Government Polytechnic, Pune
(An Autonomous Institute of Government of Maharashtra)

Department of Computer Engineering

Level I Curriculum

Foundation Level Courses

Government Polytechnic, Pune

'180 OB' – Scheme

Programme	**Diploma in Computer Engineering**
Programme code	01/02/03/04/05/**06**/07/08/15/16/17/18/19/21/22/23/24/**26**
Name of Course	**Computing Essentials**
Course Code	**CM1101**
Prerequisite course code and name	**NA**
Class Declaration	**No**

1. TEACHING AND EXAMINATIONSCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)		Examination Scheme				
					Theory		Practical		Total Marks
L	**T**	**P**	**C**		**ESE**	**PA**	**ESE**	**PA**	
03	-	-	03	**Marks**	40	10	NA	NA	50
				Exam Duration	**2 Hrs**	**1/2 Hr**			

Legends: L- Lecture, P- Practical, T- Tutorial, C- Credits, ESE-End Semester Examination, PA-Progressive Assessment (Test I, II/Term Work), *- Practical Exam, $- Oral Exam, #- Online Examination each Lecture/Practical period is of one clock hour;

2. RATIONALE

In this world of high-speed computing, it is essential for diploma in Computer Engineering students to know about basics of computer. This course is designed for basic perspective for first year diploma students.

3. COMPETENCY

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

- **Use Computing Essentials to provide various services.**

4. COURSE OUTCOMES(COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry-oriented COs associated with the above-mentioned competency**:**

1. Use of computer system and its peripherals.
2. Understand different Number systems.
3. Understand different storage devices.
4. Understand various computer architectures based on levels
5. Prepare algorithms for given problems.
6. Understand Programming Language paradigm.

5. THEORY COMPONENTS

Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
UNIT I. Classification and Components of Computer System (Weightage- 04, Hours-04)	
1a. To identify components of the PC 1b. To identify characteristics of computer system 1c. To identify the applications of computer system	1.1 What can Computer do 1.2 Applications of Computer 1.3 Components of PC, Characteristics of Computer 1.4 Generation of computer System
UNIT II. Data Representation (Weightage-08, Hours-08)	
2a. To identify various number systems 2b. To understand different codes	2.1 Different Symbols, A Generic Formula. 2.2 Codes: BCD, EBCDIC, ASCII, Unicode 2.3 Number Systems and representation: Decimal, Binary, Octal, Hexadecimal, Converting from One Number System to Another Number System
UNIT III. Main Memory and Secondary Storage Devices (Weightage-08, Hours-10)	
3a. To classify types of memory 3b. To describe various secondary storage devices	3.1 Main memory, Load and store instructions 3.2Transferring data items and records, Cache memory, memory capacity, memory categorization. 3.3 Secondary storage devices: Magnetic tape, magnetic disks, optical disks, memory storage devices
UNIT IV. Computer Architecture (Weightage-08, Hours-10)	
4a.To understand the architecture based on levels 4b. To understand various levels of program 4c. To classify types of software	4.1 A 4GL (User level) program, A 3GL (High Level) Program 4.2 A 2GL (Assembly level) Program, A 1GL (Machine level) Program, 0GL (Hardware level) Program 4.3 Classify various types of Software – System Software: Operating System, Language processors, Utility tools Application Software: Word Processing Software, Electronic Spread-sheet, Database Management System etc.
UNIT V. I/O Media and Algorithms (Weightage-06, Hours-08)	
5a. To differentiate between Hardware and Software 5b. To prepare algorithm and Flowchart for given problem.	5.1 The keyboard, The Screen, LCD, Mouse, Laser Printer, Barcode Reader and RFID 5.2 Algorithms: Introduction, Three basic operations, Procedures and Programs. 5.3 Flow chart: Use of Flowchart, Flowchart Symbols
UNIT VI. Internet and Programming Language (Weightage-06, Hours-08)	

6a. To understand the term Internet and Computer Network 6b .To classify different Programming languages	6.1 History of Internet, its basic services, The WWW, Browsers, Define term: Computer Network and its types 6.2 Introduction to Programming Language: Classification: Analogy with Natural Languages, Machine Language, Assembly Language, High Level Languages 6.3 Basic Concepts: Character set, Constants, variables, Keywords. Data Types, Modules and Separate Compilation

6. SSUGGESTED SPECIFICATION TABLE FORQUESTION PAPERDESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Classification and Components of Computer System	4	2	2	0	4
II	Data Representation	8	5	3	0	8
III	Main Memory and Secondary Storage Devices	10	3	3	2	8
IV	Computer Architecture	10	4	2	2	8
V	I/O Media and Algorithms	8	2	2	2	6
VI	Internet and Programming Language	8	2	2	2	6
Total		**48**	**18**	**14**	**8**	**40**

7. SUGGESTED STUDENT ACTIVITIES

Not Applicable

8. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

a. Massive open online courses (***MOOCs***) may be used to teach various topics/sub topics.
b. About ***15-20% of the topics/sub-topics*** which is relatively simpler or descriptive in nature is to be given to the students for ***self-directed learning*** and assess the development of the COs through classroom presentations.
c. With respect to item No.9, teachers need to ensure to create opportunities and provisions for ***co-curricular activities***.
d. Use different Audio-Visual media for Concept understanding.
e. Guide student(s) in undertaking micro-projects.
f. Demonstrate students thoroughly before they start doing the practice.
g. Observe continuously and monitor the performance of students in Lab.

9. SUGGESTED LEARNINGRE SOURCES

S. No.	Title	Author	Publisher, Edition, Year of publication, ISBN Number
1	Demystifying computer	Achyut Godbole	McGraw Hill Education (1 August 2012), ISBN: 9781259028878, 9781259028878.
2	Computer Fundamentals	Pradeep K. Sinha	BPB Publications, 2004, Edition 4 (reprint), ISBN 10: 8176567523, ISBN 13: 9788176567527

10. SOFTWARE/LEARNINGWEBSITES

1. https://www.nptel.ac.in
2. https://tutorialspoint.com/basics_of_computers/basics_ofcomputers_number_system.htm
3. https://computerhope.com/jargon/s/stordevi.htm

11. PO - COMPETENCY- COMAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	-	1	1	2	1	-
CO2	2	-	2	1	2	1	-
CO3	3	-	3	1	2	1	-
CO4	2	-	2	1	2	1	1
CO5	2	-	2	2	2	1	-
CO6	3	-	2	3	3	1	1

	PSO1	PSO2
CO1	1	-
CO2	-	1
CO3	1	-
CO4	1	1
CO5	-	1
CO6	-	1

Sign: Name: 1. Smt. V.G.Palatse 2. Dr. S.B.Nikam 3. Smt. S.A.Ade (CourseExperts)	Sign: Name: 1. Mr. U.V. Kokate 2. Dr. S.B.Nikam (Head of Department) (Department of Computer Engineering)
Sign: Name: Mr. U.V. Kokate Dr. S.B.Nikam (Programme Head) (Department of Computer Engineering)	Sign: Name: Mr. A.S. Zanpure (CDC In-charge)

Government Polytechnic, Pune

'180 OB' – Scheme

Programme	Diploma in **CE/EE/ET/ME/MT/CM/IT/DDGM**
Programme Code	**01/02/03/04/05/06/07/08/15/16/17/18/19/21/22/23/24/26**
Name of the Course	Communication Skills -I
Course Code	HU1101
Prerequisite	NA
Class Declaration	No

1. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)		Examination Scheme				
					Theory		Practical		Total Marks
L	T	P	C		ESE	PA	$ESE	PA	100
02	01	00	03	Marks	40	10	25	25	
				Exam Duration	2 Hrs	1/2 Hr	---	--	--

Legends: L- Lecture, P- Practical, T- Tutorial, C- Credits ,ESE-End Semester Examination, PA- Progressive Assessment (Test I,II/Term Work) , *- Practical Exam, $- Oral Exam, #- Online Examination Each Lecture/Practical period is of one clock hour;

2. RATIONALE

Communication skills is a natural and necessary part of an organizational life. The goal of communication skills course is to produce civic-minded and competent communicators. At the end, students will acquire proficiency in oral and written methods along with non-verbal communication.

3. COMPETENCY

The aim of this course is to attend following industry competency through various teaching learning experiences:

- **To develop English Language Speaking Abilities, enrich fluency, and to make students get acquainted with basics of communication skills.**

4. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry-oriented COs associated with the above-mentioned competency**:**

1. Communicate effectively to overcome barriers.
2. Apply Nonverbal codes for effective communication.
3. Apply Learning Skills.
4. Interpret information to present orally.
5. Use Language lab for improving listening and speaking abilities

5. SUGGESTED PRACTICALS/ EXERCISES

Sr. No.	Unit No.	TUTORIALS (Outcomes in Psychomotor Domain)	Relevant CO	Approx. Hrs. required
1	1	Introduction to Communication Cycle	1	1
2	1	Analyze Communication Events.	1	1
3	2	Collect Different Pictures Depicting Body actions.	2	2
4	2	Utilize Signs, Symbols & color codes.	2	1
5	3	Loud Reading of Given Paragraph.	3	2
6	3	Utilize Techniques of Listening with the help of lingua phone	3	2
7	4	Topic Writing on Current Issues	4	2
8	4	Comprehending Information and extempore it	4	1
9	5	Practice Vocabulary I (Identify words from various Technical Jargons.)	5	2
10	5	Practice Vocabulary II(Homophones/abbreviations/Synonyms/antonyms)	5	2
11	1 to 5	*Complete the Micro-project as per the guidelines in point no 11 -compulsory.	1 to 5	2
		Total Hrs		**16**

Assignment no 11 is compulsory. *Perform assignment no.4 or 9

Sr. No.	Performance Indicators	Weightage in %
a.	Arrangement of available equipment / test rig or model	-
b.	Setting and operation	-
c.	Safety measures	-
d.	Observations and Recording	40
e.	Interpretation of result and Conclusion	-
f.	Answer to sample questions	30
g.	Submission of report in time	30
	Total	**100**

6. MAJOR EQUIPMENT/ INSTRUMENTS 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	Experiment Sr. No
1	Language Lab	5,6

7. THEORY COMPONENTS

Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit 1 : Introduction and Principles of Communication (08 Hrs, 12 Marks)	
1a. Interpret different communication skills 1b. Define elements of communication 1c. Describe process of communication 1d. Identify barriers for finding remedies 1e. Interpret principles of communication	1.1 Introduction to communication 1.2 Definition and elements of communication 1.3 Process of communication 1.4 Barriers to communication and remedies to overcome it. 1.5 Principles of communication
Unit 2 : Nonverbal Skills (06 Hrs, 10 Marks)	
2a.Differentiate graphic communication 2b.Use different nonverbal codes 2c.Interpret various graphic forms.	2.1 Graphic communication 2.2 Nonverbal codes [Kinesics, Proxemics, Chronemics, Haptics 2.3 Vocalics Dress and Appearance] 2.4 Reading graphic forms [Bar graph, Piechart]
Unit 3 : Learning Skills (06 Hrs, 04 Marks)	
3a.Recall listened information 3b.Apply oral skills 3c.Perceives various fonts & use it 3d.Compose sentences & paragraphs	3.1 Listening skills 3.2 Speaking skills 3.3 Reading skills 3.4 Writing Skills
Unit 4 Comprehension (06 Hrs, 06 Marks)	
4a. Improve writing techniques 4b. Interpret information 4c. Summarize to extempore	4.1 Topic Writing (current issues) 4.2 Comprehend various information 4.3 Extempore some current Activities
Unit 5 Language Skills (06 Hrs, 08 Marks)	
5a. Use phonetic signs and symbols for pronunciation 5b. Practice Pronunciation using lingua-phone 5c. Utilize listening skills 5d. Classify jargon wise vocabulary for improvement	5.1 Phonetics (Practice of pronunciation) 5.2 Listening skills 5.3 Use of lingua-phone (language lab) 5.4 Vocabulary building

8. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Introduction and principles of communication	08	04	06	02	12
II	Nonverbal Communication	06	02	02	06	10
III	Learning Skills	06	00	00	04	04
IV	Comprehension	06	00	02	04	06
V	Language skills	06	-	02	06	08
Total		**32**	**06**	**12**	**22**	**40**

9. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related ***co-curricular*** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 5 pages for each activity, also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

a. Prepare journal based on practical performed inLing phone laboratory. Journal consists of drawing, observations, required equipment's, date of performance with teacher signature.
b. Collection of Paper cuttings from magazines, Newspapers, periodicals etc
c. Encyclopedia

10. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

a. Massive open online courses (***MOOCs***) may be used to teach various topics/sub topics.
b. About ***15-20% of the topics/sub-topics*** which is relatively simpler or descriptive in nature is to be given to the students for ***self-directed learning*** and assess the development of the COs through classroom presentations (see implementation guideline for details).
c. With respect to item No.8, teachers need to ensure to create opportunities and provisions for ***co-curricular activities***.
d. Guide student(s) in undertaking micro-projects.
e. Correlate subtopics with power plant system and equipment.
f. Use proper equivalent analogy to explain different concepts.
g. Use Flash/Animations to explain various components, operation and
h. Teacher should ask the students to go through instruction and Technical manuals

11. SUGGESTED MICRO-PROJECTS

. *Only one micro-project* is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project are group-based. However, in the fifth and sixth semesters, it should be preferably be ***individually*** undertaken to build up the skill and confidence in every student to become

problem solver so that s/he contributes to the projects of the industry. 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 POs, UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than ***16 (sixteen) student engagement hours*** during the course. 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. Student must collect pictures depicting various body actions.
b. Students should utilize signs, symbols, signals and color code to represent traffic signals.
c. Student should prepare a table of Jargon wise vocabulary of various technical domains.
d. Student should extempore on a given topic.
e. Student should collect abbreviations related to corporate world.

12. SUGGESTED LEARNING RESOURCES

Sr. No.	Author	Title	Publication	ISBN
1	Joyeeta Bhatacharya	Communication skills	Macmillan Co.	--
2	Sarah Freeman	Written communication in English	Orient Longman Ltd.	ISBN- 13 : 978-8125004264
3	Krishna Mohan and Meera Banerji	Developing Communication skills	Macmillan India Ltd.	0333929195 9780333929193

13. SOFTWARE/LEARNING WEBSITES

1. www.talkenglish.com
2.Edutech.com
3.Swayam.com
4 .www.mooc.org

14. PO - COMPETENCY- CO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	-	-	1	-	-	1
CO2	3	-	-	-	1	-	1
CO3	3	1	-	-	1	1	1
CO4	3	-	-	-	1	-	1
CO5	2	-	-	-	1	-	1

1) Civil Engineering

	PSO1	PSO2	PSO3
CO1	1	1	-
CO2	1	2	-
CO3	1	1	-
CO4	1	1	-
CO5	1	1	1

2) Electrical Engineering

	PSO1	PSO2	PSO3	PSO4
CO1	1	1	2	2
CO2	1	1	1	1
CO3	1	1	1	1
CO4	1	1	1	1
CO5	1	1	1	1

3) Electronics and Telecommunication Engineering

	PSO1	PSO2	PSO3
CO1	-	2	-
CO2	1	-	-
CO3	-	1	1
CO4	1	1	-
CO5	-	1	-

4) Mechanical Engineering

	PSO1	PSO2
CO1	1	1
CO2	2	1
CO3	1	1
CO4	1	1
CO5	1	1

5) Metallurgical Engineering

	PSO1	PSO2	PSO3	PSO4
CO1	-	-	-	3
CO2	-	-	-	1
CO3	-	-	-	2
CO4	-	-	-	2
CO5	-	-	-	1

6) Computer Engineering

	PSO1	PSO2
CO1	1	1
CO2	1	1
CO3	1	1
CO4	1	1
CO5	1	1

7) Information Technology

	Hardware and Networking	Database Technologies	Software Development
CO1	2	2	2
CO2	-	-	1
CO3	1	1	1
CO4	2	2	2
CO5	2	2	2

8) Dress Designing and Garment Manufacture

	PSO1	PSO2
CO1	1	1
CO2	1	1
CO3	1	1
CO4	1	1
CO5	1	1

Sign: Name: Smt. S. C. Patil (Course Expert)	Sign: Name: (Head of Department)
Sign: Name: U.V. Kokate Dr. S. B. Nikam (Programme Head)	Sign: Name : Mr.A.S.Zanpure (CDC)

Government Polytechnic, Pune

'180 OB' – Scheme

Programme	Diploma in **ET/CE/EE//ME/MT/CM/IT/DDGM**
Programme code	**01/02/03/04/05/06/07/08/16/17/21/22/23/24/26**
Name of Course	Communication Skills II
Course Code	HU1102
Prerequisite	HU1101
Class Declaration	No

1. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	**T**	**P**	**C**	**ESE**	**PA**	**ESE**	**PA**	100
02	01	00	03	40	10	NA	50	
			Exam Duration	**2 Hrs**	**1/2 Hr**	**---**	**--**	**--**

Legends: L- Lecture, P- Practical, T- Tutorial, C- Credits, ESE-End Semester Examination, PA- Progressive Assessment (Test I,II/Term Work) , *- Practical Exam, $- Oral Exam, #- Online Examination Each Lecture/Practical period is of one clock hour;

2. RATIONALE

Communication skills course is used in all spheres of human life – personal, social and professional. Students will get fair knowledge of communication skills to handle the future jobs in industry. This course includes the practice of oral and written communication, correspond with others and give presentations**.**

3. COMPETENCY

The aim of this course is to attend following industry competency through various teaching learning experiences:

- **To build confidence in written correspondence required in technical fields.**

4. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry-oriented COs associated with the above-mentioned competency**:**

1. Prepare various speeches for presentation
2. Write application for Business purposes.
3. Write various technical reports.
4. Write business letters.

5. SUGGESTED PRACTICALS/ EXERCISES

The practicals in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency**:**

S. No.	Unit No.	TUTORIALS (Learning Outcomes in Psychomotor Domain)	CO No	Approx. Hrs. required
1	1	Practice to write various speeches like vote of thanks, guest introduction etc.	1	2
2	1	Write job application, resume, leave application	3	2
3	2	Draft a project report to start a new industry (Or to write down the market survey report)	2	2
4	3	Prepare industrial visit report after visit	3	1
5	3	Write a placing an order letter, complaint letter	3	2
6	4	Write a joining letter	4	1
7	3	Draft a notice, circular and memorandum	3	2
8	3	Write a fall in production report	3	1
9	3	Work progress report	3	1
10	4	Description of devices	4	2
11 *	all	Complete a micro project based on guidelines provided in Sr. No. 11	All	2
		Total		16

* Sr. No. 11 is compulsory, perform Sr. No. 3 or 7

Sr. No.	Performance Indicators	Weightage in %
a.	Arrangement of available equipment / test rig or model	-
b.	Setting and operation	-
c.	Safety measures	-
d.	Observations and Recording	50
e.	Interpretation of result and Conclusion	20
f.	Answer to sample questions	20
g.	Submission of report in time	10
	Total	**100**

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

NA

7. THEORY COMPONENTS

Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit 1 Writing Speeches (08 Hrs, 10 Marks)	
1a. Give in own words the introduction of guest. 1b. Express feelings in own words to welcome 1c. Express feelings in own words for Farewell Speech 1d . Give in own words the vote of thanks	1.1 Introduction of guest 1.2 Welcome speech 1.3 Farewell speech 1.4 Vote of thanks
Unit 2 Writing Applications (06 Hrs, 08 Marks)	
2a. Write official correspondence for Job 2b. Application with Resume 2c. Write application for leave. 2d. Write application for getting NOC from corporation. 2e. Students can write various applications	2.1 Job application with resume 2.2 Leave application 2.3 Miscellaneous applications
Unit 3 Writing Reports and Notices (10 Hrs, 10 Marks)	
3a. Students can write Industrial visit report after visit. 3b. Students can write survey report. 3c. Students can write Fall in production report. 3d. Students can draft circular and other notices. 3e. Students can draft Memos.	3.1 Visit report 3.2 Survey report (feasibility report) 3.3 Fall in production report 3.4 Circular/notice 3.5 Memos
Unit 4 Drafting Business Letters (08 Hrs, 12 Marks)	
4a. Students can write Enquiry Letter. 4b. Students can write Placing an order letter. 4c. Student can write Complaint Letter. 4d. Students can write Appointment Letter. 4e. Students can draft Joining Letter.	4.1 Enquiry letter 4.2 Placing an order letter 4.3 Complaint letter 4.4 Appointment letter 4.5 Joining letter

8. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Writing speeches	08	2	2	6	10
II	Writing applications	06	2	2	4	08
III	Writing Reports and Notices	10	2	2	6	10
IV	Business letters	08	2	4	6	12
Total		**32**	**8**	**10**	**22**	**40**

9. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related ***co-curricular*** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 5 pages for each activity, also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

a. Prepare journal based on practical performed in Lingua- phone- laboratory. Journal consists of drawing, observations, required equipment's, date of performance with teacher signature.

10. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

a. Massive open online courses (***MOOCs***) may be used to teach various topics/sub topics.
b. About ***15-20% of the topics/sub-topics*** which is relatively simpler or descriptive in nature is to be given to the students for ***self-directed learning*** and assess the development of the COs through classroom presentations (see implementation guideline for details).
c. With respect to item No.8, teachers need to ensure to create opportunities and provisions for ***co-curricular activities***.
d. Guide student(s) in undertaking micro-projects.
e. Correlate subtopics with power plant system and equipment.
f. Use proper equivalent analogy to explain different concepts.
g. Use Flash/Animations to explain various components, operation and
h. Teacher should ask the students to go through instruction and technical manuals

11. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project is group-based. However, in the fifth and sixth semesters, it should be preferably be ***individually*** undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. 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. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than ***16 (sixteen) student engagement hours*** during the course. The student ought to submit micro-project by the end of the semester to develop the industry-oriented COs.

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

1. Practice to write various speeches and give speech on any of it.
2. Draft personal Resume/ Biodata/CV
3. For drafting project report to start a new industry student should have a market survey and search other accepts to be and an entrepreneur
4. Prepare an industrial visit report after visiting an industry.
5. Describe various technical devices and prepare a PPT on any one of it.

12. SUGGESTED LEARNING RESOURCES

Sr. No.	Author	Title	Publication	ISBN
1	Joyeeta Bhatacharya	Communication skills	Macmillan Co.	--
2	Sarah Freeman	Written communication in English	Orient Longman Ltd.	ISBN- 13 : 978-8125004264
3	Krishna Mohan and Meera Banerji	Developing Communication skills	Macmillan India Ltd.	0333929195 9780333929193
4	Sanjay Kumar and Push Lata	A Workbook Communication Skills	Oxford University Press. India.	ISBN -9780199488803 Publication Date 15/6/2018
5	Jeya Santhi.V. ,Dr. R.Selvam	Advanced skills for communication in English	New Century Book House.	ISBN -978-81-2343-101-7 Publication Date December 2015

13. SOFTWARE/LEARNING WEBSITES

1. www.talkenglish.com
2. Edutech.com

3. www.makeuseof.com
4. www.mooc.org

14. CO –PSO- CO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	-	1	3	1	2
CO2	3	1	-	-	2	1	3
CO3	3	3	-	1	2	1	3
CO4	3	2	-	1	2	-	3

CO- PSO MAPPING

1) Civil Engineering

	PSO1	PSO2	PSO3
CO1	1	1	-
CO2	3	-	1
CO3	3	-	1
CO4	2	-	2

2) Electrical Engineering

	PSO1	PSO2	PSO3	PSO4
CO1	-	1	1	2
CO2	1	1	1	2
CO3	1	1	2	2
CO4	1	1	2	2

3) Electronics and Telecommunication Engineering

	PSO1	PSO2	PSO3
CO1	-	2	-
CO2	1	2	-
CO3	1	2	1
CO4	-	2	1

4) Mechanical Engineering

	PSO1	PSO2
CO1	-	1
CO2	-	2
CO3	1	1
CO4	1	1

5) Metallurgical Engineering

	PSO1	PSO2	PSO3	PSO4
CO1	-	-	-	2
CO2	-	-	-	2
CO3	-	-	-	2
CO4	-	-	-	2

6) Computer Engineering

	PSO1	PSO2
CO1	-	-
CO2	1	1
CO3	1	1
CO4	1	1

7) Information Technology

	Hardware and Networking	**Database Technologies**	**Software Development**
CO1	2	2	2
CO2	1	1	1
CO3	2	2	2
CO4	1	1	1

8) Dress Designing and Garment Manufacture

	PSO1	PSO2
CO1	1	1
CO2	1	1
CO3	1	1
CO4	1	1

Sign: Name: Smt. S. C. Patil (Course Expert)	Sign: Name : (Head of Department)
Sign: Name: U.V. Kokate Dr. S. B. Nikam (Program Head)	Sign: Name : Shri.A.S.Zanpure (CDC)

GOVERNMENT POLYTECHNIC, PUNE

'180 OB' – Scheme

Programme	Diploma in CE/**EE/ET/ME/MT/CM/IT**
Programme code	**01/02/03/04/05/06/07/15/16/17/18/19/21/22/23/24/26**
Name of Course	**APPLIED MATHEMATICS I**
Course Code	SC1101
Prerequisite	NA
Class Declaration	**No**

1. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)		Examination Scheme				
					Theory		Tutorials		Total Marks
L	T	P	C		ESE	PA	ESE	PA	
03	02	00	05	**Marks**	80	20	NA	25	125
				Exam Duration	3 Hrs	1 Hr		--	—

Legends : L- Lecture, P- Practical, T- Tutorial, C- Credits ,ESE-End Semester Examination, PA- Progressive Assessment (Test I,II/TermWork) , *- Practical Exam, $- Oral Exam, #- Online Examination each Lecture/Practical period is of one clock hour;

2. RATIONALE

The students of Diploma in Engineering and technology must acquire some essential competencies in Mathematics

3. COMPETENCY

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

- **Solve various engineering related problems using the principles of applied mathematics**

4. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency**:**

1. Apply the concepts of algebra to solve engineering related problems.
2. Utilize basic concepts of trigonometry to solve elementary engineering problems.
3. Solve basic engineering problems under given conditions of straight lines.
4. Solve the problems based on measurement of regular closed figures and regular solids.

5. SUGGESTED PRACTICALS/ EXERCISES

Expt. Sr. No.	Unit No.	Practical Exercises (Learning Outcomes in Psychomotor Domain)	Relevant CO	Approx. Hrs. required
1	1	Solve simple problems of Logarithms based on definition and laws	1	2
2	1	Solve problems on determinants to find the area of the triangle and solution of simultaneous equations by Cramer's Rules.	1	4
3	1	Resolve into partial fraction using linear non repeated, repeated and irreducible factors.	1	4
4	2	Solve problems on Compound, Allied, multiple and sub multiple angles.	2	4
5	2	Practice problems on factorization and de factorization.	2	2
6	2	Solve problems on inverse circular trigonometric ratios.	2	2
7	3	Practice problems on equations of straight lines using different forms.	3	4
8	3	Solve problems on perpendicular distance, distance between two parallel lines, and angle between two lines.	3	2
9	4	Solve problems on Area, such as rectangle, triangle, and circle.	4	2
10	4	Solve problems on surface and volume, sphere, cylinder and cone.	4	2
11	ALL	Complete a Micro- project as per the guidelines in point no. 11 towards the fulfillment of the COs of the course.	ALL	4
		Total		32

Sr. No.	Performance Indicators	Weightage in %
a.	Prepare experimental set up	-
b.	Handling of instruments during performing practical.	-
c.	Follow Safety measures	-
d.	Accuracy in calculation	20
e.	Answers to questions related to performed practices.	40
f.	Submit journal report on time.	20
g.	Follow Housekeeping	10
h.	Attendance and punctuality	10
Total		**100**

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

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

S. No.	Equipment Name with Broad Specifications	PrO. No.
1	LCD Projector	1-11
2	Interactive Classroom	1-11

7. THEORY COMPONENTS

Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Units I : Algebra (12 hrs, 24 marks)	
1a. Solve the given simple problem based on laws of logarithm. 1b. Calculate the area of the given triangle by determinant method. 1c. Solve a given system of linear equations using Cramer's rule. 1d. Obtain the proper and improper partial fraction for the given simple rational function	1.1 Logarithm: Concept and laws of logarithm 1.2 Determinant a. Value of determinant of order 3x3 b. Solutions of simultaneous equations in three unknowns by Cramer's rule. 1.3 Partial Fractions: Types of partial fraction based on nature of factors and related Problems.
Unit II: Trigonometry (18 hrs, 24 marks)	
2a. Apply the concept of Compound angle, allied angle, and multiple angles to solve the given simple engineering problems. 2b. Apply the concept of Sub- multiple angle to solve the given simple engineering related problem 2c. Apply the concept of factorization and defactorization formulae to solve the given simple engineering problems. 2d. Investigate given simple problems utilizing inverse trigonometric ratios.	2.1 Trigonometric ratios of allied angles, compound angles, multiple angles (2A, 3A), submultiples angles.(without proof) 2.2 Factorization and De factorization formulae (without proof). 2.3 Inverse Trigonometric Ratios and related problems 2.4 Principle values and relation between trigonometric and inverse trigonometric ratios.
Unit III: Coordinate geometry (09 hrs, 16 marks)	
3a. Calculate angle between given two straight lines. 3b. Formulate equation of straight lines related to given engineering problems. 3c. Identify perpendicular distance from the given point to the line.. 3d.Calculate perpendicular distance between the given two lines.	3.1 Straight line and slope of straight line a. Angle between two lines. b. Condition of parallel and perpendicular lines. 3.2 Various forms of straight lines. a. Slope point form, two point form. b. Two points intercept form. c. General form. 3.3 Perpendicular distance from a Point on the line. 3.4 Perpendicular distance between two parallel lines
Unit IV: Mensuration (09 hrs, 16 marks)	
4a. Calculate the area of given triangle and circle 4b. Determine the area of the given square, parallelogram, rhombus, trapezium. 4c. Compute surface area of given cuboids,	4.1 Area of regular closed figures, Area of triangle, square, parallelogram, rhombus, trapezium and circle. 4.2 Volume of cuboids, cone, cylinders and sphere.

Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
sphere, cone and cylinder. 4d. Determine volume of given cuboids, sphere, cone and cylinder.	

8. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Algebra	12	6	12	6	24
II	Trigonometry	18	6	6	12	24
III	Coordinate geometry	09	2	6	8	16
IV	Mensuration	09	2	6	8	16
Total		**48**	**16**	**30**	**34**	**80**

9. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related ***co-curricular*** activities which can be undertaken to accelerate the attainment of the various outcomes in this course:

a. Identify engineering problems based on real world problems and solve them with the use of free tutorials available on the internet.

b. Use graphical softwares': EXCEL, DPLOT and GRAPH for related topics.

c. Use Mathcad as a Mathematical Tool and solve the problems on Calculus.

d. Identify problems based on applications of differential equations and solve these problems.

10. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

a. Massive open online courses (***MOOCs***) may be used to teach various topics/subtopics.

b. About ***15-20% of the topics/subtopics*** which is relatively simpler or descriptive in nature is to be given to the students for ***self-directed learning*** and assess the development of the COs through classroom presentations (see implementation guideline for details).

c. Use Flash/Animations to explain various components, operation and

d. Teacher should ask the students to go through instruction and Technical manuals

11. SUGGESTED MICRO-PROJECTS

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 a micro-project by the end of the semester to develop the industry oriented COs.
A suggestive list of micro-projects is given here. Similar micro-projects could be added by the concerned faculty:

a. Prepare charts using determinants to find areas of regular shapes.
b. Prepare models using trigonometry to solve engineering problems.
c. Prepare models using regular closed figures and regular solids to solve engineering problems.
d. Prepare models using Mensuration to solve engineering problems.

12. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1.	Higher Engineering Mathematics	Grewal B. S.	Khanna publication New Delhi , 2015 ISBN: 8174091955
2.	A text Book of Engineering Mathematics	Dutta. D	New age publication New Delhi, 2006 ISBN: 978-81-224-1689-3
3.	Advance Engineering Mathematics	Kreysizg, Ervin	Wiley publication New Delhi 2016 ISBN: 978-81-265-5423-2
4.	Advance Engineering Mathematics	Das H.K.	S Chand publication New Delhi 2008 ISBN: 9788121903455
5.	Engineering Mathematics Volume I (4^{th} edition)	Sastry S.S.	PHI Learning, New Delhi, 2009 ISBN: 978-81-203-3616-2

13. SOFTWARE/LEARNING WEBSITE

a. *www.scilab.org/ -SCI Lab*
b. *www.mathworks.com/product/matlab/ -MATLAB*
c. *Spreadsheet Applications*
d. *www.dplot.com*
e. *https://www.khanacademy.org/math?gclid=CNqHuabCys4CFdOJaddHoPig*

14. PO - COMPETENCY- CO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	2	2	1	-	-	-	1
2	3	3	1	-	-	1	2
3	3	3	-	-	-	-	1
4	3	3	1	1	-	-	1

	CE			ME		MT				EE			
CO	PSO 1	PSO 2	PSO 3	PSO 1	PSO 2	PSO 1	PSO 2	PSO 3	PSO 4	PSO 1	PSO 2	PSO 3	PSO 4
1	1	-	-	-	2	1	-	-	-	2	2	2	-
2	-	1	-	-	2	-	-	-	-	2	2	2	-
3	1	2	-	-	2	-	-	-	-	-	1	1	-
4	1	2	-	-	2	1	-	-	-	1	-	2	-

CO-PSO Matrices of course

	ET			CM		IT		
CO	PSO 1	PSO 2	PSO 3	PSO 1	PSO 2	PSO1	PSO2	PSO3
1	1	1	-	-	2	-	2	1
2	1	-	-	-	1	-	1	1
3	1	-	-	-	-	-	-	-
4	1	-	-	-	1	-	1	-

Sign: Name: S. B. Yede Shri V. B. Shinde Mrs. P. R. Nemade (Course Experts)	Sign: Name: (Head of Department)
Sign: Name: U. V. Kokate Dr. S. B. Nikam (Head of Program)	Sign: Name: Shri A. S. Zanpure (CDC)

GOVERNMENT POLYTECHNIC, PUNE

'180 OB' – Scheme

Programme	Diploma in **CE/EE/ET/ME/MT/CM/IT**
Programme code	**01/02/03/04/05/06/07/15/16/17/18/19/21/22/23/24/26**
Name of Course	**APPLIED MATHEMATICS II**
Course Code	SC1102
Prerequisite	SC1101 – Applied Mathematics I
Class Declaration	**No**

1. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)		Examination Scheme				
					Theory		Tutorials		Total Marks
L	T	P	C		ESE	PA	ESE	PA	
03	02	00	05	Marks	80	20	NA	25	125
				Exam Duration	3 Hrs	1 Hr		--	—

Legends : L- Lecture, P- Practical, T- Tutorial, C- Credits ,ESE-End Semester Examination, PA- Progressive Assessment (Test I,II/TermWork) , *- Practical Exam, $- Oral Exam, #- Online Examination each Lecture/Practical period is of one clock hour;

2. RATIONALE

This subject intends to teach students basic facts, concepts, principles and procedure of Mathematics as a tool to analyze Engineering problems and as such it lays down foundation for the understanding of engineering science and core technology subjects

3. COMPETENCY

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

- **Solve various engineering related problems using the principles of Applied Mathematics.**

4. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency**:**

1. Calculate the equation of tangent, maxima, minima, by differentiation.
2. Solve the given problems of integration using basic formulae.
3. Use basic concepts of statistics to solve engineering related problems.
4. Apply the concept of numerical methods to find the roots of the equation.
5. Apply the concept of matrix to solve engineering problems.

5. SUGGESTED PRACTICALS/ EXERCISES

Sr. No.	Unit No.	Practical Exercises (Learning Outcomes in Psychomotor Domain)	Relevant COs	Approx. Hrs. required
1	1	Solve problems based on finding value of the function at different points	1	2
2	1	*Solve problems based on standard formulae of derivatives	1	2
3	1	*Solve problems to find derivatives of implicit function and parametric function.	1	2
4	1	Solve problems to find derivative of logarithmic and exponential functions	1	2
5	1	Solve problems based on finding the equation of tangent and normal.	1	2
6	1	Solve problems based on finding maxima, minima of function	1	2
7	1	Solve problems based on finding radius of curvature at a given point.	1	2
8	2	Solve the problems based on standard formulae of integration.	2	2
9	3	Solve problems on finding range, coefficient of range and mean deviation.	3	2
10	3	*Solve problems on standard deviation.	3	2
11	3	*Solve problems on coefficients of variation and comparison of two sets.	3	2
12	4	Solve the algebraic equation using Bisection method, Regula falsi method and Newton –Raphson method	4	2
13	4	Solve the simultaneous equation using Gauss elimination method, Gauss Seidal and Jacobi's method	4	2
14	5	Solve elementary problems on Algebra of matrices.	5	2
15	5	Solve solution of Simultaneous Equation using inversion method.	5	4
16	ALL	*Complete a Micro- project as per the guidelines in point no. 11 towards the fulfillment of the COs of the course.	ALL	4
			Total	32

***Experiment No. 16 compulsory, perform experiment 2 or 3 and experiment 10 or 11.**

S.No.	Performance Indicators	Weightage in %
a.	Prepare experimental set up	-
b.	Handling of instruments during performing practical.	-
c.	Follow Safety measures	-
d.	Accuracy in calculation	20
e.	Answers to questions related to performed practices.	40
f.	Submit journal report on time	20
g.	Follow Housekeeping	10
h.	Attendance and punctuality	10
Total		**100**

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

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

S. No.	Equipment Name with Broad Specifications	PrO. No.
1	LCD Projector	1-15
2	Interactive Classroom	1-15

7. THEORY COMPONENTS

Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit I : Differential Calculus (24 hrs, 40 marks)	
1a. Solve the given simple problems based on functions. 1b. Solve the given simple problems based on rules of differentiation. 1c. Obtain the derivatives of logarithmic, exponential functions. 1d. Apply the concept of differentiation to find given equation of tangent and normal. 1f. Apply the concept of differentiation to calculate maxima and minima and radius of curvature for given function.	1.1 Functions and Limits : a. Concept of function and simple examples. b. Concept of limits without examples. 1.2 Derivatives: a. Rules of derivatives such as sum, Product, Quotient of functions. b. Derivative of composite functions to find derivatives of given function (chain Rule), implicit and parametric functions. c. Derivatives of inverse, logarithmic and exponential functions. 1.3 Applications of derivative : a. Second order derivative without examples. b. Equation of tangent and normal c. Maxima and minima d. Radius of curvature
Unit II: Integration (06 hrs, 10 marks)	
2a. Solve the given simple problem(s) based on rules of integration.	2.1 Simple Integration: Rules of integration and integration of standard functions
Unit III: Statistics (06 hrs, 10 marks)	

3a. Obtain the range and coefficient of range of the given grouped and ungrouped data. 3b. Calculate mean and standard deviation of discrete and grouped data related to the given simple engineering problem. 3c. Determine the variance and coefficient of variance of given grouped and ungrouped data. 3d. Justify the consistency of given simple sets of data.	3.1 Range, coefficient of range of discrete and grouped data. 5.2 Mean deviation and standard from mean of grouped and ungrouped data, weighted means 3.3 Variance and coefficient of variance. 3.4 Comparison of two sets of observations.
Unit IV: Numerical Methods (06 hrs, 10 marks)	
4a. Apply the concept of approximate to find root of algebraic equation 4b. Apply the concept of iteration to solve the system of equations in three unknowns.	4.1 Solution of algebraic equations : a. Bisection method, b. Regula falsi method and c. Newton –Raphson method. 4.2 Solution of simultaneous equations containing three Unknowns : a. Gauss elimination method. b. Iterative methods- Gauss Seidal and Jacobi's method
Unit V: Matrices (06 hrs, 10 marks)	
5a. Solve given system of linear equations using matrix inversion method	5.1 Matrices, algebra of matrices, transpose adjoint and inverse of matrices. 5.2 Solution of simultaneous equations by matrix inversion method.

8. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	**Differential Calculus**	24	8	12	20	40
II	**Integration**	06	2	8	--	10
III	**Statistics**	06	2	--	8	10
IV	**Numerical methods**	06	2	4	4	10
V	**Matrices**	06	2	4	4	10
Total		48	**16**	**28**	**36**	**80**

9. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related ***co-curricular*** activities which can be undertaken to accelerate the attainment of the various outcomes in this course:

a. Identify engineering problems based on real world problems and solve them with the use of free tutorials available on the internet.

b. Use graphical software: EXCEL, DPLOT and GRAPH for related topics.

c. Use Mathcad as a Mathematical Tool and solve the problems on Calculus.

d. Identify problems based on applications of differential equations and solve these problems

10. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

a. Massive open online courses (***MOOCs***) may be used to teach various topics/subtopics.

b. About ***15-20% of the topics/subtopics*** which is relatively simpler or descriptive in nature is to be given to the students for ***self-directed learning*** and assess the development of the COs through classroom presentations (see implementation guideline for details).

c. Use Flash/Animations to explain various components, operation and

d. Teacher should ask the students to go through instruction and Technical manuals

11. SUGGESTED MICRO-PROJECTS

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 a micro-project by the end of the semester to develop the industry-oriented COs.

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

a. Prepare the model using the concept of tangent and normal bending of roads in case of sliding of a vehicle.

b. Prepare the model using the concept of radius of curvature to bending of railway tracks.

c. Prepare charts for formulae of Integration.

d. Prepare charts for grouped and ungrouped data.

e. Write an algorithm to find the approximate roots of algebraic equations.

f. Write an algorithm to find the approximate roots of transcendental equations.

g. Write an algorithm to solve a system of linear equations.

h. Prepare models using matrices to solve simple problems based on cryptography.

12. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1.	Higher Engineering Mathematics	Grewal B. S.	Khanna publication New Delhi , 2013 ISBN: 8174091955
2.	A textbook of Engineering Mathematics	Dutta. D	New age publication New Delhi, 2006 ISBN: 978-81-224-1689-3
3.	Advance Engineering Mathematics	Kreysizg, Ervin	Wiley publication New Delhi 2016 ISBN: 978-81-265-5423-2
4.	Advance Engineering Mathematics	Das H.K.	S Chand publication New Delhi 2008 ISBN: 9788121903455
5.	Engineering Mathematics Volume I (4^{th} edition)	Sastry S.S.	PHI Learning, New Delhi, 2009 ISBN: 978-81-203-3616-2

13 .SOFTWARE/LEARNING WEBSITES

a. *www.scilab.org/ -SCI Lab*
b. *www.mathworks.com/product/matlab/ -MATLAB*
c. *Spreadsheet Applications*
d. *www.dplot.com*
e. *https://www.khanacademy.org/math?gclid=CNqHuabCys4CFdOJaddHoPig*

14. PO - COMPETENCY- CO MAPPING

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	3	3	1	-	-	-	1
2	2	2	-	-	-	1	1
3	3	3	-	-	-	-	1
4	3	3	1	1	-	-	1
5	3	3	1	-	-	-	2

CO-PSO Matrices of course

	CE			ME		MT				EE			
CO	PSO 1	PSO 2	PSO 3	PSO 1	PSO 2	PSO 1	PSO 2	PSO 3	PSO 4	PSO 1	PSO 2	PSO 3	PSO 4
1	1	2	-	-	2	-	-	-	-	1	2	2	-
2	-	1	-	-	1	1	1	-	-	1	2	2	-
3	2	2	-	-	3	-	-	-	-	1	1	1	1
4	2	-	-	-	2	1	-	-	-	1	1	3	1
5	1	1	-	-	1	-	-	--	-	1	1	1	1

	ET			CM		IT		
CO	PSO 1	PSO 2	PSO 3	PSO 1	PSO 2	PSO1	PSO2	PSO3
1	2	-	-	-	2	-	2	
2	1	-	-	-	-	-	-	
3	1	-	-	-	2	-	2	
4	1	-	-	-	2	-	2	2
5	2	-	-	-	2	-	2	2

1)Sign: Name: S. B. Yede 2)Sign: Name: Shri. V.B.Shinde 3)Sign: Name : Mrs. P. R. Nemade (Course Experts)	Sign: Name: (Head of Department)
Sign: Name: U. V. Kokate Dr. S.B.Nikam (Head of Program)	Sign: Name: Shri A. S. Zanpure (CDC)

Government Polytechnic, Pune

'180 OB' – Scheme

Programme	Diploma in CE/**EE**/**ET**/ME/MT/**CM**/**IT**/DDGM
Programme Code	01/**02**/**03**/04/05/**06**/**07**/08/15/**16**/**17**/18/19/21/**22**/**23**/24/**26**
Name of the Course	Engineering Physics
Course Code	SC1104
Prerequisite	NA
Class Declaration	No

1. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)		Examination Scheme				
					Theory		Practical		Total Marks
L	T	P	C		ESE	PA	*ESE	PA	150
03	00	02	05	Marks	#80	20	25	25	
				Exam Duration	2 Hrs	1 Hrs	--	--	--

Legends : L- Lecture, P- Practical, T- Tutorial, C- Credits ,ESE-End Semester Examination,PA- Progressive Assessment (Test I,II/TermWork) , *- Practical Exam, $- Oral Exam, #- Online Examination each Lecture/Practical period is of one clock hour;

2. RATIONALE

This course is designed in the 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 emphasis is on the applications of these in different technology applications.

3. COMPETENCY

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

- **Apply principles of physics to solve broad-based engineering problems.**

4. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency**:**

1. Estimate errors in measurement and Apply laws of motion in various applications.
2. Use basic principles of light in technical field.
3. Illustrate the basic principles of electrostatics in engineering field.
4. Apply basic principles of electricity to solve engineering problems.
5. Apply basic principles of magnetism to solve engineering problems.
6. Describe the principle and its application of modern physics in Engineering.

5. SUGGESTED PRACTICALS/ EXERCISES

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Relevant CO	Approx. Hrs. required
1	1	Identify given instrument and i) Mention name and range of given instrument. ii) Calculate least count of given instrument. iii) List the uses of given instrument.	1	02
2	1	Use Vernier caliper to : i) Identify and calculate instrumental error. ii) Measure dimensions of different objects. iii) Estimate error in the measurement (if any).	1	04*
3	1	Use micrometer screw gauge to: i) Identify and calculate instrumental error. ii) Measures dimensions and determine volume of given object. iii) Estimate error in the measurement.	1	04*
4	1	Use simple pendulum to determine acceleration due to gravity.	1	02*
5	2	Determine refractive index of glass slab using total internal reflection.	2	02
6	2	Study the properties and working of laser using He-Ne laser beam.	2	02*
7	4	Use the principle of series / parallel resistance in solving electrical engineering problems.	4	02
8	4	Construct circuit to verify Ohm's law and i) Determine resistance of given material of wire. ii) Calculate specific resistance of given material of wire.	1,3,4	02*
9	4	Use meter bridge to: i) Determine resistance of given material of wire. ii) Calculate specific resistance of given material of wire.	1,4	04*
10	4	Use potentiometer to : i) Determine potential gradient of given cell (Principle of potentiometer). ii) Calibrate given voltmeter.	1,3,4	04*
11	4	Use potentiometer to : i) Compare emf of two cells	1,3,4	02
12	4	Use potentiometer to: i) Find internal resistance of a cell.	1,3,4	02
13	5	Use magnetic compass to draw magnetic lines of force of magnet of different shapes.	5	02
14	6	Use photoelectric cell to study effect of :	6	04*

		i) Intensity of light on photoelectric current. ii) Applied potential on photoelectric current.		
15	All	Complete a Micro- project based on guidelines provided in Sr .no. 11	1 to 6	04*
		Total Hrs		**32**

Note: A suggestive list of PrOs is given in the above table. Minimum 10 practical need to be performed out of which practicals marked as * are compulsory. Any one practical out of Sr. No. 1,5,7,11,12 & 13 need to be performed.

S. No.	Performance Indicators	Weightage in %
a.	Arrangement of available equipment / test rig or model	10
b.	Setting and operation	10
c.	Safety measures	10
d.	Observations and Recording	20
e.	Interpretation of result and Conclusion	20
f.	Answer to sample questions	20
g.	Submission of report in time	10
	Total	**100**

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

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

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

7. THEORY COMPONENTS

Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit 1 General Physics (Weightage-12, Hrs-08)	
1a. List fundamental and derived quantities with their unit. 1b. Explain various systems of unit and its need for the measurement. 1c. Estimate errors in measurement. 1d. Derive relation between linear velocity and angular velocity. 1e. Calculate angular velocity of the given body 1f. Distinguish between centripetal and centrifugal force. 1g. Derive equation of SHM.	**1.1 Units and Measurement** Introduction, Definition of unit, Fundamental and derived units, Different System of units, Errors in measurements. **1.2 Circular Motion**: Definition, Uniform circular motion(UCM) Displacement, angular velocity, angular acceleration and units, relation between linear and angular velocity, relation between linear acceleration and angular acceleration, explanation of centripetal and centrifugal force, examples, applications of centripetal and centrifugal force, analytical treatment. **1.2 SHM**: Concept of time period, Frequency, Amplitude, Wavelength, Relation between wave velocity frequency and wavelength. Definition of SHM, examples of SHM, SHM as a projection of UCM on the diameter, Equation of SHM starting from mean position, analytical treatment.
Unit 2 Optics and Laser (Weightage-12, Hrs-06)	
2a. State laws of reflection and refraction. 2b. Describe phenomenon of total internal reflection. 2c. Calculate acceptance angle and numerical aperture for given optical fiber. 2d. Distinguish between optical fiber communication system and ordinary system. 2e. Differentiate between properties of ordinary light and laser light. 2f. Explain spontaneous and stimulated emission. 2g. Describe working of He-Ne laser with	**2.1 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. **2.2 Fiber optics**: Propagation of light through optical fiber, Structure of optical fiber, Numerical aperture, Acceptance angle, Acceptance cone, Types of optical fibers, Applications of optical fiber, Comparison of optical fiber communication with electrical

energy level diagram. 2h. State applications of laser in different field.	cable communication. **2.3 LASER:** Definition, Properties of LASER, Spontaneous and Stimulated emission, Population inversion, Metastable state, Pumping, Life time, He-Ne laser-construction and working with energy level diagram, Engineering applications of laser.
Unit 3 Electrostatics(Weightage-16, Hrs-10)	
3a. Calculate electrostatic force, electric field and electric potential difference of the given static charge. 3b. Describe properties of electric lines of force. 3c. Explain working of capacitor. 3d. Calculate the equivalent capacity and energy stored in the combination of the capacitors are 3e. Establish relation between parameters affecting capacitance of condenser.	**3.1 Electric charge**, Coulomb's law in Electrostatics, unit of charge, electric field, intensity of electric field, electric lines of forces (Properties), electric flux, flux density, analytical treatment. **3.2 Electric potential:** Explanation, Definition**,** Potential due to a point charge, potential due to a charged sphere, potential of earth, absolute electric potential, analytical treatment. **3.3 Electric Capacitor :**Capacitance Introduction**,** of conductor, unit, principle of condenser, parallel plate condenser, capacitances in series and parallel, analytical treatment.
Unit 4 Current Electricity (Weightage-16, Hrs-10)	
4a. State Ohm's law 4b. Establish relation between resistance and length , cross section area of given material of wire 4c. Calculate the value of given resistance using the principle of Whetstone's bridge. 4d. Explain principle of potentiometer 4e. Calculate the emf of given cell using potentiometer. 4f. Calculate energy consumption of different electric appliances.	**4.1 Current**, Resistance and its unit, 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. **4.2 Potentiometer,** Principle of potentiometer**,** Potential gradient, Construction of potentiometer, Applications of potentiometer, E.M.F., Comparison of E.M.F. using potentiometer.

	4.3 Electric work- Electric power, Electric energy, Units and Calculations of electric bill.
Unit 5 Electromagnetism(Weightage-14, Hrs-08)	
5a. State Ampere's right hand and Fleming's left hand rule. 5b. Explain Biot- Savert's Law (Laplace's Law), 5c. Calculate Magnetic induction for given conductor.	**5.1 Magnetic effect of electric current**, Ampere's rule, Coulombs inverse square law in magnetism, Intensity of magnetic field, Magnetic induction, Biot-Savert's Law (Laplace's Law), Fleming's left hand rule, Force experienced by current carrying straight conductor placed in magnetic field, analytical treatment.
Unit 6 Modern Physics (Weightage-10, Hrs-06)	
6a. Explain production of X-rays. 6b. Describe properties and applications of X-ray in different field. 6c. Describe properties of photon 6d. Derive Einstein's photoelectric equation. 6e. Explain working of 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, concept of photon, properties of 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.

8. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
01	General Physics	8	2	4	6	12
02	Optics and Laser	6	2	4	6	12
03	Electrostatics	10	4	4	8	16
04	Current Electricity	10	4	4	8	16
05	Electromagnetism	8	2	4	8	14
06	Modern Physics	6	2	4	4	10
Total		48	16	24	40	80

9. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related ***co-curricular*** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 5 pages for each activity, also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

a. Prepare journal based on practical performed in Physics laboratory. Journal consists of drawing, observations, required equipment's, date of performance with teacher signature.

10. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

a. Massive open online courses (***MOOCs***) may be used to teach various topics/sub topics.

b. About ***15-20% of the topics/sub-topics*** which is relatively simpler or descriptive in nature is to be given to the students for ***self-directed learning*** and assess the development of the COs through classroom presentations (see implementation guideline for details).

c. With respect to item No.9, teachers need to ensure to create opportunities and provisions for ***co-curricular activities***.

d. Use proper equivalent analogy to explain different concepts.

e. Use Flash/Animations to explain various components and operation.

f. Teacher should ask the students to go through instruction and Technical manuals.

11. SUGGESTED MICRO-PROJECTS

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

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

a. **Systems and Units** : Prepare Chart on comparison of systems of units for different physical quantities..

b. **Magnetism :** Prepare chart on magnetic lines of force of bar magnet·

c. **Optics :**Prepare chart to study Total Internal Reflection/LASER.

d. **X-Ray** :Prepare chart showing properties of X-rays/Photoelectric cell.

e. Prepare Chart to Study **Ohm's Law**.

12. SUGGESTED LEARNING RESOURCES

S. No.	Title	Author	Publisher, Edition Year of publication and ISBN Number
1	Physics Textbook Part I- Class XI	J.V.Narlikar, A.W.Joshi, et al.	National Council of Education Research and Training, New Delhi,2010, ISBN:8174505083
2	Physics Textbook Part II- Class XI	J.V.Narlikar, A.W.Joshi, et al.	National Council of Education Research and Training, New Delhi,2015, ISBN:8174505660
3	Physics Textbook Part I- Class XII	J.V.Narlikar, A.W.Joshi, et al.	National Council of Education Research and Training, New Delhi,2013, ISBN:8174506314
4	Physics Textbook Part II- Class XII	J.V.Narlikar, A.W.Joshi, et al.	National Council of Education Research and Training, New Delhi,2013, ISBN:8174506713
5	Fundamentals of Physics	David Halliday, Robert Resnick and Jearl Walker	7th EditionJohn Wily (2004) ISBN:9781118230718, 111823071X
6	Engineering Physics	R.K. Gaur and S. L. Gupta	Dhanpat Rai Publications ISBN 9788189928223 (1981)
7	Applied Physics	Prakash Manikpure	S. Chand Publishing ISBN 9788121919548
8	Applied Physics	Arthur Beiser	Schaum's Outline Series McGraw-HILL ISBN:9780071426114
9	Engineering Physics	Avadhanulu, Kshirsagar	S Chand ISBN 9788121908177

13. SOFTWARE/LEARNING WEBSITES

1) https://en.wikipedia.org/wiki/**Engineering_physics**
2) www.nanowerk.com
3) www.brainscape.com
4) https://www.open2study.com/courses/basic-physics
5) http://nptel.ac.in/course.php?disciplineId=115
6) http://nptel.ac.in/course.php?disciplineId=104
7) http://hperphysics.phy-astr.gsu.edu/hbase/hph.html
8) www.physicsclassroom.com
9) www.physics.org

14. PO - COMPETENCY- CO MAPPING (Information Technology)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	1	2	2	1	3
CO2	3	3	2	2	3	1	3
CO3	3	3	2	2	3	1	3
CO4	3	3	2	2	3	1	3
CO5	3	1	-	2	3	-	3
CO6	3	1	1	2	3	1	3
Summary	**3**	**2**	**2**	**2**	**3**	**1**	**3**

CO	PSO1	PSO2	PSO3
1	3	-	-
2	3	-	-
3	3	-	-
4	3	-	-
5	3	-	-
6	3	-	-
Summary	**3**	**-**	**-**

14 . PO - COMPETENCY- CO MAPPING
(Electronics and Telecommunication Engineering)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	1	2	2	1	3
CO2	3	3	2	2	3	1	3
CO3	3	3	2	2	3	1	3
CO4	3	3	2	2	3	1	3
CO5	3	1	-	2	3	-	3
CO6	3	1	1	2	3	1	3

CO	PSO1	PSO2	PSO3
1	3	2	-
2	3	2	-
3	3	2	-
4	3	2	-
5	3	2	-
6	3	2	

14. PO - COMPETENCY- CO MAPPING
(Computer Engineering)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	1	2	2	1	3
CO2	3	3	2	2	3	1	3
CO3	3	3	2	2	3	1	3
CO4	3	3	2	2	3	1	3
CO5	3	1	-	2	3	-	3
CO6	3	1	1	2	3	1	3

CO	PSO1	PSO2
1	3	1
2	3	-
3	3	-
4	3	-
5	3	1
6	3	1

14 . PO - COMPETENCY- CO MAPPING
(Electrical Engineering)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	1	2	2	1	3
CO2	3	3	2	2	3	1	3
CO3	3	3	2	2	3	1	3
CO4	3	3	2	2	3	1	3
CO5	3	1	-	2	3	-	3
CO6	3	1	1	2	3	1	3

CO/PO	PSO1	PSO2	PSO3	PSO4
1	3	1	2	-
2	3	2	2	1
3	1	3	-	1
4	3	2	1	2
5	3	2	1	1
6	2	2	1	1

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