Government Polytechnic, Mumbai

Department of Computer Engineering

Semester II

(Course Contents)

For P-23 Curriculum

Programme: Diploma in Computer Engineering

(Sandwich Pattern)

Approved Copy

Government Polytechnic Mumbai
(Academically Atonoums Institute, Government of Maharashtra)
Programme: Diploma in Computer Engineering (Sandwich Pattern)

Teaching and examination Scheme (P23) | **With Effect From Academic Year : 2023-24**
Duration Of Programme : 6 Semester | **Duration : 16 WEEKS**
Semester : Second | **Scheme : (P23)**

Sr. No.	Course Code	Course Title	Course Type	Total IKS Hrs for Sem	Learning Scheme					Credits	Assesment Scheme														
					Actual Contact Hrs/Week			Self Learning(TW + Assignment)	Notional Lerning Hrs / Week		Paper Duration (hrs.)	Theory					Based on LL & TL Practical					Based on Self Learning		Total Marks
												FA-TH	FA-TH	SA-TH	Total		FA-PR		SA-PR			SLA		
												T1	T2												
					CL	TL	LL					Max	Max	Max	Max	Min	Max	Min	PR	OR	Min	Max	Min	
1	HU23501	Communication Skills	AEC	0	3	–	2	1	6	3	2.30	20	20	60	100	40	25	10	–	–	–	25	10	150
2	SC23502	Engineering Mathematics	AEC	1	3	2	–	1	6	3	2.30	20	20	60	100	40	25	10	–	–	–	25	10	150
3	CO23102	Object Oriented Programming using C++	DSC	0	2	–	4	–	6	3	–	–	–	–	–	–	50	20	50#	–	20	–	–	100
4	CO23103	Computer Hardware and Networking	DSC	0	2	–	4	–	6	3	–	–	–	–	–	–	50	20	50@	–	20	–	–	100
5	CO23104	Data Structures	DSC	0	3	–	4	1	8	4	2.30	20	20	60	100	40	25	10	25#	–	10	25	10	175
6	CE23301	Environmental Studies	VEC	0	–	–	2	2	4	2	–	–	–	–	–	–	25	10	–	25@	10	25	10	75
7	CO23602	LaTex (MOOC)	SEC	0	–	–	–	4	4	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–
		Total		**1**	**13**	**2**	**16**	**9**	**40**	**20**					**300**		**200**		**200**			**100**		**750**

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

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

Note : 1. FA-TH represents two class tests of 20 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then candidate shall be declared as fail & will have to repeat & resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.*16 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. *Self learning hours shall not be reflected in the TimeTable.

Course Category : Discipline Specific CourseCore(DSC): 3, Discipline Specific Elective (DSE):0,Value Education Course(VEC):1, Intern./Apprenti./Project./ Community(INP):0, Ability Enhancement Course (AEC) : 2, Skill Enhancement Course (SEC) : 1, Interdisciplinary Elective (GE) : 0

Department Coordinator, Curriculum Development, Dept. of Computer Engineering | Head of Department, Dept. of Computer Engineering | In-Charge, Curriculum Development Cell | Principal, Government Polytechnic, Mumbai

Programme : Diploma in _ CE/ME/EE/EC/IS/CO/IF/AIML/LG/LT/RT														
Course Code:HU23501					**Course Title :Communication Skills (CMS)**									
Compulsory / Optional:														
Teaching Scheme and Credits						**Examination Scheme**								
CL	**TL**	**LL**	**SLH**	**NLH**	**Credits**	**FA-TH**		**SA-TH (3Hrs.)**	**FA-PR**	**SA**		**SLA**	**Total**	
										PR	**OR**			
03	--	02	01	06	03	20	20	60	25	--	--	25	150	

Total IKS Hrs. for course:

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

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

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

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

II. Industry / Employer Expected Outcome

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

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

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

Course Content Details:

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

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

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

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

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

Any 10 out of 12 practicals are compulsory

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

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

VI. Specification Table:

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

VII. Assessment Methodologies/Tools

Formative assessment (Assessment for Learning)

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

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

Summative Assessment (Assessment of Learning)

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

VIII. Suggested COs - POs Matrix Form

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

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

Course	Programme Outcomes (POs) CIVIL ENGINEERING	Programme Specific Outcomes

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

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

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

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

Course Outcomes (COs)	**Programme Outcomes (POs)** **INSTRUMENTATION ENGINEERING**							**Programme Specific Outcomes (PSOs)**		
	2	3	1		**2**	2	**3**	**PSO-1**	**PSO-2**	**PSO-3**
CO1					1	2	**2**	**2**	**1**	**2**
CO2	1	3			**2**	2	**2**	**2**	**1**	**2**
CO3					**2**	3	**2**	**2**	**1**	**2**
CO4	2				**2**	3	3	**2**		**2**
CO5	3	3	3	3	3	3	3	**2**		
Legends: - High:03, Medium:02, Low:01, No Mapping: --										

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

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

CO1	2	3	1		**2**	2	**3**	**1**	**3**
CO2					1	2	**2**		
CO3	1	3			**2**	2	**2**	**1**	**2**
CO4					**2**	3	**2**	**1**	**2**
CO5	2				**2**	3	3		**2**

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

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

IX. Suggested Learning Materials / Books

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

X. Learning Websites & Portals

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

XI.Academic Consultation Committee/Industry Consultation Committee:

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

4	Ms. N. N. Dhake	Lecturer in English	Government Polytechnic Mumbai

Coordinator,
Curriculum Development,
Department of _____ Engineering

Head of Department
Department of _____ Engineering

I/C, Curriculum Development Cell

Principal

	Programme : Diploma in EE / EC / IS / CE / ME / CO / IF/AI & ML / RT												
Course Code: SC23502					**Course Title :ENGINEERING MATHEMATICS**								
	Compulsory / Optional: Compulsory												
Teaching Scheme and Credits						**Examination Scheme**							
CL	**TL**	**LL**	**SLH**	**NLH**	**Credits**	**FA-TH**		**SA-TH (2Hrs.30 Min)**	**FA-PR**	**SA**		**SLA**	**Total**
						T1	**T2**			**PR**	**OR**		
3	2	--	1	6	3	20	20	60	25	--	--	25	150

Total IKS Hrs. for course: 01 Hrs

Abbreviations: CL- ClassRoom Learning, TL- Tutorial Learning, LL- Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, SLA- Self Learning Assessment
Legends: @ Internal Assessment, # External Assessment, *# On Line Examination, @$ Internal Online Examination
Note:
1. FA-TH represents Total of two class tests of 20 marks each conducted during the term.
2. FA-PR represents Tutorial Term work of 25 Marks
3. SLA represents self learning Assessment of 25 Marks
4. SA-TH represents the end term examination of 60 Marks

I. Rationale

An Engineering 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.

II. Industry / Employer Expected Outcome

Engineers applying Mathematics should proficiently solve complex real-world problems, enhancing decision-making, design and innovation with precision and efficiency.

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

CO1	Solve the broad-based engineering problems of integration using suitable methods.
CO2	Use integration to find area,volume, mean value and root mean square value for given engineering related problems.
CO3	Apply the differential equation to find the solutions of given programme specific problems.
CO4	Apply numerical methods to solve programme specific problems.
CO5	Use probability distributions to solve elementary engineering problems.

Course Content Details:

Unit No.	Theory Learning Outcomes (TLO's)aligned to CO's.	Topics / Sub-topics
1	TLO 1.1 Solve the given simple problem(s)based on rules of integration. TLO 1.2 Evaluate the given simple integral(s) using substitution method. TLO 1.3 Integrate given simple functions using the integration by parts. TLO 1.4 Solve the given simple integral by partial fractions.	**Unit-I Indefinite Integration** 1.1 Simple Integration: Rules of integration and integration of 1.2 standard functions 1.3 Integration by substitution. 1.4 Integration by parts. 1.5 Integration by partial fractions
	Course Outcome : CO1 **Teaching Hours : 9** **Marks: 10**	
2	TLO 2.1 Solve given examples based on definite Integration. TLO 2.2 Use properties of definite integration to solve given problems. TLO2.3Utilize the concept of definite integration to find the following (a)Area under the curve (b)Area between given two curves (c) Volume of revolution (d) Mean value (e) Root mean square value	**Unit- II Definite Integration and Applications** 2.1 Definite Integration: Definition, rules of definite integration with simple examples 2.2 Properties of definite integral (without proof) and simple examples. 2.3 Applications of integration: area under the curve, area between given two curves, volume of revolution, mean value and root mean square value.
	Course Outcome : CO2 **Teaching Hours : 10** **Marks: 14**	
3	TLO3.1 Find the order and degree of given Differential equations. TLO3.2 Form simple differential equation for given elementary engineering problems. TLO3.3 Solve given differential equations using the methods of Variable separable and Exact Differential Equation (Introduce the concept of partial differential equation). TLO3.4 Solve given Linear Differential Equation. TLO3.5 Solve given programme specific problems using the category of 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, Homogeneous D.E., Exact Differential Equation, Linear Differential Equation 3.4 Application of differential equations and related engineering problem(s).
	Course Outcome : CO3 **Teaching Hours : 10** **Marks: 14**	

4	TLO 4.1 Find roots of algebraic equations by using appropriate methods. TLO 4.2 Solve the system of equations in three unknowns by using given methods. TLO 4.3 Apply the concept of numerical integration to solve given engineering problems. TLO 4.4 Solve problems using Yukti bhasa iterative methods for finding approximate square root. (IKS)	**Unit-IV: Numerical Methods and Numerical Integrations** 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 Gauss elimination method. 4.3 Solution of simultaneous equations containing three Unknowns by iterative methods: Gauss Seidal and Jacobi's method. 4.4 Numerical Integration: Trapezoidal rule, Simpson's 1/3rd rule, Simpson's 3/8 th rule. (Without proof) 4.5 Yukti bhasa iterative methods for finding approximate square root. (IKS)
	Course Outcome : CO4 **Teaching Hours : 8** **Marks: 12**	
5	TLO 5.1 Solve given problems based on repeated trials using Binomial distribution. TLO 5.2 Solve given problems when number of trials are large and probability is very small. TLO 5.3 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.
	Course Outcome : CO5 **Teaching Hours : 8** **Marks: 10**	

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

Practical / Tutorial / Laboratory Learning Outcome (LLO)	**Sr No**	**Laboratory Experiment / Practical Titles / Tutorial Titles**	**Number of hrs.**	**Relevant COs**
LLO1.1Solve simple problems of Integration by substitution	1	Integration by substitution	2	CO1
LLO2.1Solve integration using by parts	2	Integration by parts	2	CO1
LLO3.1Solve integration by Partial fractions	3	Integration by partial fractions.	2	CO1
LLO4.1Solve examples on Definite Integral Based on given methods.	4	Definite Integral based on given methods.	2	CO2
LLO5.1Solve problems on properties of Definite integral.	5	Properties of definite integral	2	CO2
LLO6.1Solve given problems for finding The area under the curve, area between two curves and volume of revolution.	6	Area under the curve, area between two curves and volume of revolution.	2	CO2
LLO7.1Solve examples on mean value and Root mean square value.	7	Mean value and root mean square value.	2	CO2
LLO8.1Solve examples on order, degree And formation of differential equation.	8	Order, degree and formation of differential equation.	2	CO3
LLO9.1Solve first order first degree D.E. Using variable separable method	9	Variable separable method and homogeneous method.	2	CO3

and homogeneous method.				
LLO10.1Solve first order first degree D.E. Using exact differential equation and linear differential equation.	10	Exact differential equation and linear differential equation.	2	CO3
LLO11.1Solve engineering application Problems using differential equation.	11	Applications of differential equations.	2	CO3
LLO12.1Solve problems on Bisection Method and Regula falsi method.	12	Bisection Method and Regula Falsi Method	2	CO4
LLO13.1Solve problems on Newton-Raphson method and Gauss elimination method.	13	Newton-Raphson method and Gauss elimination method.	2	CO4
LLO14.1Solve problems on Jacobi's method and Gauss Seidal Method.	14	Jacobi's method and Gauss Seidal Method.	2	CO4
LLO 15.1 Solve examples on Trapezoidal rule,Simpson's1/3rd rule and Simpson's3/8 th rule.	15	Trapezoidal rule,Simpson's 1/3rd rule And Simpson's 3/8thrule.	2	CO4
LLO16.1Solve problems on Bisection method, Regula falsi method, Newton- Raphson method using spread sheet .	16	Bisection method, Regula falsi method, Newton-Raphson method problems using spreadsheet.	2	CO4
LLO17.1UseYukti bhasa iterative methods For finding approximate value of square root and cube root. (IKS)	17	Yukti bhasa iterative methods for Finding approximate value of square root and cube root. (IKS)	2	CO4
LLO18.1Solve engineering problems using Binomial distribution.	18	Binomial Distribution	2	CO5
LLO19.1Solve engineering problems using Poisson distribution.	19	Poisson Distribution	2	CO5
LLO20.1Solve engineering problems using Binomial distribution.	20	Normal Distribution	2	CO5

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

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

- Choose a real world problem and formulate a differential equation to model it.
- Solve the formulated differential equation and interpret the solution in the context of the problem
- Collect examples based on real world applications of Integration
- Collect examples based on real world applications of Definite Integration
- Consider a fair six-sided die. Define a discrete random variable X as the number obtained when rolling the die. Construct the probability distribution table for X
- Collect examples based on real world applications of Newton Raphson Method.
- Collect examples based on real world applications of Binomial Distribution.
- Collect examples based on real world applications of Poisson Distribution.
- Collect examples based on real world applications of Normal Distribution.

- Collect examples based on real world applications of Differential Equations
- Collect examples based on real world applications of Gauss Seidal Method.
- Collect examples based on real world applications of Gauss Jacobi's Method

Attempt any 5-7 Assignment, out of the given list

V. Specification Table:

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Indefinite Integration	2	4	4	10
2	Definite Integration and Applications	2	4	8	14
3	Differential Equation	2	4	8	14
4	Numerical Methods and Numerical Integrations	2	4	6	12
5	Probability Distribution	2	4	4	10
	Total	10	20	30	60

VI. Assessment Methodologies/Tools

Formative assessment (Assessment for Learning)

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

Summative Assessment (Assessment of Learning)

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

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

VII. Suggested Learning Materials / Books

Sr.No	Author	Title	Publisher
1	Grewal B.S.	Higher Engineering Mathematics	KhannapublicationNewDelhi,2013ISBN : 8174091955
2	Dutta. D	A text book of Engineering Mathematics	NewagepublicationNewDelhi,2006 ISBN:978-81-224-1689-3
3	Kreysizg, Ervin	Advance Engineering Mathematics	WileypublicationNewDelhi2016ISBN: 978-81-265-5423-2
4	Das H.K.	Advance Engineering Mathematics	SChandpublicationNewDelhi2008 ISBN: 9788121903455
5	S.S. Sastry	Introductory Methods of Numerical Analysis	PHILearning Private Limited, NewDelhi. ISBN-978-81-203-4592-8
6	C.S. Seshadri	Studies in the History of Indian Mathematics	Hindustan Book Agency (lndia) P19 Green Park Extension NewDelhi.ISBN978-93- 80250-06-9
7	Marvin L.Bittinger David J.E lenbogen ScottA. Surgent	Calculus and Its Applications	Addison-Wesleyl0thEditionISBN-13: 978-0-321-69433-1
8	Gareth James, Daniela Witten,Trevor Hastie Robert and Tibshirani	An Introduction to Statistical Learning with Applications in R	Springer NewYork Heidelberg Dordrecht LondonISBN978-1-4614-7137-0ISBN 978-1-4614-7138-7(eBook)

VIII. Learning Websites & Portals

Sr.No	Link /Portal	Description
1	https://www.wo1frama1pha.com/	Solving mathematical problems, performing calculations, and visualizing mathematical concepts.
2	http://www.sosmath.com/	Free resources and tutorials
3	http://mathworld.wolfram.com/	Extensive math encyclopedia with detailed explanations of mathematical concepts
4	https://www.mathsisfun.com/	Explanations and interactive lessons covering various math topics, from basic arithmetic to advanced
5	http://tutorial.math.1amar.edu/	Comprehensive set of notes and tutorials covering a wide range of mathematics topics, including calculus
6	https://www.purplemath.com/	Purple math is a great resource for students seeking help with algebra and other foundational math
7	https://www.brilliant.org/	Interactive learning in Mathematics
8	https://www.edx.org/	Offers a variety of courses
9	https://www.coursera.org/	Coursera offers online courses in applied mathematics from universities and institutions around the
10	https://ocw.mit.edu/index.htm	The Massachusetts Institute of Technology (MIT) offers free access to course materials for a wide range

IX.Academic Consultation Committee/Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
1	Mr.Santosh Bhandekar	Lecturer in Mathematics	Government Polytechnic, Osmanabad
2	Mr.Abhijit S.Patil	Lecturer in Mathematics	Government Polytechnic ,Mumbai
3	Mr.Vinod S.Patil	Lecturer in Mathematics	Government Polytechnic ,Mumbai

Coordinator,
Curriculum Development,
Department of _____ Engineering

Head of Department
Department of _____ Engineering

I/C, Curriculum Development Cell

Principal

Programme : Diploma inComputer Engineering													
Course Code:CO23102						**Course Title : Object Oriented Programming using C++**							
Compulsory / Optional: Compulsory													
Learning Scheme and Credits						**Assessment Scheme**							
CL	**TL**	**LL**	**SLH**	**NLH**	**Credits**	**FA-TH**		**SA-TH (**2Hrs.30 Min**)**	**FA-PR**	**SA**		**SLA**	**Total**
						T1	**T2**			**PR**	**OR**		
2	--	4	0	6	3	--	--	--	50	50#	--		100

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

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

Note:

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

I. Rationale

Object Oriented Programming is programming language model organized around objects rather than 'actions' and data rather than logic. The goal of this course is to provide the students with the fundamental knowledge of Object Oriented Programming. In this course they will learn how to solve real life problems more efficiently and with fewer efforts using Object Oriented Programming. Basic file handling has also been included in the course so that a habit of programming in professional manner as per the needs of the industry will be developed in the students.

II. Industry / Employer Expected Outcome

Engineers applying Object Oriented Programming is programming language (C++) should proficiently solve real-world problems, enhancing decision- making, design and innovation with precision and efficiency.

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

CO1	Describe concepts of different programming paradigms and features of Object Oriented Programming.
CO2	Summarize the concepts of functions.
CO3	Develop programs using the concepts of Encapsulation and Data Abstraction.
CO4	Develop programs using the concepts of Inheritance and Polymorphism..
CO5	Manipulate the file and Console IO.

Course Content Details:

Unit No.	Theory Learning Outcomes (TLO's)aligned toCO's.	Topics / Sub-topics
1	**TLO 1.1** Compare 1.2 Procedural Programming Approach and Object Oriented Programming Approach. **TLO 1.2** State use and need of OOP. **TLO 1.3** State the applications of OOP. **TLO 1.4** Write a program to accept integers from user and print only those elements which are greater than average. **TLO 1.5** Write a program to accept choices for switch case e.g. result analysis, arithmetic operations. **TLO 1.6** Write a program to use of Scope Resolution operator.	**Unit I Introduction to Object Oriented programming** 1.1 Different programming paradigms 1.2 Procedural Programming Approach and Object Oriented Programming Approach 1.3 Need and Features of OOP 1.4 Beginning with C++: Basic and Derived Data Types, Tokens, Expressions, Operators in C++, Scope Resolution Operator 1.5 Control Structures, Arrays, Structures and Unions. 1.6 Applications of OOP
	Course Outcome : CO1	**Teaching Hours : 02**
2	**TLO 2.1** Write the use of Inline Functions **TLO 2.2** State function prototyping	**Unit- II Functions in C++** 2.1 The main function

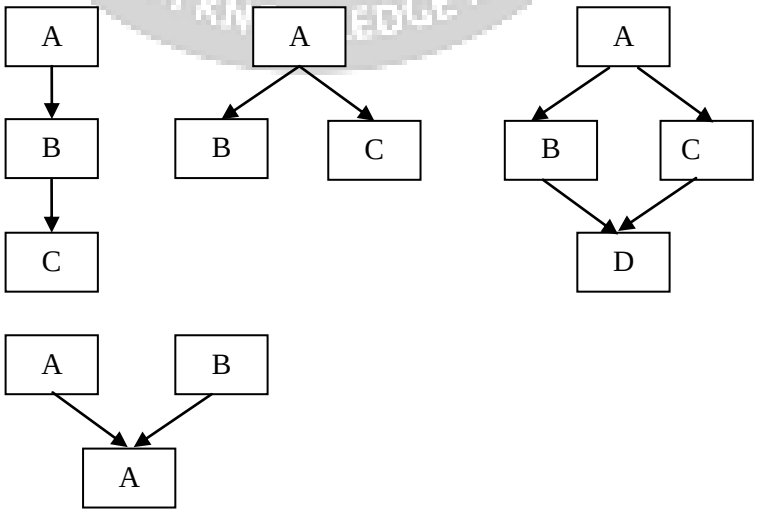
	TLO 2.3 Write a program to Create a function which will find sum of all the prime numbers up to n. where n is input by user. **TLO 2.4** Write a program to accepttwo numbers swap them by 1.with using third variable 2.without using third variable **TLO 2.5** Write a program for call functions by 2.3.1 Call by Value 2.3.2 Call by Reference 2.3.3 Return by Reference	2.2 Function Prototyping 2.3 Parameter Passing: 2.3.1 Call by Value, 2.3.2 Call by Reference, 2.3.3 Return by Reference 2.4 Inline Functions 2.5 Default Argument and const Arguments
	Course Outcome : CO2	**Teaching Hours : 02**
3	**TLO 3.1** Create a class Student with the data members name, dateOfBirth, adharNumber, street, city, pincode and member functions set and get accepting necessary parameters and returning appropriate values. **TLO 3.2** Modify 3.1 with static data members and member functions. **TLO 3.3** Create two classes Test1 and Test2 which stores marks of a student. Read values for class objects and calculate average of two tests. **TLO3.4** Write a program Objects as Function Arguments. **TLO3.5** Write a program for Friend Functions	**Unit-III Classes and Objects** 3.1 Specifying a class 3.2 Defining member functions 3.3 Making Outside Functions Inline 3.4 Nesting of Member Functions 3.5 Public and Private Member Functions 3.6 Arrays within a class 3.7 Memory Allocation for Objects 3.8 Static Data Members and Member Functions 3.9 Array of Objects 3.10 Objects as Function Arguments 3.11 Friend Functions 3.12 Returning Objects
	Course Outcome : CO3	**Teaching Hours : 08**

4	**TLO 4.1** Modify 3.1 a. Add parameterized and default constructors in the class. b. Add copy constructor destructor in the class. **TLO4.2** Modify 4.1 In the main class create objects of the class modified in 5.1 with dynamic initialization. **TLO4.3** Write benefits of Constructors and Destructors.	**Unit-IV:Constructors and Destructors** 4.1 Constructors 4.2 Types of Constructors 4.2.1 Default Constructor 4.2.2 Parameterized Constructors 4.3.3 Copy Constructor 4.3 Constructor Overloading 4.4 Constructors with Default Arguments 4.5 Dynamic Initialization of Objects 4.4Destructors
	Course Outcome : CO4	**Teaching Hours :04**
5	**TLO 5.1** Justify" Inheritance is one of three pillar of OOP" **TLO 5.2** Write use and short note of all types of Inheritance **TLO 5.3** Write program of all types of Inheritance. **TLO 5.4** Write benefits and need of Virtual Base Classes	**Unit**-V: **Inheritance** 5.1 Base Class 5.2 Derived Class 5.3 Single Inheritance 5.4 protected Members 5.5 Multilevel Inheritance 5.6 Multiple Inheritance 5.7 Hierarchical Inheritance 5.8 Hybrid Inheritance 5.9 Virtual Base Classes 5.10 Abstract Classes 5.11 Constructors in Derived Classes
	Course Outcome : CO4	**Teaching Hours : 6**
6	**TLO 6.1** Justify" **Polymorphism is one of three pillar of OOP**" **TLO 6.2** Write use and short note of all types of **Polymorphism** **TLO 6.3** Write program of all types of **Polymorphism.** **TLO 6.4** Write program of Virtual function.	**Unit**-VI: **Polymorphism** 6.1 Function Overloading 6.2 Operator Overloading 6.2.1 Overloading Unary Operators 6.2.2 Overloading Binary Operators 6.3 Type Conversions 6.4 Virtual Functions 6.5 Pure Virtual Functions
	Course Outcome : CO4	**Teaching Hours :6**

7	**TLO 7.1** Write short note on need of files. **TLO 7.2** Compare File modes	**Unit**-VII: **IO Handling: Console and Files** 7.1 C++ Streams and Stream Classes 7.2 Formatted ConsoleIO Operations 7.3 File Stream Classes 7.4 Opening and Closing a File 7.5 Deleting a File **7.6** File Modes
	Course Outcome : CO5	**Teaching Hours :4**

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

Practical/Tutorial/Laboratory Learning Outcome (LLO)	**Sr No**	**Laboratory Experiment / Practical Titles / Tutorial Titles**	**Number of hrs.**	**Relevant COs**
1. Write program for accepting input.	1	LLO 1.1 Write a program to accept integers from user and print only those elements which are greater than average.	2	CO1
2. Write program for Menu-driven choices.	2	LLO 1.2 Write a program to accept choices for switch case e.g. result analysis, arithmetic operations.	2	CO1
3. Use Scope Resolution operator	3	LLO 1.3 Write a program to use of Scope Resolution operator	2	CO1
4. Use functions for various types of argument passing.	4	LLO 2.1 Write a program to Create a function which will find sum of all the prime numbers up to n. where n is input by user.	2	CO2
	5	LLO 2.2 Write a program to accept two numbers swap them by 1.with using third variable 2.without using third variable	2	CO2
5. Call and parameters for functions with various styles.	6	LLO 3.1 Write a program for call functions by 3.3.1 Call by Value 3.3.2 Call by Reference 3.3.3 Return by Reference	4	CO3
6. Create class and object and use objects to call member function.	7	LLO 3.2 Create a class Student with the data members name, dateOfBirth, adharNumber, street, city, pincode and member functions set and get accepting necessary parameters and returning appropriate values.	4	CO3

7. Use static data members and member functions in given class.	8	LLO 3.3 Modify 3.2 with static data members and member functions.	2	CO3
8. Deal and program using multiple classes.	9	LLO 3.4 Create two classes Test1 and Test2 which stores marks of a student. Read values for class objects and calculate average of two tests.	2	CO3
9. use different flavors of Function.	10	LLO 3.4 Write a program Objects as Function Arguments.	2	CO3
	11	LLO 3.5 Write a program for Friend Functions	2	CO3
10. Create and destroy objects using constructor.	12	LLO 4.1 Modify 9 a. Add parameterized and default constructors in the class. b. Add copy constructor destructor in the class.	4	CO4
11. Create objects dynamically.	13	LLO 4.2 Modify 12 In the main class create objects of the class modified in 5.1 with dynamic initialization	2	CO4
12. Use and create classes and reuse for further programming.	14	LLO 5.1 Create following classes as shown in the figures to perform all types of inheritances. Write constructors, destructor, some private as well as protected data members and some member functions which access the private and protected data members. In main function create objects of all the classes and make appropriate function call on the objects**. (Take all types and combinations of Inheritance)** 	12	CO4

13. Use and create classes and functions to take many forms.	15	LLO 6.1 Write a C++ program for definition a class Account. The class Account has two subtypes. viz., Current and Savings. Write a virtual function 'calculateInterest' which will calculate interest. Current account has simple interest and Savings Account has Compound interest.	4	CO4
	16	LLO 6.1 Create a class Shape with necessary data members and a function to find the area of the shape. Create two subclasses of the class Shape viz., Rectangle and Triangle. Override the function to find area of the Rectangle and Triangle.	4	CO4
14. Create and perform operations on files.	17	LLO 6.2 Write a program to display the following output. 1 1 2 1 1 2 3 2 1 1 2 3 4 3 2 1 1 2 3 4 5 4 3 2 1	2	CO5
	18	LLO 7.1 Write a menu-driven program to create, update, display a data file containing customer records.	2	CO5
	19	LLO 7.2 Write a program to open file in different modes	4	CO5

Note: 1. Take any10-12 out of 14 and ensured that all the units are covered. 2. Take practical in the batch size of 20 to 30 students. 3. Give students at least 10-12 problems to solve in each practical.

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

- Choose a real world problem and Write code to solve it.
- Collect examples based on real world applications of C++
- Collect examples based on real world applications of three pillars of OOP.

VI. Assessment Methodologies/Tools

Formative assessment (Assessment for Learning)

- SLA - Continuous Assessment of Self Learning for 25 Marks

Summative Assessment (Assessment of Learning)

- **TH –** NIL

VII. 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	3	1	--	1	3	3	2
CO2	3	2	1	3	1	--	1	3	3	2
CO3	3	3	3	3	1	1	--	3	3	2
CO4	3	3	3	3	1	1	--	3	3	2
CO5	3	3	3	3	2	2	--	3	3	3
Legends: - High:03, Medium:02, Low:01, No Mapping: --										

VIII. Suggested Learning Materials / Books

Sr. No.	Book Title	Author, Publication and Year of Publication	ISBN
1	Object Oriented Programming with C++, 6th Edition.	E. Balagurusamy, McGraw Hill Education (India) Private Limited, New Delhi.	978-0-07-066907-9
2	C++ The Complete Reference, 4th Edition.	Herbert Schildt, McGraw Hill/ Oshome, New Delhi	0-07-150239-4 (eBook) 0-07-222680-3 (print)
3	Programming with C++, 2nd Edition	John R. Hubbard, Schaum's Outlines	0-07-030837-3
4	Let Us C++	Yashwant Kanetkar,	8176561061 (ISBN13: 9788176561068)

IX. Learning Websites & Portals

1. **https://www.tutorialspoint.com/cplusplus**
2. **https://www.w3schools.com/cpp/**
3. **https://www.javatpoint.com/cpp-tutorial**
4. **https://cplusplus.com/doc/tutorial/**

X. Academic Consultation Committee/Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
1	Mrs. Mamata Joshi	Project Manager,	Capgemini
2	Ms. P. S. Sadafule	Lecturer in Computer Engineering	Government Polytechnic, Mumbai
3	Mrs. R. V. Molawade	Lecturer in Computer Engineering	Government Polytechnic, Mumbai

Coordinator,
Curriculum Development,
Department of Computer Engineering

Head of Department
Department of Computer Engineering

I/C, Curriculum Development Cell

Principal

Programme: Diploma in Computer Engineering (Sandwich Pattern)												
Course Code: CO23103					**Course Title : Computer Hardware and Networking**							
Compulsory / Optional: Compulsory												
Learning Scheme and Credits						**Assessment Scheme**						
CL	**TL**	**LL**	**SLH**	**NLH**	**Credits**	**FA-TH**	**SA-TH (2.30 Hrs.)**	**FA-PR**	**SA**		**SLA**	**Total**
									PR	**OR**		
2	---	4	---	6	3	---	---	50	50@	--	--	100

Total IKS Hrs. for course: 0

Abbreviations: CL- Class Room Learning, TL- Tutorial Learning, LL- Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, SLA- Self Learning Assessment
Legends: @ Internal Assessment, # External Assessment, *# On Line Examination, @$ Internal Online Examination
Note:
1. FA-TH represents two class tests of 20 marks each conducted during the term.
2. SA-TH represents the end term examination.

I. Rationale

It is hard to imagine our lives without computers and internet today. For most of us, the days are few and far between when we do not use our computers to pay bills, play games, surf the internet. Most people need computers and internet to get their professional work done as well. Since computers are such an integral part of our lives, it is crucial that we take care of them by having them properly maintained.

Also here we will study basic concept of networking topologies, network devices used for communication in a network

Diploma students must be able to use and maintain computer system, network devices and its peripherals. This course will help them know computer hardware, computer network topologies and network devices basics and to develop basic skills such as assembling PC and troubleshooting its peripherals, Network Interface card and configuration of various network devices.

II. Industry / Employer Expected Outcome

Student will be able to

1. Troubleshoot the problems in assemble and dissemble of PC.
2. Configuration of various network devices and troubleshoot the nonfunctioning of it.

III. Course Outcomes:

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

CO1	Identify various internal and external hardware components to assemble computer system.
CO2	Install operating system and configure it.
CO3	Implement hardware virtualization and use cloud services.
CO4	Understand basic concepts of network and identify different network hardware components.
CO5	Identify the given topology and configure its IP addresses.

Course Content Details:

Unit No.	Teaching Learning Outcome	Topics / Sub-topics
1	**TLO 1.1.** Identify internal components of computer system. **TLO 1.2.** Identify external components of computer system. **TLO 1.3.** assemble computer system.	**Computer Hardware & Peripherals** **1.1 Internal Components** Introduction to PC architecture, Microprocessor, Motherboard, Memory (Primary & Secondary), Chipset, BIOS and POST, IDE/PATA & SATA Devices(Hard Disk Drive and CD/DVDs Drives), SMPS, Zip Drive, Backup Drive, Expansion Cards- LAN Card, IDE Card, VGA and SVGA Cards, Sound Card,, Interface Card, I/O Cards, Video Cards, USB Card, Internal Ports, Cables and Connector Types. **1.2 External Components** Monitor and types of Monitors, Printers and types of Printers, Scanner, Keyboard, Mouse, Modem, Digital Camera, Sound, Ports and Connectors, Batteries, Power Supply, Pen Drives, SCSI interface devices. **1.3 Assembling Computer** Overview of the Assembly Process and Safety Issues, Creating a Computer Inventory, The Computer Case and Power Supply, Preparing the Motherboard for Installation, Installing the Motherboard, Installing the Floppy Drive, Hard Drive, CD-ROM, and DVD, Video Card Installation, Booting the System for the First Time. **Course Outcome: CO1** **Teaching Hours: 08 hrs.**

2	**TLO 2.1.** Install operating system and install basic software's. **TLO 2.2.** Install and configure given hardware device. **TLO 2.3.** Use diagnostic tools for PC maintenance.	**Operating System & Diagnostic Tools:** **2.1 Operating System & Software Installation:** Installation of Operating System and types of operating systems, Functions of Operating System, File system (FAT and NTFS), Window installation, Unix, and Linux, installing application software and settings, Backup and Restore, Trouble shooting and referring manuals. **2.2 Device Installation** Graphic Card, Sound Card, LAN Card, Wireless LAN Card, SCSI Card, External Drive, Flash Cards, Web Camera, CCTV Camera, Mobile Devices, Modem, Printer, Projector **2.3 Diagnostic Tools & PC Maintenance** introduction to Diagnostic tools, Virus & its types, Effect of virus on computer system, Installing & Configuring Antivirus Software, setting of Firewall, Data Recovery, PC care & maintenance, Electrical Power Issues, Troubleshooting PC Hardware, Solutions for common computer issues (computer doesn't start, devices not working/recognize, applications running slowly/hang, Not enough space etc.), Handling issues related to printer (paper jam, printer isn't printing, paper size mismatch, Printer error etc.), Handling issues related to scanner (paper jam, poor image quality etc.) , using projector. **Course Outcome: CO2** **Teaching Hours: 08 hrs.**
3	**TLO 3.1** Install Virtual machine and use any open-source cloud services.	**Introduction to Cloud Computing and Virtualization:** **3.1** From Mainframe to cloud, benefits of cloud computing, hardware Virtualization, essentials of cloud characteristics, challenges, cloud economics, cloud types and service models, cloud computing platforms. **Course Outcome: CO3** **Teaching Hours: 04 hrs.**
4	**TLO 4.1** Understand basic concepts of network. **TLO 4.2** Identify network hardware components.	**Network Essentials & Management:** **4.1 Basic Concepts of Network** What is Network, Computer Network Architecture (Peer to Peer network and Client/ Server network), Network Types (LAN, MAN, WAN), Internetwork and types of internetwork (Intranet and Extranet).

		4.2 Network Hardware Components Network Cables and Connectors, Networking Devices (Modem, NIC, HUB, Bridge, Switch, Repeaters, Router, and Gateway etc.). **Course Outcome: CO4** **Teaching Hours: 05 hrs.**
5	**TLO 5.1** Identify given network topology. **TLO 5.2** Configure IP address of your machine.	**Network Topologies and IP Addressing** **5.1 Network Topologies:** Introduction, Definition, Selection Criteria, Types of Topologies – Bus, Ring, Star, Mesh, Tree, Hybrid. **5.2** Introduction to TCP/IP and sub-netting, IP Address: Networks & Hosts, Subnet mask, Network Classes, Configuring IP address and sub-netting, Troubleshooting **Course Outcome: CO5** **Teaching Hours: 05 hrs.**

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

Sr. No.	Laboratory Learning Outcome	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
1	**LLO 1.1** Identify type of desktop and laptop and connect I/O devices.	Identify Motherboard Components and connections. CPU (Processor), RAM (Memory), Hard Drive Connections, Mechanical vs. Solid State Drives, ROM Drives, Graphic Cards, Sound Cards.	4	CO1
2	**LLO 1.2** Install local printer (Software configuration settings on printer and Troubleshooting.	Install local printer (Software configuration settings on printer and Troubleshooting.	2	CO1
3	**LLO 1.3** Assemble new PC and Install required software.	Assemble new PC and Install required software.	4	CO1
4	a. **LLO 2.1** Create a bootable device using pen drive/DVD. b. **LLO 2.1** Write the contents of files/folders to CD/DVD	a. Create a bootable device using pen drive/DVD. b. Write the contents of files/folders to CD/DVD.	2	CO2

5	**LLO 2.1** Install Windows OS & Verify components with the configuration of CMOS, BIOS set up	Install Windows OS through a BOOTABLE device and Verify components with the configuration of CMOS, BIOS set up.	4	CO2
	LLO 2.1 Install Linux, Partition the disk, Format the drive.	Install Linux (Ubuntu, Fedora, Debian, Red hat) OS through a BOOTABLE device. Partition the disk, Format the drive.	4	CO2
6	**LLO 2.2** Partition and manage hard disk	Partition and manage hard disk: format hard drives with different file systems.	2	CO2
7	**LLO 2.3** boot Windows in UEFI mode	Boot Windows in UEFI mode.	2	CO2
9	**LLO 2.3** Troubleshooting of Common problems of a PC and its solution.	Troubleshooting of Common problems of a PC and its solution.	2	CO2
10	**LLO 2.3** Installation & configuration of camera, mic, scanner, printer, projector.	Installation & configuration of camera, mic, scanner, printer, projector.	2	CO2
11	**LLO 2.3** Install any popular antivirus software & view its various options. On and off Firewall option inside antivirus software.	Install any popular antivirus software. Online updating of antivirus. View its various options. On and off Firewall option inside antivirus software.	2	CO2
12	**LLO 3.1** Use common cloud services such as Office 365, Google Drive, and Drop box.	Use common cloud services such as Office 365, Google Drive, and Drop box	2	CO3
13	**LLO 3.1** Creating Virtual Machines, installing Operating system and applications on Virtual Machine.	Creating Virtual Machines, installing Operating system and applications on Virtual Machine.	4	CO3
14	**LLO 3.1** Create and document the process of creating a Microsoft Azure Account (or any other free).	Create and document the process of creating a Microsoft Azure Account (or any other free).	2	CO3
15	**LLO 3.1** Create a free Microsoft Azure (or any other free) account and explore its management console.	Create a free Microsoft Azure (or any other free) account and explore its management console.	2	CO3
16	**LLO 3.1** Case Study: PAAS (Facebook, Google App Engine).	Case Study: PAAS (Facebook, Google App Engine).	4	CO3
17	**LLO 4.1** Connect the computers in a	Connect the computers in a laboratory using	2	CO4

	laboratory using peer to peer type of connection.	peer to peer type of connection.		
18	**LLO 4.1** Identify various Network devices.	Identify various Network device like: (a) Switch (Normal and Managed), (b) Router (Normal and wireless), (c) Rack, Patch Panel, I/O box, (d) Access Point etc.	2	CO4
19	**LLO 4.2** Practice crimping with straight and cross CAT 6 cables.	Practice crimping with straight and cross CAT 6 cables.	2	CO4
20	**LLO 5.1** Identify and draw the topology used in your laboratory.	Identify and draw the topology used in your laboratory.	2	CO4
21	**LLO 5.2** Configure the IPv4 address and identify the MAC address.	Configure the IPv4 address and identify the MAC address of your machine.	2	CO5
22	**LLO 5.2** Setup of basic collaboration tool for remote desktop access and control.	Setup of basic collaboration tool for remote desktop access and control.	2	CO5
23	**LLO 5.2** Sharing files, folders, and Printer in a Network.	Sharing files, folders, and Printer in a Network.	2	CO5
24	**LLO 5.2** Execute basic Networking commands.	Execute basic Networking commands: Ping, ipconfig, tracert, netstat, route.	2	CO5

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

1. Arrange PA system for the function in the department.
2. Configure UPS.
3. Setting Surveillance camera for home security.
4. Set up a projector for the conference in your institute.
5. Setting Up Your Own Personal Home Cloud.
6. IP based patient monitoring system.
7. Home Automation system using Wi-Fi.

VI. Assessment Methodologies/Tools

Formative assessment (Assessment for Learning)

- Rubrics for continuous assessment based on practical performance indicators

Summative Assessment (Assessment of Learning)

End term examination practical performance and Viva-voce.

VII. 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	1	-	-	-	1	-	3	2
CO2	3	3	2	-	-	1	1	2	2	2
CO3	3	2	2	1	-	2	1	3	2	-
CO4	3	2	1	-	-	1	1	-	3	1
CO5	3	2	1	1	1	2	1	1	2	2
Legends: - High:03, Medium:02, Low:01, No Mapping: -										

VIII. Suggested Learning Materials / Books

Sr. No.	Author	Title	Publisher
1	A Panel of **Authors**	Computer Hardware & Networking	Computech Publications Limited
2	Nurul Sarkar	Computer Networking & Hardware Concepts	Information Science Publishing

IX. Learning Websites & Portals

Sr.No	Link / Portal	Description
1	Computer Hardware, Operating System and Networking | Udemy	Online course
2	Best Computer Hardware Courses & Certificates Online [2024] | Coursera	Online course
3	Best Online Computer Hardware Courses and Programs | edX	Online course
4	Cisco Networking Academy. Build your skills today, online. It's Free - Cisco	Online course

X. Academic Consultation Committee/Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
1	Mr. Atul Jadhav	Founder	9TH Legends Pvt,Ltd
2	Mr. Samit Shukla	Assistant Manager	L & T Infotech,Pune
3	Miss. A. V. Wankar	Lecturer in Computer Engineering	Government Polytechnic, Mumbai
4	Mrs. V. A. Patil	Lecturer in Computer Engineering	Government Polytechnic, Mumbai

Coordinator, Head of Department
Curriculum Development, Department of Computer Engineering
Department of Computer Engineering

I/C, Curriculum Development Cell Principal

Programme : Diploma in Computer Engineering (Sandwich Pattern)													
Course Code: CO23104					**Course Title : Data Structures**								
Compulsory / Optional: Compulsory													
Learning Scheme and Credits						**Assessment Scheme**							
CL	**TL**	**LL**	**SLH**	**NLH**	**Credits**	**FA-TH**		**SA-TH (2.30Hrs.)**	**FA-PR**	**SA**		**SLA**	**Total**
						T1	**T1**			**PR**	**OR**		
03	---	04	1	6	3	20	20	60	25	25		25	175

Total IKS Hrs. for course: 0

Abbreviations: CL- Class Room Learning, TL- Tutorial Learning, LL- Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, SLA- Self Learning Assessment
Legends: @ Internal Assessment, # External Assessment, *# On Line Examination, @$ Internal Online Examination
Note:
1. FA-TH represents two class tests of 20 marks each conducted during the term.
2. SA-TH represents the end term examination.

I. Rationale

The study of Data Structure is essential part of Computer Science. Data structure is a logical and mathematical model for storing and organizing data in a particular way in a computer. The study of data structure helps the students in developing logic and structured programs.

II. Industry / Employer Expected Outcome

Student will be able to

1. Develop solutions to the given problem statements.

III. Course Outcomes:

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

CO1	Demonstrate different Data Structures.
CO2	Use Stack and recursion concept
CO3	Implement the Queue and its operations
CO4	Use Linked List, Tree and Graph, Blockchain
CO5	Implement different Searching and Sorting Techniques.

Course Content Details:

Unit No.	Teaching Learning Outcome	Topics / Sub-topics
1	**TLO 1.1.** Classify given Data Structure based on their characteristics **TLO 1.2.** Perform Different operations on different types of Data Structures.	**Introduction to Data Structures**: **1.1** Concept and Need of data structures. **1.2** Definition of Data structure and Abstract Data Type. **1.3** Classification of Data structures: Linear, non-linear, homogeneous , non-homogeneous, static & dynamic **1.4** Operations on Data Structures **Course Outcome: CO1 Teaching Hours: 05hrs Marks: 08**
2	**TLO 2.1.** Create Singly Link List **TLO 2.2.** Develop Algorithm to perform different operations on SLL. **TLO 2.3**. Create DLL and perform different operations on DLL	**Linked List** **2.1 Introduction and Terminologies :** Node, Next Address and Pointer, Null pointer, Empty list **2.2 Types of Linked List:** Single Linked List, Doubly Linked List, Circular Linked List Doubly Circular Linked List **2.3 Operations on Single Linked List**: Searching, Insertion - (At Front ,In between and At End), Deletion - (From Front ,In between, From End) **2.4 Blockchain data structure:** Introduction to Blockchain , Applications of Blockchain **Course Outcome: CO4 Teaching Hours :08 Marks: 12**
3	**TLO 3.1** Develop an algorithm and program to perform PUSH and POP operation **TLO 3.**2 Conver Infix expression into Postfix expression	**Stacks** 3.1 Definition & examples of Stack, Stack as an abstract data type implementations using arrays and dynamic memory allocation **3.2 Operations on Stack :** PUSH, POP, Top Of The Stack **3.3** Overflow & Underflow of Stack **3.4 Applications of Stack** : Polish Notation : Conversion of Infix to Postfix expression, Evaluation of Postfix expression Reversing a List Recursion **Course Outcome: CO2 Teaching Hours : 06 Marks: 08**
4	**TLO 4.1** Develop an algorithm and program to perform INSERT and DELETE operations on various types of Queues	**Queue** 4.1 Definition & examples of Queue ,Queue as an Abstract Data Type , Implementations using arrays and dynamic memory allocation 4.2 Operations on Queue: INSERT , DELETE 4.3 Types of Queue: Priority queue Circular queue 4.4 Application Of Queue **Course Outcome:CO3 Teaching Hours :08 Marks: 08**

5	**TLO 5.1.** Draw BST for given set of nodes. **TLO 5.2** Write algorithm to traverse tree for given method. **TLO 5.3** Represent given Graph using adjacency matrix	**Trees and Graphs** **5.1** Introduction and Terminologies : Sub-tree, root ,leaf , left, non-leaf, right, parent, child, ancestor, descendant, brother, level, depth, height. **5.2** Types of Tree : General Tree Binary Tree Binary Search Tree **5.3** Representation of Tree **5.4** Operations on Trees : Insertion Deletion Searching - Depth-first search and Breadth-first search Traversing - Pre-order, In-order ,Post-order **5.6** Introduction to GRAPHS Terminologies: graph, node (Vertices), arcs (edge), directed graph, in-degree, out-degree, adjacent, successor, predecessor, relation, weight, path, length. Adjacency Matrix **Course Outcome: CO4 Teaching Hours :10 Marks: 12**
6	**TLO 6.1.**Explain working of different Search Techniques **TLO 6.2.**Explain working of different Sorting Techniques	**Searching and Sorting :** **6.1** Searching : Linear Search Binary Search Hash Search. **6.2** Sorting : Bubble Sort Insertion Sort Selection Sort Merge Sort Quick Sort **Course Outcome: CO5 Teaching Hours :08 Marks: 12**

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

Sr No	Laboratory Learning Outcome	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
1	**LLO 1.1** Perform operations on Array.	Write a program to perform insertion, deletion and searching operations on an Array.	4	CO1
2	**LLO 2. 1** Perform operations on SSL	Write a program to implement following operations on Singly Linked List a)Create b)Insertion c)Deletion	4	CO4
3	**LLO 3. 1** Perform operations on DLL	Write a program to implement following operations on Doubly Linked List a)Create b)Insertion c)Deletion	4	CO4
4	**LLO 3. 1** Perform operations on Circular Singly Linked List	Write a program to implement following operations on Circular Singly Linked List a) Create b) Insertion c) Deletion.	4	CO4

5	**LLO 4.11** Perform operations on Stack	Write a program to implement the PUSH and POP operation of Stack	4	CO2
6	**LLO 5.1** Perform Infix Prefix and Postfix Operation	Write a program to implement Infix, Prefix and Postfix Operation on a given expression. .	4	CO2
7	**LLO 6.1.** Perform operations on Queue.	Write a program to implement different operations on Queue	4	CO3
8	**LLO 7.1** Use of Doubly Ended Queue.	Write a program to implement different operations on Doubly ended Queue.	4	CO3
9	**LLO 8.1** Perform operations on Tree.	Write a program to insert and delete nodes in a Tree.	4	CO4
10	**LLO 9.1** Demonstrate different Traversal methods.	Write a program to implement Inorder, Preorder and Postorder traversal on Tree.	4	CO4
11	**LLO 10.1** Demonstrate different Traversal methods	Write a program to implement depth first search	4	CO5
12	**LLO 10.1** Demonstrate different Traversal methods	Write a program to implement breadth first search.	4	CO5
13	**LLO 11.1** Use different Searching Techniques.	Write a program to implement Linear Search Technique.	2	CO5
14	**LLO 11.1** Use different Searching Techniques.	Write a program to implement Binary Search Technique.	2	CO5
15	**LLO 12.1** Use different Sorting Techniques.	Write a program to implement a) Quick sort b) Bubble sort c) Insertion d) Selection	8	CO5

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

1. Develop a program in C that creates Queue of given persons**.** Shift the original position of a person to a new position based on its changed priority or remove a person from the Queue using Linked List implementation
2. Write a program to implement the do and undo activity using Stack
3. Write a program to implement Ticket Reservation system which is based on following priorities VIP=5, Senior =4, Handicap=3, Ladies=2, General =1
4. Phone directory application using doubly link list.

VI. Specification Table:

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Introduction to Data Structures	02	04	02	08
2	Linked List	02	04	06	12
3	Stack	02	04	02	08
4	Queue	02	02	04	08
5	Trees and Graphs	02	04	06	12
6	Searching and Sorting	02	04	06	12
	Total	**12**	**22**	**26**	**60**

VII. Assessment Methodologies/Tools

Formative assessment (Assessment for Learning)

Rubrics for continuous assessment based on practical performance indicators and self-learning assessment.

Summative Assessment (Assessment of Learning)

End term examination, practical performance.

VIII. Suggested COs - POs Matrix Form

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

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

IX. Suggested Learning Materials / Books

Sr.No	Author	Title	Publisher
1	Seymour Lipschutz ,	Data Structure	Tata McGraw Hill
2	Tremblay, Sorenson	An Introduction to Data Structures with applications	Tata McGrawHill

X. Learning Websites & Portals

Sr.No	Link / Portal	Description
1	http://www.w3schools.com	
2	https://www.javatpoint.com/data-structure-tutorial	
3	https://www.geeksforgeeks.org/data-structures/	

XI.Academic Consultation Committee/Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
1	Mr.ShubhamShimpi	Analyst	Course5i
2	Mr. VaibhavVasani	Assistant Professor	k J. SomaiyaEngg College
3	Mrs. VandanaS.Lokhande	Lecturer in Computer Engineering	Government Polytechnic, Mumbai

Coordinator,
Curriculum Development,
Department of Computer Engineering

Head of Department
Department of Computer Engineering

I/C, Curriculum Development Cell

Principal

Programme : Diploma in CE/CO/EC/EE/IT/IS/LG/LT/ME/RT												
Course Code: CE23301					**Course Title: ENVIROMENTAL STUDIES**							
Compulsory / Optional: Compulsory												
Learning Scheme and Credits						**Assessment Scheme**						
CL	**TL**	**LL**	**SLH**	**NLH**	**Credits**	**FA-TH**	**SA-TH (2 Hrs. 30Min.)**	**FA-PR**	**SA**		**SLA**	**Total**
									PR	**OR**		
-	**-**	**2**	**2**	**4**	**2**	**-**	**-**	**25**	**-**	**@25**	**25**	**75**

Total IKS Hrs. for course: 2

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

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

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

I. Rationale

Environmental studies is the interdisciplinary academic field which systematically studies human interaction with the environment in the interests of solving complex problems. It is a broad field of study that includes also the natural environment, built environment, and the sets of relationships between them. The turn of the twentieth century saw the gradual onset of its degradation through depletion of resources such as air, water and soil; the destruction of ecosystems and the extinction of wildlife by our callous deeds without any concern for the well-being of our surrounding. We are today facing a grave environmental crisis. It is therefore necessary to study environmental issues to realize how human activities affect the environment and what could possibly be the remedies or precautions which need to be taken to protect the environment.

II. Industry / Employer Expected Outcome

Select an industry which is potential pollution causing but following all the norms of CPCB/MPCB and study its pollution mitigation methods

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

CO1	Identify various terms related with environment and importance of the course.
CO2	Identify and distinguish Ecosystems and Biodiversity.
CO3	Identify various types of Environmental Pollutions and specify solutions to environmental problems
CO4	Analyze various Environmental Issues and suggest sustainable development.
CO5	Identify measures taken by the GOI to protect environment.

Course Content Details:

Unit No.	Theory Learning Outcomes (TLO)	Topics / Sub-topics
1	**TLO1.1** Explain the Scope and Importance of the environmental studies **TLO1.2** Explain the importance/ significance of the environmental studies **TLO 1.3** Describe the need for creating public awareness **TLO 1.4** Describe the of ways creating public awareness	**Introduction to Environmental Studies** 1.1 Definition, Scope and Importance of the environmental studies 1.2 Importance/significance of the environmental studies irrespective of course 1.3 Need for creating public awareness about environmental issues 1.4 Ways/means/methods of creating public awareness 1.5 Some important terms related with Environmental Studies **Course Outcome : CO1** **Teaching Hours :4 hrs**
2	**TLO2.1** Explain the concept of Ecosystem **TLO2.2** Explain the classification of Ecosystem **TLO2.3** Explain the basic structure and functions of ecosystem **TLO2.4** Describe energy flow in ecosystem **TLO2.5** State the definition of Biodiversity **TLO2.6** Explain the levels of biodiversity **TLO2.7** Explain the Threats to biodiversity **TLO2.8** Explain the Conservation of biodiversity	**Ecosystems and Biodiversity** 2.1 Concept of Ecosystem 2.2 Classification 2.3 Structure and functions of ecosystem: Basics 2.4 Energy flow in ecosystem: Gross primary product and Net primary product, Autotrophic levels and Bioaccumulation 2.5 Definition of Biodiversity 2.6 Levels of biodiversity: Genetic, Species, Community & Ecosystem 2.7 Threats to biodiversity: Habitat destruction, Invasive species, Genetic pollution, Overexploitation, Hybridization, Climate change & Overpopulation 2.8 Conservation of biodiversity: In-situ & Ex-situ **Course Outcome: CO2** **Teaching Hours :8 hrs**

3	**TLO3.1** Explain the definition of environmental pollution **TLO3.2** Explain the Air pollution **TLO3.3** Explain the Water Pollution **TLO3.4** Explain the Soil Pollution **TLO3.5** Explain the Noise Pollution	**Environmental Pollution** 3.1 Definition of environmental pollution 3.2 Air pollution: Definition, sources, effects, prevention 3.3 Water Pollution: Definition, sources, effects, prevention 3.4 Soil Pollution: Definition, sources, effects, prevention 3.5 Noise Pollution: Definition, sources, effects, prevention **Course Outcome:CO3** **Teaching Hours :6 hrs**
4	**TLO4.1** Explain the development Goals **TLO4.2** Explain the Water conservation with method **TLO4.3** Explain the Rain water harvesting **TLO4.4** Explain the Climate Change: **TLO4.5** Explain the Climate Change: **TLO4.6** Explain the Nuclear Accidents and Holocaust **TLO4.7** Explain the Concept of Carbon Credits and its advantages	**Environmental Issues and Sustainable Development** 4.1 Concept of development and Seventeen Sustainable development Goals 4.2 Water conservation and its method 4.3 Rain water harvesting 4.4 Climate Change: Causes 4.5 Global warming, Acid rain, Ozone Layer Depletion, 4.6 Nuclear Accidents and Holocaust 4.7 Concept of Carbon Credits and its advantages **Course Outcome:CO4** **Teaching Hours :8 hrs**
5	**TLO5.1** Explain the Brief description of various Environmental Acts **TLO5.2** Explain the EIA Clearance procedure **TLO5.3** Explain the Montreal protocol and ozone cell, Wetlands **TLO5.4** Explain the Green Building and rating systems	**Environmental Protection** 5.1 Brief description of the following acts and their provisions: • Environmental Protection Act, 1986 • Air (Prevention and Control of Pollution) Act, 1981 • Water (Prevention and Control of Pollution) Act, 1974 • Wildlife Protection Act 1972 • Forest Conservation Act, 1980 &1988 5.2 EIA Clearance procedure 5.3 Montreal protocol and ozone cell, Wetlands, CDM approval, PARIVESH, Genetic Engineering Appraisal Committee (GEAC) Clearances, Hazardous Waste Import and Export Clearances 5.4 Introduction to Green Building and rating systems **Course Outcome:CO5** **Teaching Hours :4 hrs**

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

Sr No	Laboratory Learning Outcomes (LLO)	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
1	**LLO 1.1** Follow safety rules in environmental studies laboratory.	a) Definition, Scope and Importance of the environmental studies&Some important terms related with Environmental Studies b) Importance/significance of the environmental studies irrespective of course	2	CO1

2	**LLO2.1** Identify the need for creating public awareness about environmental issues and to find Ways/means/ methods of creating public awareness	a) Need for creating public awareness about environmental issues b) Ways/means/methods of creating public awareness	2	CO1
3	**LLO 3.1** Determine the Concept of Ecosystem, Classification, Structure and functions of Ecosystem **LLO 3.2** Identify the Energy flow in ecosystem	a) Concept of Ecosystem, Classification, Structure and functions of ecosystem: Basics, b) Energy flow in ecosystem: Gross primary product and Net primary product, Autotrophic levels and Bioaccumulation	4	CO2
4	**LLO 4.1** Explain the Definition of Biodiversity and to study Levels of biodiversity, Threats to biodiversity **LLO 4.2** Explain the Hybridization, Climate change & Overpopulation, Conservation of biodiversity	a) Definition of Biodiversity, Levels of biodiversity: Genetic, Species, Community & Ecosystem, Threats to biodiversity: Habitat destruction, Invasive species, Genetic pollution, Overexploitation, b) Hybridization, Climate change & Overpopulation, Conservation of biodiversity: In-situ & Ex-situ	4	CO2
5	**LLO 5.1** Explain the Definition of environmental pollution **LLO 5.2** Explain the types of environmental pollution	a) Definition of environmental pollution, Air pollution: Definition, sources, effects, prevention b) Water Pollution: Definition, sources, effects, prevention	4	CO3
6	**LLO 6.1** Explain the Soil Pollution **LLO 6.2** Explain the Noise Pollution	a) Soil Pollution: Definition, sources, effects, prevention b) Noise Pollution: Definition, sources, effects, prevention	2	CO3
7	**LLO 7.1** Explain the Sustainable development Goals **LLO 7.2** Explain the Rain water harvesting	a) Concept of development and Seventeen Sustainable development Goals, Water conservation and its method b) Rain water harvesting, Climate Change: Causes	4	CO4
8	**LLO 8.1** Describe the concept of Global warming, Acid rain, Ozone Layer Depletion, Nuclear Accidents and Holocaust **LLO 8.2** Describe the concept of Carbon Credits and its advantages	a) Global warming, Acid rain, Ozone Layer Depletion, Nuclear Accidents and Holocaust b) Concept of Carbon Credits and its advantages	4	CO4

9	**LLO 9.1** Describe briefly various Environmental Acts **LLO 9.2** Describe Environmental Acts	a) Brief description of the following acts and their provisions, Environmental Protection Act, 1986, Air (Prevention and Control of Pollution) Act, 1981 b) Water (Prevention and Control of Pollution) Act, 1974, Wildlife Protection Act 1972, Forest Conservation Act, 1980 &1988	2	CO5
10	**LLO 10.1** Explain the EIA Clearance procedure **LLO 10.2** Explain the Montreal protocol and ozone cell, Wetlands, CDM approval, PARIVESH, Genetic Engineering Appraisal Committee (GEAC) Clearances, Hazardous Waste Import and Export Clearances	a) EIA Clearance procedure b) Montreal protocol and ozone cell, Wetlands, CDM approval, PARIVESH, Genetic Engineering Appraisal Committee (GEAC) Clearances, Hazardous Waste Import and Export Clearances	2	CO5

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

1. One write-up on each unit (altogether five in number) that summarizes the whole chapter and presents all the important points/material on it.
2. 10 MCQs (twenty questions each) at the start of each tutorial based on the topic of previous tutorial unit

3. project report on any one project of the following:

a) Visit to a local area to document environmental assets suchas river/ forest/ grassland / hill / mountain

b) Visit to a local polluted site: Urban/Rural/Industrial/Agricultural

c) Study of common plants, insects, birds

d) Study of simple ecosystems of ponds, river, hill slopes etc

VI. Formative assessment (Assessment for Learning) for PR and SLA

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

VII. Summative Assessment (Assessment of Learning)

End term examination, Viva-voce, Workshop performance (__marks)

VIII. Suggested COs - POs Matrix Form

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

IX. Suggested Learning Materials / Books

Sr.No	Author	Title	Publisher
01	AninditaBasak	Environmental Studies	Pearson Education
02	R. Rajgopalan	Environmental Studies from Crises to Cure	Oxford University Press
03	Dr. R. J. Ranjit Daniels, Dr. JagdishKrishnaswamy	Environmental Studies	Wiley India

X. Learning Websites & Portals

Sr.No	Link / Portal	Description
1	https://www.engineeringcivil.com	Civil Engg. Portal
2	https://moef.gov.in/	For environmental Info
3	www.youtube.com/	For Various subjects
4	http://civildigital.com	
5	http://www.quora.com	
6	http://www.nationallibrary.gov.in	

XI. Academic Consultation Committee/Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
1	Shri. S D Borkar	Deputy Engineer	PWD
2	Shri. Sudhir Nimbalkar	Assistant Engineer	BMC
3	Mr. K.V. Kelgandre	Sr. Lecturer in Civil Engg.	K.J. Somaiya Polytechnic
4	Dr D K Gupta	HOD in Civil Engg.	Govt. Polytechnic Mumbai

Coordinator,
Curriculum Development,
Department of _____ Engineering

Head of Department
Department of _____ Engineering

I/C, Curriculum Development Cell

Principal