 6.3** Identify the Characteristics of a given layer in Bluetooth architecture **TLO 6.4** Compare Functional/Operating Parameters and Different Generations of Mobile Telephone Systems.	6.1 IEEE Standards. 6.2 Wireless LANs: 802.11 Architecture, MAC Sublayer, Addressing Mechanism. 6.3 Bluetooth Architecture, Bluetooth Layers, Radio Layer. 6.4 The Mobile Telephone System, First-Generation: Analog Voice, Second-Generation: Digital Voice, Third-Generation: Digital Voice and Data. 6.5 4G & VoLTE: Introduction to 4G and VoLTE, Features of 4G and VoLTE, Introduction to 5G technology.	Hands-on Demonstration Presentations	**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 1.1:** Identify the type and use of transmission media. LLO 1.2:List characteristics of guided and unguided media.	Demonstrate various transmission media.	04	CO1
2	**LLO 2.1:** Design a network for a small organization with components to be used.	Observe components of the network in your network laboratory and state their specifications like transmission media and network control devices	04	CO1
3	**LLO 3.1**: Identify the physical topology and cabling (coaxial, OFC, UTP, STP) of a network.	Recognize the physical topology and cabling of a network.	04	CO1
4	**LLO 4.1:** Identify and use of various types of connectors RJ-45, RJ-11, BNC, and SCST.	Recognition and use of various types of connectors .	04	
5	**LLO 5.1**: Observeserial communication between two devices.	Demonstrate RS232 standard.	04	CO2
6	**LLO 6.1:** Set up a LAN cable with RJ 45 crimped on both ends.	Prepare and Test Straight and Cross UTP Cable.	04	CO2
7	**LLO 7.1:** Crate layout of a network depending on building structure and given topology.	Designing the layout of a Network for small organizations. 1. Deciding upon the type of network, Floor designing/ building designing 2. Deciding upon the number/ length of components	04	CO3
8	**LLO 8.1**: Install and configure the Telnet client-server environment.	Configure and use Telnet Client-server.	04	CO4
9	**LLO 9.1:** Execute TCP/IPcommands and observe the output.	Run the following TCP/IP commands with options and record their output: Arp, rarp, ipconfig, ping, tracert.	04	CO4
10	**LLO 10.1:** Locate the network interface card attached to the CPU and list the properties.	Install and Configure the Network Interface Card and identify its MAC address	04	CO5
11	**LLO 11.1:** Connect two machines inthe same network and transfer files and other resources.	Share Files/Folders and Printers in the network and access the resources from other nodes.	04	CO5
12	**LLO 12.1:** Install and configure theFTP client-server environment.	Set up FTP client-server and transfer the file using FTP.	04	CO6
13	**LLO 131:** Use Packet sniffer software to capture FTP packet details.	Use Wireshark Packet Sniffer Software and capture TCP, IP, UDP, ARP, ICMP, Telnet, and FTP packets.	04	CO5

14	**LLO 14.1:** Create and configure Subnet.	Create two subnets and implement them with calculated subnet masking.	04	CO5
15	**LLO 15.1:** Configuring DHCP and DNS server.	Configuring Dynamic Host configuration protocol and Domain Name system server.	04	CO6

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

Self-Learning

1. Design and set up a network using star /ring/bus topologies.
2. Case studies on topics given by respective faculty teaching the course.
3. Install and Configure Network Interface Card, connect 2 or 3 machines in the network using a workgroup. Then share files among these computers.
4. Configure telnet and execute all commands with options and in different operating modes.
5. Prepare an animation clip of at least 10 minutes on Transmission Media/Signal Transmission/Multiplexing/Switching/Error detection and Correction/Packet flow in the TCP/IP protocol suite. (And many other Topics given by respective faculty teaching the course.
6. Prepare charts, comparison tables or models on the topics given by the respective faculty teaching the course.

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	Desktop PC with Windows 7 or higher version, LAN Tester, Cat6 cables, NIC Card, Crimping tool	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 DATA COMMUNICATION AND NETWORKING	CO1	06	05	05	--	10
2	II	SIGNAL TRANSMISSION & CONVERSION	CO2	08	04	04	04	12
3	III	MULTIPLEXING & SWITCHING	CO3	08	06	04	04	14
4	IV	ERROR DETECTION, CORRECTION AND OSI MODEL	CO4	08	02	04	06	12
5	V	NETWORKING PROTOCOL AND INTERNETWORKING BASICS	CO5	09	04	04	04	12
6	VI	WIRELESS COMMUNICATION	CO6	06	05	05	--	10
		Grand Total		45	26	26	18	70

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	PSO-3
CO1	1	2	1	1	1	--	3	2	--	1
CO2	2	1	1	1	--	1	3	1	--	1
CO3	1	--	--	--	--	1	2	1	1	1
CO4	1	1	--	--	--	1	2	1	--	1
CO5	1	--	--	1	--	2	2	1	--	1
CO6	1	--	2	1	1	1	3	-	--	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	Behroz A. Forouzan	Data Communication and Networking	McGraw Hill; Standard Edition (3 August 2022) ISBN : 9355320949
2	Andrew Tanenbaum	Computer Network	Pearson Education; Sixth edition (1 April 2022) ISBN : 935606360
3	William Stallings	Data and Computer Communications	Pearson Prentice Hall Pearson Education,Inc ISBN: 0132433109
4	William Stallings	Wireless Communications and Networking	Prentice Hall, 2002 ISBN: 0130408646
5	William D. Stanley	Digital Signal Processing	Reston Publishing Company, ISBN: 879091991

XII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	www.nptelvideos.in/2012/11/data-communication.html	Introduction to data Communication, Components, Types of network,Topologies
2	http://www.tutorial-reports.com/wireless/wlanwifi/wifi_architecture.php	Wireless LAN 802.11, Architecture, Types
3	www.tutorialspoint.com/data_communication_computer_network	Line and block codes, Multiplexing and Demultiplexing

Name & Signature:

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Lecturer in Information Technology

Mrs.S. P. Dudhe
Lecturer in Information Technology

(Course Experts)

Name & Signature:

Dr.D.N.Rewadkar
(Programme Head)

Name & Signature:

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

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	**DIPLOMA IN INFORMATION TECHNOLOGY**
PROGRAMME CODE	**07**
COURSE TITLE	**SOFTWARE ENGINEERING AND TESTING**
COURSE CODE	**IT41201**
PREREQUISITE COURSE CODE & TITLE	**NA**
CLASS DECLARATION	**NO**

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme										
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration in Hrs.	Theory				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
IT41201	SOFTWARE ENGINEERING AND TESTING	DSC	3	1	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.

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 course.
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:

The main objective of this course is to introduce the students to software engineering- the fundamentals of software engineering principles and practices, including project management, configurations management, requirements definition, system analysis, design, testing, and deployment.

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 relevant software process model for software development.

CO2: Prepare appropriate Software Requirement Specifications.

CO3: Use Software modeling to create data designs with effective use of UML tools..

CO4: Estimate the size and cost of the Software Project.

CO5: Identify and handle risk management and software configuration management

CO6: Apply different software testing types to ensure the quality of software product.

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
	UNIT-I INTRODUCTION TO SOFTWARE ENGINEERING (CL Hrs-8, Marks-10)			
1.	**TLO 1.1:** Define Software. **TLO 1.2:** Explain the process framework. **TLO 1.3:** Describe the prescriptive process models. **TLO 1.4:** Suggest the relevant activities in the Agile Development process in the given situation with justification.	**1.1:** Introduction to software engineering, The Nature of Software, Defining Software, Software Engineering Practice. **1.2** Software Process: A Generic Process Model, defining a Framework Activity, Identifying a Task Set, Process Patterns, Process Assessment and Improvement. **1.3** Prescriptive Process Models, The Waterfall Model, Incremental Process Models, Evolutionary Process Models, Concurrent Models **1.4** Agile Process Model: Extreme Programming, Adaptive Software Development (ASD), Scrum, dynamic System development method (DSDM), CRYSTAL.	Hands-on Demonstration Presentations.	**CO1**
	UNIT-II SOFTWARE REQUIREMENTS ENGINEERING AND ANALYSIS (CL Hrs-8 Marks-12)			
2	**TLO 2.1:** Apply the principles of Software engineering to the given situation problem. **TLO 2.2:** Choose the relevant requirement engineering steps in the given problem. **TLO 2.3:** Represent the requirement engineering model in the given problem **TLO 2.4:** Prepare SRS for the given problem	**2.1** Software Engineering practices and importance. **2.2** Communication Practices, Planning Practices, Modelling practices construction practices, and software deployment (statement and meaning of each principle for each practice). **2.3** Requirement Engineering: Requirement Gathering and Analysis, types of requirements(functional, products, organizational, external requirements), Eliciting Requirements, Building requirements negotiation, Validation. **2.4** Software Requirement Specification: Need of SRS, format, and its characteristics.	Hands-on Demonstration Presentations	**CO2**
	UNIT-III DESIGN ENGINEERING (CL Hrs-8, Marks-12)			
3	**TLO 3.1:** Explain software quality guidelines and attributes. **TLO 3.2** Describe the design concepts. **TLO 3.3:** Explain different design elements. **TLO 3.4:** Understand software architecture.	**3.1:** Design within the Context of Software Engineering, The Design Process, Software Quality Guidelines and Attributes. **3.2** Design Concepts-Abstraction, Architecture, Design Patterns, Modularity, Information Hiding, Functional Independence, Refinement, Aspects, **3.3** Design Classes, The Design Model, Data Design Elements, Architectural Design Elements, Interface Design Elements, Component-Level Design Elements, Component Level Design for Web Apps, Content Design at the Component	Hands-on Demonstration Presentations	**CO3**

		Level, Functional Design at the Component Level, Deployment-Level Design Elements 3.4 Architectural Design: Software Architecture, What is Architecture, Why is Architecture Important, Architectural Styles, A Brief Taxonomy of Architectural Styles.		
UNIT-IV PROJECT MANAGEMENT AND ESTIMATION (CL Hrs-7, Marks-12)				
4	**TLO 4.1:** Explain 4P's in Management Spectrum **TLO 4.2:** Estimate the size of the software product using the given method **TLO 4.3:** Estimate the cost of the software product using the given method. **TLO 4.4:** Evaluate the size of the given software using the COCOMO model. **TLO 4.5:** Apply the RMMM strategy to identified risks for the given software development problem.	4.1The management spectrum-4p's 4.2Metrics for size Estimation: Line of Code (LoC), Function Points (FP). 4.3 Project Cost Estimation Approaches using COCOMO (Constructive Cost Model), COCOMO II. 4.4 Overview of Heuristic, Analytical and Empirical Estimation. 4.5 Define risk, types of risk, RMMM strategy.	Hands-on Demonstration Presentations	CO4
UNIT –V PROJECT SCHEDULING & QUALITY ASSURANCE(CL Hrs-8, Marks-14)				
5	**TLO 5.1.** Use the given scheduling technique for the identified project. **TLO 5.2** Draw the activity network for the given task. **TLO 5.3** Prepare the timeline chart/Gantt chart to track the progress of the given project. **TLO 5.4** Describe the given software Quality Assurance (SQA) activity **TLO 5.5** Describe the feature of the given software quality evaluation standard **TLO 5.6** Explain Software Configuration Management	5.1 Project scheduling: Basic Principles Work breakdown structure, activity network and Critical Path Method 'scheduling techniques (CPM, PERT). 5.2 Project tracking: Timeline charts, Gantt charts 5.3 Quality Assurance: Quality concepts, Phases of SQA: Planning, activities, audit, reviews. 5.4 Defect amplification and removal: Formal technical reviews, the review meeting, Review reporting and record keeping. 5.5 Quality Evaluation standards: Six Sigma, ISO for software, CMMI: Levels, Process areas. 5.6 Software Configuration Management: Software Configuration Management, The SCM Repository ,The SCM Process, Configuration Management for any suitable software system.	Hands-on Demonstration Presentations	CO5

UNIT –VI BASICS OF SOFTWARE TESTING(CL Hrs-6, Marks-10)				
6	**TLO 6.1** State the importance of software testing. **TLO 6.2** Identify errors and bugs in the program. **TLO 6.3** Prepare test case for the application. **TLO 6.4** Identify the entry and exit criteria for the given test application. **TLO 6.5** Describe features of the given testing method. **TLO 6.6** Apply specified testing levels for the given application	**6.1** Software testing, objective of testing, software testing life cycle (STLC) **6.2** Failure, fault, error, defect, bug terminology **6.3** Test case, when to start and stop testing **6.4** Static and dynamic testing **6.5** The box approaches: Compare white box testing, black box testing **6.6** Levels of testing: Unit testing, integration testing, system testing, acceptance testing	Hands-on Demonstration Presentations	**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 1.1:** Write the problem statement for the selected project.	Write problem statements to define the project title with a bounded scope of the project	2	CO1
2	**LLO 2.1:** Study SRS format.	Write SRS for the selected project statement.	2	CO2
3	**LLO 3.1:** Draw the ER Diagram	Develop data design using DFD, Decision Table & ER (Entity Relationship) Diagram.	4	CO3
4	**LLO 4.1:** Understand the design of Biometric Authentication software	Study design of Biometric Authentication software	4	CO3
5	**LLO 5.1:** Prepare RMMM plan	Identify the risk involved in the project and prepare RMMM plan.	4	CO4
6	**LLO 6.1:** Understand Risk Management in food delivery software.	Study Risk management in Food delivery software	2	CO4
7	**LLO 7.1:** Implement a CPM/PERT chart for a given problem.	Use CPM/PERT for scheduling the assigned project.	4	CO5
8	**LLO 8.1:** Implement a Timeline/Gantt chart for a given problem.	Use a Timeline chart or Gantt chart to track the progress of the project.	2	CO5
9	**LLO 9.1:** Prepare SQA plan.	Prepare SQA plan that facilitates various attributes of quality for process & product.	2	CO5

10	**LLO 10.1:** Design test cases for Web Page Testing for any Web Site.	Prepare test case for any Web Application	4	CO6
11	**LLO 11.1:** Execute test cases for any e-commerce application login form using an Automation Tool.	Prepare test case for any Automation Tool	2	CO6

Note: Out of the above suggestive LLOs –

1.'*' Marked Practicals (LLOs) Are mandatory.

2.A judicial mix of LLOs is to be performed to achieve the desired outcomes

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

MICRO PROJECT

1. Design a system for students to enroll in courses, demonstrating use-case diagrams and design patterns
2. Create a design blueprint for managing orders, payments, and inventory using UML diagrams.
3. Visit any restaurant, collect requirements from manager and prepare SRS document.
4. Visit your Institute library, Collect the functional requirements for a Library Management System and estimate cost and size of the project
5. Visit any medical shop, gather information about purchasing and selling medicines, maintaining their inventory, generating sales invoices and generating reminders of expiry date about medicines. Write the Functional and non-functional requirements for the medical shop management system.

ASSIGNMENT

Prepare a journal of practicals performed in the laboratory.

OTHER : Any course related to SOFTWARE ENGINEERING AND TESTING from Infosys Spring Board.

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Hardware: Personal Computer (i3-i5 preferable), RAM minimum 2 GB.	ALL
2	Operating System: Windows 7/Windows 8/Windows10/Linux or any other.	ALL
3	**Suggested Free Open Source tools:** a) StarUML, Modelio, SmartDraw. b) Gantt Project, Agantty, Project Libre. c) CF Engine Configuration Tool, Puppet Configuration Tool. d) Software Tools : Selenium or any other automation testing tool.	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 SOFTWARE ENGINEERING	CO1	8	2	4	4	10
2	II	SOFTWARE REQUIREMENTS ENGINEERING AND ANALYSIS	CO2	8	2	4	6	12
3	III	DESIGN ENGINEERING	CO3	8	2	4	6	12
4	IV	PROJECT MANAGEMENT & ESTIMATION	CO4	7	2	4	6	12
5	V	PROJECT SCHEDULING & QUALITY ASSURANCE	CO5	8	4	4	6	14
6	VI	BASICS OF SOFTWARE TESTING	CO6	6	2	4	4	10
			Grand Total	45	14	24	32	70

IX. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
Lab performance, Assignment 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	PSO-3
CO1	2	2	2	--	1	3	3	--	2	3
CO2	3	3	3	3	2	3	3	2	1	3
CO3	3	3	3	3	2	3	3	-	3	3
CO4	2	3	3	2	2	3	3	1	2	3
CO5	2	2	2	--	--	1	2	--	3	3
CO6	2	3	3	3	2	3	3	1	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.	Pressman, Roger S.	Software Engineering: A practitioners approach	McGraw Hill Higher Education, New Delhi,(Seventh Edition) ISBN 978-0-07-337597-7
2	Ian Sommerville	Software Engineering	Addison and Wesley, ISBN 0-13-703515-2
3	Naresh Chauhan	Software Testing: Principles and Practices	Oxford University Press Noida. ISBN: 9780198061847
4	Ron Patton	Software Testing	Sams Publishing; 2nd edition, 2005 ISBN: 0672327988
5	M. G. Limaye	Software Testing: Principles, Techniques and Tools	Tata McGraw Hill Education, New Delhi., 2009 ISBN 13: 9780070139909

XII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://nptel.ac.in/courses/106105087	All Practicals
2	www.tutorialspoint.com//software_engineering/	Software Engineering Tutorial
3	https://www.geeksforgeeks.org/software-testing-basics/	Software Testing Tutorial
4	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013842970114113536282 69_shared/overview	Software engineering and testing courses

Name & Signature:

Smt.P.C.Fafat
Lecturer in Information Technology

Mr.Y.U Bodhe
Lecturer in Information Technology

(Course Experts)

Name & Signature:	Name & Signature:
Dr.D.N.Rewadkar (Programme Head)	**Shri. S.B. Kulkarni** (CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMA IN INFORMATION TECHNOLOGY
PROGRAMME CODE	07
COURSE TITLE	DATABASE ADMINISTRATION
COURSE CODE	IT51201
PREREQUISITE COURSE CODE & TITLE	NA
CLASS DECLARATION	YES

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme											
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
IT51201	DATABASE ADMINISTRATION	DSE	3	0	2	1	6	3	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.

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:

The subject aims to teach students the fundamentals of Database Architecture, Database Creation and Administration, as well as techniques for Database Backup, Recovery and Security. It equips them with the skills necessary to create, manage, design, monitor, execute, and maintain any database system. This course provides essential knowledge for ensuring that database systems remain current and properly maintained.

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 Explain database architecture and its management.
CO2 Design and administer databases effectively.
CO3 Configure and maintain control files and redo log files
CO4 Perform database backup and recovery using the RMAN tool.
CO5 Manage tables, indexes and constraints.
CO6 Create and manage database users.

IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No.	Theory Learning Outcomes(TLO's) aligned to CO's.	Learning content mappedwith TLO's	Suggested Learning Pedagogies	Relevant Cos
	UNIT 1 – Basic of DBA (CL Hrs-06, Marks-12)			
1	**TLO 1.1** Define Responsibilities of DBA **TLO 1.2** Define the purpose of tablespaces and data files **TLO 1.3** Create and Manage Tablespaces. **TLO 1.4** Describe Physical, Logical and memory structure of Oracle database. **TLO 1.5** Plan an Oracle installation	1.1 Responsibility of DBA, Oracle Architectural Components-Overview of Primary Components, Oracle server, Oracle instance, Establishing Connection and creating a session, Oracle Database. 1.2 Database Architecture: Physical Structure- Data File, Control File, Redo log File Memory structure: SGA,PGA, Shared Pool , Database Buffer cache, Redo log buffer, Large Pool , Process Structure –User Process, Background Process, Server Process, Database Writer, Log Writer, SMON , PMON,CKPT, ARCn, Logical Structure- Blocks ,Extents and Segments, Different Types of Segments, Tablespaces 1.3 Database Administrative Tools - Oracle Universal Installer, DBCA, SQL * plus,OEM 1.4 Managing Tablespaces : Types of Tablespaces , Creating , Altering and Dropping Tablespaces	Hands-on Demonstration Presentations	CO1

Unit 2:Oracle Instance and Database Management(CL Hrs. -08, Marks-12)				
2	**TLO 2.1 Create** a database with the Database Configuration Assistant (DBCA) tool. . **TLO 2.2** Create and Manage the database by writing command. **TLO 2.3** Start and stop the Oracle database and components. **TLO 2.3** Modify database initialization parameters.	2.1 Managing an Oracle Instance- Initialization Parameter Files, PFILE, SPFILE, Starting Up a Database. 2.2 Creating Database- Planning & Organizing database, OFA, Prerequisites necessary for Database creation, Creating Database using DBCA, Creating Database Manually 2.3 Managing database- Alter Database, Opening a Database Restricted Mode and Read Only mode, Shutting down Database using Various Modes	Hands-on Demonstration Presentations	CO2
Unit 3: Control and Redo Log File(CL Hrs-08, Marks-11)				
3	**TLO 3.1** Modify database initialization parameters. **TLO 3.2** Create and Manage Redo Log Files and Control Files. **TLO 3.3** Describe the main concepts and functionality of Automatic Storage Management (ASM) **TLO 3.4** Describe the mechanism of OMF data file	3.1 Control File- Control File Contents, Creating Control File, Multiplexing Control File, Obtaining Control File Information 3.2 Redo Log Files- Structure of Online Redo Log File, Working of Online Redo Log Files , Creating Initial online Redo Log files, Altering Redo Log Files-Adding Online Redo Log File Groups & Members, Dropping Online Redo Log File Groups & Members, Renaming & Clearing Online Redo Log Files 3.3 Oracle Managed Files (OMFs). The mechanism of OMF, OMF Data File 3.4 Automatic Storage Management ASM Architecture, Data Dictionary, Data Dictionary Contents, Usage of Data Dictionary	Hands-on Demonstration Presentations	CO3

Unit 4: Backup & Recovery (CL Hrs-07, Marks-11)				
	TLO 4.1 Identify the types of failure that may occur in Database. **TLO 4.2** Backup database without shutting it down. **TLO 4.3** Backup database using RMAN tool. **TLO 4.4** Recover Database using RMAN tool.	4.1 Database Backup: Factors impacting Backup and Recovery, Need of Database Backup, Different Types of Backup-Logical and physical Backups, Operating System Backup, Cold and Hot backup, Whole & Partial Database Backup,Flash Recovery Area-Benefits, Ways to create Flash Recovery Area, backing Up Flash recovery Area. 4.2 Database Recovery: Types of Database Failure, Different Recovery environment, The Oracle Recovery Process-Crash & Instance Recovery , Media Recovery 4.3 Performing Recovery with RMAN-Recovery Manager, Benefits of RMAN, RMAN Architecture, RMAN's Advantages for Recovery	Hands-on Demonstration Presentations	CO4
Unit 5: Managing Tables, Indexes and Constraints(CL Hrs-09, Marks-14)				
	TLO 5.1 Create and Manage tables. **TLO 5.2** Create and manage Indexes on given data. **TLO 5.3** Apply different constraints on table to maintain integrity.	5.1Managing Tables: Creating Table, Creating Table Guidelines, Create Table using OEM , Create Temporary table ,Altering Table- Changing Storage and Block utilization parameters, Manually Allocating Extents, Truncating & Dropping Table , Obtaining Table Information 5.2 Managing Index: Classification of Indexes, B-Tree Index, Bitmap index, Creating B-Tree Index & Bitmap Index ,Altering Index- Changing Storage Parameters , Allocating and Deallocating Index Space, Rebuilding Indexes, Checking Index validity, Dropping Index, Obtaining Index Information 5.3 Managing Constraints: Data Integrity, Different Types of Constraints, Primary key constraint, Foreign key constraint, unique constraint, Not Null constraint, Check constraint ,Defining Constraints while creating table, Altering Table ,Constraints- Enabling, Disabling & Renaming Constraints, Dropping Constraints, Obtaining constraint	Hands-on Demonstration Presentations	CO5

		Information		
Unit 6: Managing Users and Security (CL Hrs-07, Marks-10)				
	TLO 6.1 Create and Manage Users in Oracle database **TLO 6.2** Grant and revoke privileges **TLO 6.3** Create and Manage the User Roles **TLO 6.4** Create and manage profiles **TLO 6.5** Implement standard password security features on database.	6.1 Managing User : Creating Users, Altering Users, Dropping Users 6.2 System Privileges and Role: System privileges ,Granting System Privileges, Revoking System Privileges, Object Privileges, Granting Object Privileges, Revoking Object Privileges, Obtaining Privileges information, Roles: Benefits of Roles, Creating Roles, Predefined Roles, Modifying Roles, Assigning Roles , Revoking Roles From Users, Removing Roles, Obtaining Role information 6.3 Password Management: Enabling Password Management, Password Account Locking, Creating Profile, Altering Profile, Dropping Profile with password setting 6.4 Auditing: Auditing Guidelines ,Statement Auditing, Schema Object Auditing, Fine Grained Auditing, Obtaining Auditing Information	Hands-on Demonstration Presentations	CO6

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

Sr. No.	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment/Practical Titles/Tutorial Titles	No. of Hrs	Relevant COs
1	LLO1.1 Install latest Oracle software	Installation of Oracle Software.	2	1
2	LLO2.1 Identify Oracle Architecture and its Main components	Oracle Architecture and its Main components	2	1
3	LLO 7.1 Create Tablespace LLO 7.2 Manage Tablespace Create Different types of Tablespaces • To Extend the Size of a tablespace • To Decrease the size of a tablespace	Create and Manage Tablespace	2	1

	• Making a Tablespace Read only. • Renaming Tablespaces • Dropping Tablespaces • Change the storage settings of tablespaces • Adding Data files to a Tablespace • Manually resizing data files • Obtaining Tablespace Information			
4	LLO3.1 Design Oracle Database using DBCA	Creation of Oracle Database using DBCA.	2	2
5	LLO 4.1 Create SPFILE and PFILE LLO 4.2 Manage oracle instance	Management of Oracle Instance.	2	2
6	LLO 5.1 Create Control file in Oracle Database LLO 5.2 Maintain Control file in Oracle Database	Create and Maintain Control file in Oracle Database	2	3
7	LLO 6.1 Create Initial Online Redo Log File LLO 6.2 Alter Online Redo log file with adding Groups and Members in it.	Create Initial Online Redo Log File and Alter Online Redo log file with adding Groups and Members in it.	2	3
8	LLO 14.1 Configure RMAN LLO 14.2 Recovery with RMAN	Configure RMAN, Create Backup sets using RMAN and Manage Backup.	2	4
9	LLO 15.1 Recover database with RMAN	Perform Database Recovery with RMAN	2	4

10	LLO 8.1 Create Table LLO 8.2 Create Temporary Tables • Create Table • Create Table using Oracle Enterprise Manager • Create Table with Integrity Constraints • Alter Table • Create Temporary Tables Changing storage and Block Utilization parameters • Reorganize, truncate, drop a table, Drop a column within a table	Managing Tables with Data Integrity	2	5
11	LLO 9.1 Create various types of indexes LLO 9.2 Alter, Drop and show Index Index strcuture	Create and Manage Indexes	2	5
12	LLO 10.1 Create new database Users LLO 10.2 Alter and Drop existing database LLO 10.3 Monitor Information about existing Users. LLO 1.4 Display existing Users Information	Create and Manage Database Users.	2	6
13	LLO 11.1 Grant System and Object Privileges to Users LLO 11.2 Revoke System and Object Privileges from users	Managing Privileges: • Grant System and Object Privileges to Users • Revoke System and Object Privileges from users	2	6
14	LLO 12.1 Creating Profiles LLO 12.2 Altering Profiles	Managing Profiles: • Creating Profiles • Altering Profiles • Dropping Profiles	2	6

15	LLO 13.1 Create and modify Roles LLO 13.2 Control availability of Roles • Create and modify Roles • Enabling and Disabling Roles • Control availability of Roles • Removing Roles • Display Role Information	Managing Roles-	2	

NOTE: Practicals should be performed on any latest version of database software. Example: Oracle 11g and above, Sql Server and Mysql

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 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:

MICRO PROJECT

Develop and maintain database for Employee Attendance System
Develop and maintain database for tracking patient history in a healthcare system.
Develop and maintain database for tracking issued and pending books in a library.

ASSIGNMENT:

Assignments covering all COs

OTHER:

Any course related to Database Administration from Infosys Springboard.

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr. No.	Equipment Name with Broad Specifications	Experiment Sr.No.
1	Computer System.	All
2	Any Database Software.	All

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

Unit	Unit Title	Aligned Cos	Learning Hours	R Level	U Level	A Level	Total marks
01	Basic of the DBA	CO1	6	04	04	04	12
02	Managing an Oracle Instance AND Database	CO2	8	04	04	04	12
03	Maintaining Control and Redo Log files AND Storage Management	CO3	8	04	03	04	11
04	Overview of Backup & Recovery	CO4	7	04	03	04	11
05	Managing Tables, Indexes and Data Integrity	CO5	9	04	04	06	14
06	Database Security & Auditing	CO6	7	04	02	04	10

IX. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
Each Practical will be assessed considering 60% weightage to the process, 40% weightage to the product.	End Semester Exam based on Practical performance and 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	PSO-3
CO1	2	1	2	2	1	2	1	1	-	1
CO2	1	2	2	3	2	2	2	2	2	2
CO3	1	2	2	3	2	2	2	2	-	3
CO4	1	2	2	3	2	2	2	2	2	3
CO5	1	1	2	2	-	1	1	1	-	1
CO6	1	1	2	2	-	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.	Title	Author, Publisher, Edition and Year of publication	ISBN Number
1	Oracle Database Database Administrator's Guide, 19c	Oracle	
2	Oracle 9i:DBA Fundamentals	Oracle Education-Tutorialpoints	
3	Oracle 9i : Expert publication	APress	1590590228

Sr. No.	Link/Portal
1	https://docs.oracle.com/en/database/oracle/oracle-database/19/admin/toc.htm
2	https://www.oracletutorial.com/oracle-administration/

Name & Signature:

Smt.A.D.Kshirsagar
Lecturer in Information Technology

Smt.S.D.Raut
Lecturer in Information Technology

(Course Experts)

Name & Signature:

Dr. D A Rewadkar
(Programme Head)

Name & Signature:

(CDC In-charge)
G P Pune

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMA IN INFORMATION TECHNOLOGY
PROGRAMME CODE	07
COURSE TITLE	DIGITAL FORENSICS AND ETHICAL HACKING
COURSE CODE	IT51202
PREREQUISITE COURSE CODE & TITLE	NA
CLASS DECLARATION	YES

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme										
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
IT51202	DIGITAL FORENSICS AND ETHICAL HACKING	DSE	3	0	2	1	6	3	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.

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:

Digital forensic investigation is crucial for detecting and analyzing digital crimes. It involves preserving, identifying, analyzing, and reporting digital evidence stored on magnetically encoded media. This hidden data can only be accessed using specialized forensic tools and standardized methods. Hacking explores techniques to assess system security, identify vulnerabilities, and address them before malicious actors exploit them. Ethical hacking focuses on the lawful and professional safeguarding of systems. This course empowers students to implement security measures and protect against external threats and malicious users.

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 Describe models of digital forensic Investigation.
- CO2 Locate the digital evidences in file system.
- CO3 Follow evidence handling procedures.
- CO4 Select relevant tools for etnical hacking.
- CO5 Detect system and network vulnerabilities.
- CO6 Apply ethical hacking methodologies to get into the system.

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
		SECTION I		
		UNIT 1 –Basics of Digital Forensics (CL Hrs. -07, Marks- 11)		
1	**TLO 1.1** Explain the given rule of digitalforensic. **TLO 1.2** Describe the given model of digital forensic investigation. **TLO 1.3** Identify whether the given issue in digital forensics is ethical or unethical **TLO 1.4** Explain the characteristics of the given Model of Digital Forensic Investigation.	1.1 Digital forensics: History of digital forensics, Rules of digital forensics, Digital forensics investigation and its goal 1.2 Models of Digital Forensic Investigation: DFRWS Investigative Model, Abstract Digital Forensics Model (ADFM), Integrated Digital Investigation Process (IDIP), End-to-End digital investigation process (EEDIP), An extended model for cybercrime investigation, UML modelling of digital forensic process model (UMDFPM) 1.3 Ethical issues in digital forensic: General ethical norms for investigators, Unethical norms for investigation.	Hands-on Demonstration Presentations	CO1
		UNIT 2- Hardware and Software Environments (CL Hrs. -08, Marks- 12)		
2	**TLO 2.1** Describe the given nature of digital information. **TLO 2.2** Show relationship between different categories in the given file system.	2.1 Computers and the nature of digital information: Magnetic hard drives and tapes, Optical media storage devices, Random-access memory (RAM), Solid-state drive (SSD)	Hands-on Demonstration Presentations	CO2

	TLO 2.3 Write steps to locate the given evidence in file system. **TLO 2.4** Describe the indicators of confidentiality, integrity and availability for the given information.	storage devices, Network- stored data, The cloud 2.2 File systems that contain evidence: file system category, filename category, metadata category, content category 2.3 Locating evidence in file systems: Determining the means of transgression, opportunity to transgress, and the motive to transgress, Deciding where to look for possible evidence, Indexing and searching for files, Unallocated data analysis 2.4 Password security, encryption, and hidden files: User access to computer devices, importance of information confidentiality, information integrity, and information availability, User access security controls, Encrypted devices and files		
UNIT 3- Digital Evidence (CL Hrs. -08, Marks- 12)				
3	**TLO 3.1** Describe the given rule of digital evidence. **TLO 3.2** Explain characteristics of the given typeof digital evidence. **TLO 3.3** Explain features of the given Challenge in evidence handling. **TLO 3.4** Describe the given evidence handling procedure.	3.1 Digital Evidences: Definition, Best Evidence Rule, Original Evidence 3.2 Rules of Digital Evidence 3.3 Characteristics of Digital Evidence: Locard's Exchange Principle, Digital Stream of bits 3.4 Types of evidence: Illustrative, Electronics, Documented, Explainable, Substantial, Testimonial 3.5 Challenges in evidence handling: Authentication of evidence, Chain of custody, Evidence validation 3.6 Volatile evidence 3.7 Evidence handling procedure: Evidence system description, digital photos, evidence tag, evidence label, evidence storage, evidence log, working copies, evidence backup, evidence disposition, evidence custodial audit, evidence safe, shipping evidence media 3.8 Ethical issues/legal principle of digital evidence: Circumstantial and	Hands-on Demonstration Presentations	CO3

		hearsay nature of Digital Evidence, Authorization to conduct Digital Forensics investigation, authenticity of digital evidence, scientific method 3.9 Digital Evidence and metadata		
		SECTION II		
		UNIT 4- Basics of Hacking (CL Hrs. -07, Marks- 12)		
4	**TLO 4.1** Explain the characteristics of the given type of attack on computer system. **TLO 4.2** Describe the features of the given ethical hacking principle to be obeyed. **TLO 4.3** Explain the process of ethical hacking for the given problem. **TLO 4.4** Classify the given component of cracking the Hacker Mindset.	4.1 Ethical Hacking: How Hackers Beget Ethical Hackers, Defining hacker, Malicious users 4.2 Understanding the need to hack your own system 4.3 Understanding the dangers your systems face: Nontechnical attacks, Network-infrastructure attacks, Operating-system attacks, Application and other specialized attacks 4.4 Obeying the Ethical hacking Principles: Working ethically, Respecting privacy, Not crashing your systems 4.5 Ethical hacking Process: Formulating plan, Selecting tools, Executing the plan, Evaluating results 4.6 Cracking the Hacker Mindset: Understanding what you're up Against and who breaks in to computer systems, Identifying the purpose of hacking, Planning and Performing Attacks, Maintaining Anonymity	Hands-on Demonstration Presentations	CO4

UNIT 5- Types of Vulnerabilities (CL Hrs. -08, Marks- 12)				
	TLO 5.1 Describe the characteristics of the given type of Network Infrastructure Vulnerability. **TLO 5.2** Explain features of the given type of operating system Vulnerability. **TLO 5.3** Describe the given type of best practice followed to minimize e-mail security risk. **TLO 5.4** Describe the given type of best practice followed to minimize Database Vulnerability.	5.1 Network Hacking Network Infrastructure: Network Infrastructure Vulnerabilities, Scanning-Ports, Ping swiping, Scanning SNMP, Grabbing Banners, Analyzing Network Data and Network Analyzer, MAC-daddy attack Wireless LANs: Implications of Wireless Network Vulnerabilities, Wireless Network Attacks 5.2 Operating System Hacking: Introduction of Windows and Linux vulnerabilities 5.3 Applications Hacking: Messaging Systems: Vulnerabilities, E-Mail Attacks- E-Mail Bombs, Banners, Best practices for minimizing e-mail security risks Web Applications: Web Vulnerabilities, Directories Traversal and Countermeasures 5.4 Database system: Database Vulnerabilities, Best practices for minimizing database security risks	Hands-on Demonstration Presentations	CO5
UNIT 6- Ethical Hacking Plan and Hacking Methodologies (CL Hrs. -07, Marks- 11)				
6	**TLO 6.1** Write steps to develop ethical hacking plan **TLO 6.2** Select appropriate security assessment tool. TLO 6.3 Describe the given ethical hacking methodologies. TLO 6.4 Describe process to assess vulnerabilities in the given system.	6.1 Developing Ethical Hacking Plan: Establishing your Goal, Determining which system to hack, Creating testing standards, Selecting security assessment tools 6.2 Hacking Methodologies: Setting the stage for testing, Seeing what others see, Scanning systems, Determining what's running on open ports, Assessing vulnerabilities, Penetrating the system.	Hands-on Demonstration Presentations	CO6

Develop ethical hacking plan | Establishing your Goal, Determining | Demonstration

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

Sr. No.	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment/Practical Titles/Tutorial Titles	No. of Hrs.	Relevant COs
1	LLO 1.1 Monitor CPU and memory utilization, analyze for unauthorized process detection	Monitor CPU Utilization and Memory Utilization for detecting unauthorized process activations.	2	1
2	LLO 2.1 Use password-cracking tools to analyze system security and identify vulnerabilities.	Crack passwords using password cracking tools like LC4/John the Ripper/pwdump or any equivalent.	2	1
3	LLO 3.1 Create a complete memory dump on Windows by recalling and applying procedures. LLO 3.2 Use Windows Driver Toolkit to read memory dumps and analyze data.	a) Create complete memory dump using windows operating system. b) Read Memory Dump Using Windows Driver toolkit.	4	2
4	LLO 4.1 Analyze and interpret operating system logs on Windows/Linux file systems.	Read and Interpret Operating Systems logs on Windows/Linux file system.	2	2
5	LLO 5.1 Install Kali Linux operating systems by understanding requirements, configuring, troubleshooting, and customizing setup.	Install Kali Linux operating system.	2	2
6	LLO 6.1 Develop a response toolkit using cmd.exe, PsLoggedOn, and netstat utilities. LLO 6.2 Establish TCP connection with netcat by recalling, applying,	Collect live data on Windows: a) Create a response toolkit on windows having utility *cmd.exe, PsLoggedOn, netstat* b) Establish TCP connection between forensic workstation and the target system using *netcat*	4	3

	and testing configuration. LLO 6.3 Run cmd.exe, identify users, record file changes, and analyze modifications.	c) Run trusted *cmd.exe*, identify logged users and remote access users, Record creation, access times and all the modificationsmade to the files.		
7	LLO 7.1 Install Wireshark by recalling system requirements, applying installation steps and verifying setup. LLO 7.2 Capture network traffic with Wireshark, analyze packets and understand handshaking.	a) Install Wireshark tool on Windows/Kali Linux b) Use Wireshark tool to capture network traffic and to understand three-way handshaking concept/Analyze the packet.	2	4
8	LLO 8.1 Analyze email header to identify indicators of spam and malicious content. LLO 8.2 Install SpamAssassin by recalling installation steps and applying configurations. LLO 8.3 Analyze email headers with SpamAssassin by recalling features and applying filters	a) Check whether Email is a spam by analyzing the Email Header b) Install software like SpamAssasin (an antispam platform) c) Read and analyze Email Header using software like SpamAssasin	4	5
9	LLO 9.1 Perform ARP poisoning with Ettercap on Kali Linux by applying techniques.	Perform Arp poisoning on Kali Linux using Etercap or equivalent tool.	2	5
10	LLO 10.1 Initiate DoS attack with TCP/ICMP flooding and analyze target machine behavior. LLO 10.2 Write shell script for continuous ping flooding and observe network behavior.	Establish DoS attack using TCP/ICMP flooding: a) Ping continuously a particular machine at a time from different machines and observe the machine behavior on Network. b) Write shell script for continuously flooding a Machine with ping and observe the machine behavior on Network.	4	5

11	LLO 11.1 Perform port scanning with Nmap to identify open and vulnerable ports.	Perform port scanning using nmap utility to test whether ports are listening and vulnerable.	2	6

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

VI. 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:

a. Prepare report on case study of any Trojan attack.
   i. Identify the Trojan attack.
   ii. State the way Trojan got installed on particular Machine.
   iii. State the effects of the Trojan.
   iv. Elaborate/Mention/State protection/Blocking mechanism for this specific Trojan, examplespecification of any anti-threats platform which filters the Trojan.

b. Prepare report on case study of any Credit card fraud as an identity threat. Identify:
   i. Use of digital media in carrying out fraud.
   ii. Vulnerability Exploited.
   iii. Effect of fraud.
   iv. Protection/Precaution to be taken against such frauds.

c. Prepare report on case study of any forgery /falsification crime case solved using digital forensics:
   i. Identify the model used for Digital Investigation.
   ii. Was investigation done ethically or unethically?
   iii. Where does digital evidence found for crime establishment?
   iv. State the punishment meted.

d. Prepare report on case study of any case of fake profiling. Identify
   i. The way digital forensics was used in detecting the fraud.
   ii. Where was digital evidence located?
   iii. Effects.

e. Case studies related to digital forensics
   i. Hosting obscene profile
   ii. Illegal money transfer
   iii. Fake travel agent
   iv. Creating fake profile

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr. No.	Equipment Name with broad specifications	Relevant LLO
1	Computer system (Any computer system with basic configuration)	All
2	Windows/Linux (Kali Linux) operating system.	
3	Digital Forensic and Hacking Tools preferably Open source as mentioned in practical's	

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

Unit	Unit Title	Aligned Cos	Learning Hours	R Level	U Level	A Level	Total marks
1	Basics of Digital Forensics	CO1	7	04	04	03	11
2	Hardware and Software Environments	CO2	8	02	06	04	12
3	Digital Evidence	CO3	8	02	06	04	12
4	Basics of Hacking	CO4	7	04	06	02	12
5	Types of vulnerabilities	CO5	8	02	04	06	12
6	Ethical Hacking Plan and Hacking Methodologies	CO6	7	04	04	03	11

IX. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
Each Practical will be assessed considering 60% weightage to the process, 40% weightage to the product.	End Semester Exam based on Practical performance and 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	PSO-3
CO1	2	2	3	1	2	1	2	-	-	1
CO2	2	2	-	-	1	1	3	1	2	2
CO3	1	3	2	1	2	2	2	2	-	1
CO4	2	1	2	3	2	2	3	-	-	2
CO5	3	2	1	3	3	1	3	2	1	2
CO6	3	2	2	3	3	3	3	1	-	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	Jain,Nilakashi Kalbande, Dhananjat R.	Digital Forensic	Wiley Publishing, New Delhi, 2017, ISBN: 978-81-265-6574-0
2	Sammons,John	The Basics of Digital Forensic	Elsevier, Netherlands ISBN 978-1-59749-661-2
3	Kevin Beaver CISSP	Hacking for Dummies	Wiley Publishing, New Delhi ISBN: 978-81-265-6554-2
4	Jain,Nilakashi Kalbande, Dhananjat R.	Digital Forensic	Wiley Publishing, New Delhi, 2017, ISBN: 978-81-265-6574-0
5	Richard Boddington	Practical Digital Forensics	[PACKT] Publication, Open source community
6	Eoghan Casey	Digital Evidence and Computer Crime	Academic Press, ISBN: 9780123742681

VII. LEARNING WEBSITES & PORTALS

Sr. No.	Link/Portal	Description
1	https://resources.infosecinstitute.com/digital-forensics-models/#gref.	Digital forensics models and methodologies
2	https://docs.microsoft.com/en-us/sysinternals/downloads/psloggedon	It is a utility for determining which users are logged onto a computer and for tracking user activity on Windows systems.
3	https://docs.kali.org/introduction/download-official-kali-linux-images	Kali Linux official website
4	www.openwall.com/passwords/windows-pwdump	Windows utility designed for extracting password hashes from the Security Account Manager (SAM) database
5	https://onlinecourses.nptel.ac.in/noc23_cs127/preview	Cyber Security and Privacy course in NPTEL
6	https://archive.nptel.ac.in/courses/106/105/106105217/	Introduction to Ethical Hacking video lecture in NPTEL.
7	https://onlinecourses.swayam2.ac.in/cec20_lb06/preview	Digital Forensic course in NPTEL

Name & Signature: **Mr. O. R. Varma** Lecturer in Information Technology	Name & Signature: **Mr. Y. U. Bodhe** Lecturer in Information Technology
(Course Experts)	
Name & Signature: **Dr. D. N. Rewadkar** (Programme Head)	Name & Signature: **Shri. S.B.Kulkarni** (CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMA IN INFORMATION TECHNOLOGY
PROGRAMME CODE	07
COURSE TITLE	DATA ANALYTICS
COURSE CODE	IT51203
PREREQUISITE COURSE CODE & TITLE	NA
CLASS DECLARATION	YES

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme										
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration in Hrs.	Theory				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
	DATA ANALYTICS	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

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 course.
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:

Data Analytics equips individuals with the skills to process, analyze, and interpret data. It is essential for students and professionals, as it blends technical skills with critical thinking to address real-world challenges. A Data Analyst collects, cleans, and visualizes Datasets to solve 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 - Elaborate the fundamental concepts of Data Analytics.
CO2 - Apply appropriate statistical techniques to analyze and interpret complex Datasets.
CO3 - Apply data cleaning techniques to handle missing values, duplicates and outliers.
CO4 - Analyze numerical data by creating pivot table.
CO5 - Represent data in terms of various types of charts.
CO6 - Visualize the data using a Python library.

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
		SECTION I		
		UNIT-I INTRODUCTION TO DATA ANALYTICS (CL Hrs-6, Marks-10)		
1.	**TLO 1.1** Describe the importance of data analytics. **TLO 1.2** Differentiate between types of data analytics. **TLO 1.3** Describe the quality and quantity of data. **TLO 1.4** Measures the central tendency of given dataset.	**1.1** Data Analytics: An Overview, Importance of Data Analytics **1.2** Types of Data Analytics: Descriptive Analysis, Diagnostic Analysis, Predictive Analysis, Prescriptive Analysis, Visual Analytics **1.3** Life cycle of Data Analytics, Quality and Quantity of data, Measurement **1.4** Data Sources: Structured and Unstructured Data.	Hands-on Demonstration Presentations.	**CO1**
		UNIT-II STATASTICAL ANALYSIS (CL Hrs-8 Marks-12)		
2	**TLO 2.1** Create a box plot of the test scores and interpret its key components. **TLO 2.2** Perform correlation and regression analysis. **TLO 2.3** Use various methods to address missing values in Dataset. **TLO 2.4** Apply Anova and Chi Square test. **TLO 2.5** Use scatter diagrams. **TLO 2.6** Test hypothesis. **TLO 2.7** Explain the concept of a sampling distribution. **TLO 2.8** Analyze the probability distribution.	**2.1** Graphical techniques, box plot, skewness and kurtosis, Descriptive Stats **2.2** Correlation and Regression **2.3** Imputation Techniques **2.4** Anova and Chi Square **2.5** Scatter Diagram **2.6** Estimation and Hypothesis Testing **2.7** Sampling Distributions, Counting **2.8** Probability, Probability Distributions	Hands-on Demonstration Presentations	**CO2**
		UNIT-III Data Preparation and Cleaning (CL Hrs-8 Marks-12)		
3	**TLO3.1** Explain the significance of data cleaning in ensuring data quality and reliability. **TLO 3.2** Identify different types of data issues such as missing data, duplicates and inconsistencies. **TLO 3.3** Differentiate between normalization and standardization techniques for data transformation **TLO 3.4** Explore the functionality of tools.	**3.1** Importance of Data Cleaning: Garbage in, garbage out (GIGO). **3.2** Data Cleaning Techniques: Handling missing data: Removing or imputing, dealing with duplicates, Removing inconsistencies and formatting errors. **3.3** Data Transformation: Normalization and Standardization, Encoding categorical variables. **3.4** Tools and Technologies: Introduction to tools like Excel, Python, Grafana and Power BI.	Hands-on Demonstration Presentations	**CO3**

SECTION II

UNIT - IV DATA ANALYTICS WITH EXCEL (CL Hrs-08 Marks-12)				
4	**TLO 4.1** Describe the steps for making excel dashboard. **TLO 4.2** Create a pivot Table. **TLO 4.3** Sort and filter the pivot tables. **TLO 4.4** Create a pivot chart for different types of grouping items.	**4.1** Excel Dashboard: Tables and Data Grids, Dynamic Filters and Controls, Trend Analysis and Forecasting **4.2** Pivot Tables: Creating a Pivot Table Specifying Pivot Table Data **4.3** Changing a Pivot Tables, Calculation Filtering and Sorting a Pivot Table **4.4** Creating a Pivot Chart	Hands-on Demonstration Presentations	**CO4**
UNIT-V DATA VISUALIZATION (CL Hrs-07, Marks-12)				
5	**TLO 5.1:** Create relevant chart based on requirement. **TLO 5.2** Describe the process of selecting the data range. **TLO 5.3** Explain the features of Chart Wizard. **TLO 5.4** Explain the steps to move an embedded chart to a new position within the same worksheet. **TLO 5.5** Format various components of given type of chart.	**5.1** Creating a Simple Chart, Charting Non-Adjacent Cells **5.2** Creating a Chart Using the Chart Wizard Modifying Charts, Moving an Embedded Chart, Sizing an Embedded Chart **5.3** Changing the Chart Type, Changing the Way Data is Displayed, Moving the Legend **5.4** Formatting Charts, Adding Chart Items, Formatting All Text, Formatting and Aligning Numbers, Formatting the Plot Area, Formatting Data Markers **5.5** Pie Charts, creating a Pie Chart Moving the Pie Chart to its Own Sheet	Hands-on Demonstration Presentations	**CO5**
UNIT –VI DATA VISUALIZATION USING PYTHON (CL Hrs-8, Marks-12)				
6	**TLO 6.1** Describe the steps for Installing and setting up Matplotlib in Python. **TLO 6.2** Create various types of plots. **TLO 6.3** Customize Plots. **TLO 6.4** Write steps to Export plots in different formats	**6.1** Overview of Matplotlib and its role in data visualization, Installing and setting up Matplotlib in Python **6.2** Basic plotting with Matplotlib, Line plot, Scatter plots, Bar charts, Histograms, adding titles, labels, and legends to plots **6.3** Changing figure size and aspect ratio, Customizing axes (limits, ticks, and labels) **6.4** Exporting and Saving Visualizations: Saving plots in different formats (PNG, PDF, SVG).	Hands-on Demonstration Presentations	**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 2.1:** Perform Statistical Analysis in Excel.	Calculate mean, median, and mode for a given dataset using Excel functions (AVERAGE, MEDIAN, MODE).	2	CO2
2	**LLO 2.2:** Construct box plot.	Construct a box plot using the Insert Chart feature to identify the median, quartiles, and outliers of a dataset.	2	CO2
3	**LLO 4.1:** Create a table to execute the function using dashboard.	a. Create a Data Table to import a sample dataset (e.g., sales data) into Excel. b. Convert the dataset into an Excel Table using the "Format as Table" feature and apply appropriate styles.	4	CO4
4	**LLO 4.2:** Create a pivot table to analyze the data set.	a. Create a basic Pivot Table from a dataset to Specify and filter data in a pivot table b. Add a calculated field to a pivot table	4	CO4
5	**LLO 5.1:** Customize your chart with titles, labels, colors, and legends as desired.	a. Create a basic pivot chart from a dataset b. Create a dynamic pivot chart that updates based on user selection	4	CO5
6	**LLO 5.2:** Create a simple chart to visualize the data sets.	a. Create a simple bar chart to visualize data sets. b. Create a bar chart using non-adjacent cells to visualize data from different ranges.	2	CO5
7	**LLO 5.3:** Change the chart type with adding data labels, axis format, and adjusting the gridlines.	a. Create a basic bar chart using a dataset and change its type to a different chart	4	CO5
8	**LLO 5.4:** Design a pie chart	a. Create a pie chart from a dataset b. Move the pie chart to a new worksheet for better visibility	2	CO5
9	**LLO 6.1:** Generate and Save the plot in various formats.	Create different types of plots. Write a Python script to save the plot in different formats: PNG, PDF, and SVG.	2	CO6

LLO 6.2: Analyze data analytics applications across various business domains.	Application of data analytics across various industries through case study	4	CO6

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

1. '*' Marked Practicals (LLOs) Are mandatory.
2. A judicial mix of LLOs is to be performed to achieve the desired outcomes

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 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:

a. Evaluate student performance based on exam scores and attendance.
   i) Use a dataset with student information (e.g., scores, attendance percentage, subject).
   ii) Analyze the correlation between attendance and performance.
   iii) Identify high-performing and low-performing subjects or students.
   iv) Visualize trends with bar or line charts.

b. Analyze movie ratings and genres to identify trends.
   i) Use a dataset with movie titles, genres, and user ratings.
   ii) Calculate average ratings for each genre.
   iii) Identify top-rated movies and trends over time.
   iv) Create bar charts or heatmaps for visualization.

c. Track the spread of COVID-19 and its impact.
   i) Use datasets on COVID-19 cases, recoveries, and deaths.
   ii) Perform time-series analysis to study trends.
   iii) Calculate recovery and mortality rates.
   iv) Create dashboards showing daily trends by country or region.

d. Analyze web traffic and user behavior on an e-commerce site.
   i) Use a sample dataset with user visits, page views, and bounce rates.
   ii) Identify peak traffic times and popular pages.
   iii) Suggest improvements to reduce bounce rates.
   iv) Visualize user behaviour trends.

e. Analyze patient demographics and treatment outcomes.
   i) Use a dataset with patient age, gender, diagnosis, and outcomes.
   ii) Calculate recovery rates based on treatments.
   iii) Analyze patterns in diseases by age or gender.
   iv) Create dashboards showing patient outcomes and insights.

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Microsoft Office ,Office 365	ALL
2	Software: Editor: Python setup	ALL
3	Computer (i5 preferable), RAM minimum 8 GB onwards.	
4	Operating system: Windows 10 onward	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
SECTION I								
1	I	INTRODUCTION TO DATA ANALYTICS	CO1	6	4	4	2	10
2	II	STATISTICAL ANALYSIS	CO2	8	2	4	6	12
3	III	DATA PREPARATION AND CLEANING	CO3	8	4	4	4	12
SECTION II								
4	IV	DATA ANALYTICS WITH EXCEL	CO4	8	2	2	8	12
5	V	DATA VISUALIZATION	CO5	7	2	4	6	12
6	VI	DATA VISUALIZATION USING PYTHON	CO6	8	2	4	6	12
			Grand Total	45	16	22	32	70

IX. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
Lab performance, Assignment 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	PSO-3
CO1	2	2	2	--	1	3	3	--	2	3
CO2	3	3	3	3	2	3	3	2	1	3

Programme Specific

CO3	3	3	3	3	2	3	3	-	3	3
CO4	2	3	3	2	2	3	3	1	2	3
CO5	2	2	2	--	--	1	2	--	3	3
CO6	3	3	2	3	--	2	2	--	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.	Jinjer Simon	Excel Data Analysis: Your visual blueprint for analyzing data, charts, and PivotTables	Wiley Publication Edition: 3rd ISBN: 978- 0-470-59160-4
2	A. J. Smalley	Data Analysis with Excel	SAGE Publications Edition: 1st, 2007 ISBN 10: 0070139903 / ISBN 13: 9780070139909
3	Fabio Nelli	Python Data Analytics: With Pandas. NumPy, and Matplotlib	Apress pubication ISBN-13 :978-1484239124 ISBN-13978-1484247372
4	Jake VanderPlas	Python Data Science Handbook	Shroff/O'Reilly Publication ISBN-10-9355422555 ISBN-13-978-9355422552
5	Business Analytics with MindTap	Jeffrey D. Camm | James J Cochran | Michael J. Fry | Jeffrey W. Ohlmann	Cengage Learning India Pvt. Ltd. Publication Edition:4th ISBN: 9789360533533

XII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://spreadsheetpoint.com/excel/dashboard-in-excel/	Advance Excel
2	https://www.javatpoint.com/how-to-create-a-dashboard-in-exce l	Excel Dashboard
3	https://www.simplilearn.com/tutorials/exce l-tutorial/data-an alysis-excel	Data Visualization
4	https://www.freecodecamp.org/news/introduct ion-to-data-vizua lization-using-matplotlib/	Matplotlib in Python
5	https://archive.nptel.ac.in/courses/106/107/106107220/	Introduction to Data Analytics

Name & Signature:

Smt. P.C. Fafat
Lecturer in Information Technology

Smt. V.M. Khanapure
Lecturer in Information Technology

(Course Experts)

Name & Signature:

Dr. D.N. Rewadkar
(Programme Head)

Name & Signature:

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