NATIONAL INSTITUTE OF ELECTRONICS AND INFORMATION TECHNOLOGY

Diploma in Electronics Production and Maintenance

Programme Educational Objectives (PEO) (What s/he will continue to do even after 3-5 years of working in the industry)

PEO 1. Provide socially responsible, environment friendly solutions to Electronics and Telecommunication engineering related broad-based problems adapting professional ethics.

PEO 2. Adapt state-of-the-art Electronics and Telecommunication engineering broad-based technologies to figure in multi-disciplinary work environments.

PEO 3. Solve broad-based problems individually and as a team member communicating effectively within the world of labor .

Program Outcomes (PO) given by NBA. (What s/he will be able to do at the entry point of industry soon after diploma programme)

1	**Discipline knowledge**	Apply Electronics and Telecommunication engineering knowledge to solve broad-based Electronics and Telecommunications engineering related problems.
2	**Basic knowledge**	Apply knowledge of basic mathematics, sciences and basic engineering to solve the broad-based Electronics and Telecommunication engineering problems.
3	**Environment and sustainability**	Apply Electronics and Telecommunication engineering solutions also for sustainable development practices in societal and environmental contexts.
4	**Experiments and practice**	Plan to perform experiments and practices to use the results to solve broad-based Electronics and Telecommunication engineering problems
5	**Engineering tools**	Apply relevant Electronics and Telecommunications technologies and tools with an understanding of the limitations
6	**Individual and team work**	Function effectively as a leader and team member in diverse/ multidisciplinary teams.
7	**The engineer and society**	Assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to practice in field of Electronics and Telecommunication engineering.
8	**Life-long learning**	Engage in independent and life-long learning activities in the context of technological changes also in the Electronics and Telecommunication engineering and allied industry.

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9	**Ethics**	Apply ethical principles for commitment to professional ethics, responsibilities and norms of the practice also inthe field of Electronics and Telecommunication engineering.
10	**Communication**	Communicate effectively in oral and written form.

Program Specific Outcomes (PSO) *(What s/he will be able to do in the Electronics and Telecommunication engineering specific industry soon after the diploma programme)*

PSO 1. Electronics and Telecommunication Systems: Maintain various sorts of Electronics and Telecommunication systems.
PSO 2. EDA Tools Usage: Use EDA tools to develop simple Electronics and Telecommunication engineering related circuits.

Notes for All the Semesters

1. Every student has to **separately pass** in **End-Semester-Examination (ESE)** for **both theory** and **practical** by securing minimum of 40% marks, (i.e. 30 out of 75, 28 out of 70, 20 out of 50, and 10 out of 25).
2. **Progressive Assessment (PA) for Theory** includes Written Exam/micro projects/ Assignment/Quiz/Presentations/attendance according to the nature of the course. The scheme and schedule for progressive assessment should be informed to the students and discussed with them at the start of the term. This scheme should also be informed in writing to the principal of the institute.
3. Teachers need to give **marks judiciously for PA of theory and practical** so that there is always a **reasonable correlation** between the **ESE marks** obtained by the **student** and the **PA marks** given by **respective teachers for the same student**. In case the PA marks in some courses of some students seems to be relatively inflated in comparison to ESE marks, then MSBTE may review the PA records of such students.
4. For developing self-directed learning skills, from each course about 15-20% of the topics/sub-topics, which are relatively simpler or descriptive in nature are to be given to the students for self-study and proper learning of these topics should be assured through classroom presentations by students (see implementation guideline for details).
5. Passing Criterion for Theory and Practical Courses for all Semesters
   a. **Passing Criterion for Theory course**: - Each Theory course consists of 2 components, ESE (End Semester Examination) and PA (Progressive Assessment)
      i. The passing criterion for each theory course is obtaining minimum 40% of marks allotted to ESE & PA component together. [i.e. for total marks of ESE (70 marks) + PA(30 marks) together = (Total 70+30 =100), obtaining minimum 40 marks are mandatory for passing the Theory course.]
      ii. To qualify for above condition (i), obtaining minimum 40% of marks allotted to ESE component is mandatory. [i.e. for total marks of ESE = 70, obtaining *minimum 28 marks are mandatory. For passing ESE component)*
   b. ***Passing Criterion for Practical course**: - Practical course consists of 2 components, ESE (End Semester Examination) and PA (Progressive Assessment)*

i. *ESE and PA components of Practical course are independent head of passing.*

ii. *The passing criterion for ESE component is obtaining minimum 40 % of marks allotted to ESE component. [i.e. for total marks of ESE= 25, obtaining minimum 10 marks are mandatory for passing in ESE component]*

iii. The passing criterion for PA component is obtaining minimum 40 % of marks allotted to PA component. [i.e. for total marks of PA= 25, obtaining minimum 10 marks are mandatory for passing in PA component]

Note: - If Candidate not securing minimum marks for passing in the PA part of practical of any course of any semester then the candidate shall be declared as detained for that semester.

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Teaching and Examination Scheme for Diploma in Electronics Production and Maintenance

Program Name: Diploma in Electronics Production and Maintenance

Program Code: DEPM **With Effect from Academic Year: 2021-2022**

Duration of Program: 6 Semesters **Duration: 16 Weeks**

Semester: First

Sr. No	Course Title	Abbreviation	Sub. code	Teaching Scheme			Credit (L+T+P)	Examination Scheme												Grand Total
								Theory							Practical					
				L	T	P		Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
									Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
1	English	ENG	21D11	3	-	2	5	3	70	28	30	12	100	40	25	10	25	10	50	20	150
2	Mathematics-I	MAT1	21D12	4	2	-	6	3	70	28	30	12	100	40	-	-	-	-	-	-	100
3	Physics	PHY	21D13	2	-	2	4	3	70	28	30	12	100	40	25	10	25	10	50	20	150
4	Chemistry	CHE	21D14	2	-	-	2	3	70	28	30	12	100	40	--	--	--	--	--	--	100
5	Fundamentals of ICT	ICT	21D15	2	-	2	4	3	70	28	30	12	100	40	25	10	25	10	50	20	150
6	Engineering Drawing	EDW	21D16	2	-	4	6	3	70	28	30	12	100	40	25	10	25	10	50	20	150
7	Workshop Technology	WT	21D17	-	-	4	4	-	-	-	-	-	-	-	25	10	25	10	50	20	50
8	Environmental Studies	EST	21D18	3	-	-	3	3	70	28	30	12	100	40	--	--	--	--	--	--	100
			Total	**18**	**2**	**14**	**34**	-	-	-	-	-	-	-	-	-	-	-	-	-	

Student Contact Hours Per Week: **34 Hrs.** Medium of Instruction: English

Theory and practical periods of 60 minutes each.

Abbreviations: ESE- End Semester Exam, PA- Progressive Assessment, L - Lectures, T - Tutorial, P - Practical

• Under the theory PA, Out of 30 marks, 10 marks are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the cognitive domain LOs required for the attainment of the COs.

For the courses having ONLY Practical Examination, the PA has two parts, marks for : (1) Practical Part - 60% of total marks (ii) Micro-Project Part - 40% of total marks.

- **Candidate remaining absent in practical examination will be declare as Absent in Mark List and has to reappear for examination. The marks of the part for which candidate was present will not be processed or carried forward.**

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DEPM	Semester I

Program Name	:	Diploma in Electronics Production and Maintenance
Program Code	:	DEPM
Semester	:	First
Course Title	:	English
Course Code	:	21D11

1. RATIONALE

Language is the most commonly used medium of self-expression in all spheres of human life personal, social and professional. A student must have a fair knowledge of English language and skills to communicate effectively to handle the future jobs in industry. A technician has to communicate all the time with peers, superiors, subordinates and clients in his professional life The objective of this course is to enable the diploma holders to acquire proficiency, both in spoken (oral) and written language. At the end of the course, the student will be able to develop comprehension skills, improve vocabulary, use proper grammar, acquire writing skills, correspond with others and enhance skills in spoken English.

2. COMPETENCY

The purpose of this course is to guide students to Communicate in English and attain effective speaking and writing skills

1. Communicate verbally and in writing in English
2. Comprehend the given passages and summarize them

3. COURSE OUTCOMES (COs)

On completion of the theory and practical parts of the course student demonstrates the following industry oriented COs associated with the above mentioned competency:

a) Correction of sentences with grammatical errors
b) To develop the four basic skills in English and use them effectively in day-to-day life.
c) Usage of words as per situation
d) Preparing speeches and expressing ideas

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme													
				Theory							Practical						
L	T	P		Paper Hrs	ESE		PA		Total		ESE		PA		Total		
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
3	-	2	5	3	70	28	30*	12	100	40	25	10	25	10	50	20	

Under the theory PA out of 30 marks, 10 marks are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the cognitive domain UOs required for the attainment of the COs.

Legends: L-Lecture T-Tutorial/ Teacher Guided Theory Practice P-Practical C-Credit. ESE - End Semester Examination: PA - Progressive Assessment.

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.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
	Use 'language laboratory' for different practical tasks		
1	Make sentences using correct articles.	I	2
2	Construct sentences using correct prepositions.	I	2*
3	Formulate sentences using correct conjunctions/connectors.	I	2
4	Rewrite sentences using relevant forms of verbs.	I	2
5	Change the voice from active to passive and vice versa.	I	2*
6	Change the narration direct to indirect and vice versa.	I	2*
7	Repeat words on Language Lab software after listening to them.	I	2*
8	Deliver oral presentations using correct grammar.	I	2*
9	Write short paragraphs emphasizing on syntax.	II	2
10	Compose dialogues on various situations.	III	2
11	Enact a role play.	III	2*
12	Construct sentences using idioms.	III	2*
13	Narrate anecdotes of various situations.	IV	2
14	Construct sentences using various collocations.	IV	2
15	Answer questions based on the given passage.	IV	2
16	Use correct pronunciations and voice modulation while reading articles from different sources.	IV	2*
17	Deliver prepared speeches on the given topic.	V	2*
18	Repeat dialogues on Language Lab software after listening to them	V	2*
	Total		36

Note

i) A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. A judicial mix of minimum 12 or more practical need to be performed out of which, the practical's marked as '*' are compulsory, so that the student reaches the 'Precision Level' of Dave's 'Psychomotor Domain Taxonomy' as generally required by the industry

ii) The Process' and 'Product' related skills associated with each PrO is to be assessed according to a suggested sample given below**:**

S.No.	Performance Indicators	Weightage in %
a	Setting up of language laboratory	10
b	Using the language laboratory skillfully	30
c	Follow Safety measures	10
d	Work in teams	20

e	Respond to given questions	10
f	Self-learning	20
	Total	**100**

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field based experiences:

a. Follow safety practices
b. Maintain Cleanliness.
c. Demonstrate working as a leader/a team member
d. Follow ethics.

Acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of practical experiences over a period of time. Moreover, the level of achievement of the ADOs according to Krathwobl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in I year
- 'Organizing Level' in II year
- 'Characterizing Level' in III year.

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED:

The following topics/subtopics is to be taught and assessed in order to develop U0s for achieving the COs to attain the identified competency.

S.No.	Equipment Name with Broad Specifications	Exp S.No.
1	Language Lab with relevant software and Computer system with all necessary components like: Motherboard, Random Access Memory (RAM), Read-Only Memory (ROM), Graphic cards, Sound Cards, Internal Hard Disk Drives, DVD drive, Network Interface Card	All
2	LCD Projector with document reader	All
3	Smart Board with networking	All

7. UNDERPINNING THEORY COMPONENTS:

The following topics/subtopics should be taught and assessed in order to develop LOs in cognitive domain for achieving the COs to attain the identified competency:

Unit	Unit Outcomes(UOs) (in cognitive domain)		Topics and Sub-Topics
	Writing Skills	**Speaking Skills**	
Unit-1 Applied Grammar	1a Use relevant articles in constructing sentences. 1b Apply prepositions to construct	1g Formulate grammatically correct sentences for the specified situation. 1h Use relevant Prepositions for the	1.1 Articles: Definite and Indefinite 1.2 Prepositions: Usage 1.3 Conjunctions: Coordinating and

	meaningful sentences. 1c Identify conjunctions to connect phrases and clauses in the specified sentences. 1d Use correct form of tenses in given situation. 1e Change the active and passive voice from the specified passage/list. 1f Change the narration for the given situation.	situation mentioned. 1i Apply relevant conjunctions to use idiomatic language for the given situation. 1j Apply the relevant voice in formal communication for the given passage. 1k Use relevant narrations for the given situation	Subordinating 1.4 Types of sentences: Assertive, Imperative, Exclamatory, Interrogative 1.5 Tenses-Present Tense(simple, continuous, Perfect)-Past Tense(Simple, Continuous, Perfect)-Future Tense(Simple) 1.6 Active and passive voice 1.7 Direct and Indirect Speech
Unit-II Comprehension	2a Meaning of Key words 2b Arrangement of ideas in proper order 2c Formulate sentences with new words 2d Answer questions on given unseen passage	2e Pronounce words correctly in given passage 2f Give Oral instructions with correct pronunciation 2g Answer questions orally on given unseen passage	2.1 Idioms and Phrases 2.2 Usage of Idioms and phrases 2.3 Importance of comprehension 2.4 Interpretation of passages in written and spoken form
Unit –III Writing Paragraph and technical reports	3a Arrangement of data as per priority 3b Formulate a paragraph in words with synchronized sentence structure on the given topic. 3c Preparation of Reports From Data	3d Summarize the given paragraph with correct pronunciation and intonation 3e Take part in debates with correct pronunciation, intonation and using verbal and non-verbal gestures on the given themes.	3.1 Types of Paragraph i. Technical ii. Descriptive iii. Narrative iv. Compare and Contrast 3.2 Dialogue Writing i. Greetings ii. Development of Dialogue iii. Closing Sentence

Unit –IV Vocabula -ry Building	4a Remove the spelling errors in the given sentences/paragr aph 4b Use relevant words to correctly express for the given themes/ situation. 4c Use the collocations correctly. 4d Construct sentences using given idioms.	4e Speak in specified formal situations with correct pronunciation 4f Speak in specified Informal situations with correct pronunciation 4g Speak sentences using relevant collocations	4.1 Rules of Spelling 4.2 Words Often Confused 4.3 Collocations 4.4 Idioms
Unit-V Speeches	5a Develop a welcome speech on the given theme/ situation. 5b Develop a farewell speech for the given theme/ situation. 5c Formulate a speech for introducing a guest in the given situation. 5d Develop a vote of thanks for the given situation	5e Introduce oneself with correct pronunciation, intonation and using verbal and non-verbal gestures. 5f Give extempore talks with correct pronunciation, intonation and using verbal and non-verbal gestures for the given theme/ situation.	5.1 Importance of Public Speaking 5.2 Characteristics of Good Speech 5.3 Welcome Speech 5.4 Farewell Speech 5.5 Introducing a Guest 5.6 Vote of Thanks

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	Applied Grammar	12	02	04	08	14
II	Comprehension	20	05	06	13	24
III	Writing Paragraph and technical Reports	06	02	04	06	12
IV	Vocabulary Building	06	02	04	06	12

V	Speeches	04	02	02	04	08
Total		**48**	**13**	**20**	**37**	**70**

Legends: R=Remember, l'= Understand. A =Apply and above (Bloom's Revised taxonomy) Note: This specification table provides general guidelines to assist student for their learning and to teachers to teach and assess students with respect to attainment of UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.

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. Collect good articles from newspapers and find and write the meanings of words.
b. Listen to TV news.
c. Read articles from magazines/newspapers.
d. Undertake micro-projects.

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. 'L' in item No. 4 does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
c. 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).
d. With respect to item No.10, teachers need to ensure to create opportunities and provisions for co-curricular activities.
    a. Arrange various communication activities using functional grammar.
    b. Show video/animation films to develop listening skills and enhance vocabulary.
    c. Use real life situations for explanation
    d. Prepare and give oral presentations
    e. Guide micro-projects in groups as well as individually

11. SUGGESTEDTITLES OF 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. S/he ought to submit it by the end of the semester to develop the industry oriented COs. Each micro-project should encompass two or more COs %Ouch are in fact, an integration of practicals PrOs. UOs and ADOs. The micro-project could be industry application based, internet-based. workshop-based. laboratory -based or field-based. 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.

In the first four semesters, the micro-project could be group-based. However, in higher semesters, it should be individually undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. A suggestive list is given here. Similar micro-projects could be added by the concerned faculty:

a. Develop language games, activities, crossword puzzles enhancing word power to be used in English language.
b. Prepare advertisement for five technical projects using contextual vocabulary.
c. After studying standard English newspapers, prepare a booklet identifying various grammatical aspects of sentences.
d. Prepare a booklet of the interviewing any successful person in your locality in context with his life journey, inspiration, social contribution, role model and keys to success.
e. Prepare a booklet of the contribution of eminent Indian scientists and develop well organized paragraphs.
f. Summarize the contents of a famous book/books.[fiction/ non-fiction]
g. Prepare a collage using different idioms with their origins and their contextual usage

12. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	English Communication	Technical Teachers Training Institute	Madras Oxford University Press
2	Living English speech	Standard Allen Orient Longman	Longman ISBN-10 : 0582523613
3	Essential English Grammar	Murphy. Raymond	Cambridge University Press, New Delhi, Third edition, 2011, ISBN: 97800-521-
4	English Grammar at Glance	Gnanamurali. M	S. Chand and Co New Delhi. 2011 1SBN:9788121929042
5	Living English Structure	Allen. W.S.	Pearson Education, New Delhi, Fifth edition. 2009, ISBN:108131728498,99
6	Effective English with CD	Kumar, E. Suresh; Sreehari, P.;	Pearson Education, Noida, New Delhi, ISBN: 978-81-317-3100-0

13. SOFTWARE/LEARNING WEBSITES

a. https://www.britishcouncil.in/english/leam-online
b. http://leamenglish.britishcouncil.org/en/content
c. http://www.talkenglish.com/

DEPM	Semester I

Program Name : Diploma in Electronics Production and Maintenance
Program Code : DEPM
Semester : First
Course Title : Mathematics-I
Course Code : 21D12

1. RATIONALE

Mathematics is the root of engineering. To understand the engineering subjects the knowledge of mathematics is required. This proposed syllabus of mathematics is intended that student should know about the basic concepts and principles of Mathematics as a tool to analyze the Engineering problems.

2. COMPETENCY

The course content should be taught so as to understand and perform the Engineering concepts and computations. Aim to develop the different types of Mathematical skills leading to the achievement of the following competencies:

1. Apply the concepts and principles of mathematics to solve engineering problems

3. COURSE OUTCOMES(Cos)

On completion of the theory and practical parts of the course student demonstrates the following industry oriented COs associated with the above mentioned competency

a) Solving engineering related problems with knowledge in Algebra
b) Describe the concept of an angle, its units and measurement and trigonometric ratios.
c) Simplify trigonometric expressions and solve trigonometric equations which will be useful in solving the scientific problems.
d) Calculate the surface area and volume of different shapes and bodies.
e) Solving engineering related problems using basic concepts of statistics

4. TEACHING AND EXANIINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme													
				Theory							Practical						
L	T	P		Paper Hrs	ESE		PA		Total		ESE		PA		Total		
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
4	2	-	6	3	70	28	30*	12	100	40	-	-	-	-	-	-	

(*): Under the theory PA out of 30 marks, 10 marks are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the cognitive domain UOs required for the attainment of the COs.
Legends: L-Lecture: T Tutorial/ Teacher Guided Theory Practice: P-Practical: C-Credit, ESE - End Semester Examination: PA - Progressive Assessment.

5. SUGGESTED PRACTICALS/ EXERCISES

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

S. No.	Tutorials	Unit No.	Approx. Hrs. required
1	Solve simple problems of Logarithms based on definition and laws.	I	2
2	Solve problems on determinant to find area of triangle, and solution of simultaneous equation by Cramer's Rules.	I	2
3	Solve elementary problems on Algebra of matrices.	I	2
4	Solve solution of Simultaneous Equation using inversion method.	I	2
5	Resolve into partial fraction using linear non repeated, repeated, and irreducible factors.	I	2
6	Solve problems on Compound, Allied, multiple and sub multiple angles.	II	2
7	Practice problems on factorization and de factorization.	II	2
8	Solve problems on inverse circular trigonometric ratios.	II	2
9	Practice problems on equation of straight lines using different forms	III	2
10	Solve problems on perpendicular distance, distance between two parallel lines, and angle between two lines.	III	2
11	Solve problems on Area, such as rectangle, triangle, and circle.	IV	2
12	Solve problems on surface and volume, sphere, cylinder and cone	IV	2
13	Solve practice problems on the surface area, volumes and its applications.	IV	2
14	Solve problems on finding range, coefficient of range and mean deviation.	V	2
15	Solve problems on standard deviation.	V	2
16	Solve problems on coefficient of variation and comparison of two sets.	V	2
	Total		32

Note: The above tutorial sessions are for guideline only. The remaining tutorial hours are for revision and practice.

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

- Not applicable –

7. UNDERPINNING THEORY COMPONENTS

The following topics/subtopics should be taught and assessed in order to develop UOs in cognitive domain for achieving the COs to attain the identified competency

DEPM **Semester I**

Unit	Unit outcomes (in cognitive domain)	Topics and Sub-topics
Unit-I Algebra	1a Solve the given simple problem based on laws of logarithm, A.P. & G.P. series. 1b Calculate the area of the given triangle by determinant method. 1c Solve given system of linear equations using matrix inversion method and by Cramer's rule. 1d Obtain the proper and improper partial fraction for the given simple rational function. 1e Solving Vector addition and product	1.1 Logarithm: Concept and laws of logarithm, A.P. & G.P. series. 1.2 Determinant and matrices a. Value of determinant of order 3x3 b. Solutions of simultaneous equations in three unknowns by Cramer's rule. c. Matrices, algebra of matrices, transpose adjoint and inverse of matrices. Solution of simultaneous equations by matrix inversion method. 1.3 Types of partial fraction based on nature of factors and related problems 1.4 Vector Algebra
Unit-II Trigonometry	2a Apply the concept of Compound angle, allied angle, and multiple angles to solve the given simple engineering problem(s). 2b Apply the concept of Sub-multiple angle to solve the given simple engineering related problem(s). 2c Employ concept of factorization and de-factorization formulae to solve the given simple engineering problem(s). 2d Investigate given simple problems utilizing inverse trigonometric ratios.	2.1 Trigonometric ratios of Compound, allied, multiple and sub-multiple angles (without proofs) 2.2 Factorization and de-factorization formulae (without proofs) 2.3 Inverse trigonometric ratios and related problem. 2.4 Principle values and relation between trigonometric and inverse trigonometric ratio.
Unit-III Coordinate Geometry	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.	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

	3d Calculate perpendicular distance between the given two parallel lines. 1. Finding center and radius of circle 2. Finding eccentricity of Parabola and Hyperbola	b) Two point intercept form c) General form d) Perpendicular distance from pint to line e) Perpendicular distance between two parallel lines 3.3 Conic Section a) Equation of Circle b) Parabola c) Hyperbola
Unit-IV Mensuration	4a Calculate the area of given triangle and circle. 4b Determine the area of the given square, parallelogram, rhombus and trapezium. 4c Compute surface area of given cuboids, sphere, cone and cylinder. 4d Determine volume of given cuboids, sphere, cone and cylinder.	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 –V Statistics	5a Obtain the range and coefficient of range of the given grouped and ungrouped data. 5b Calculate mean and standard deviation of discrete and grouped data related to the given simple engineering problem. 5c Determine the variance and coefficient of variance of given grouped and ungrouped data.	5.1 Range, coefficient of range of discrete and grouped data. 5.2 Mean deviation and standard deviation from mean of grouped and ungrouped data, weighted means 5.3 Variance and coefficient of Variance 5.4 Comparison of two sets of observation.

Note: To attain the COs and competency. above listed Unit Outcomes (UOs) need to be undertaken to achieve the 'Application Level' and above of Bloom's 'Cognitive Domain Taxonomy'

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	20	02	08	10	20
II	Trigonometry	I8	02	08	10	20
111	Coordinate Geometry	08	02	02	04	08
IV	Mensuration	08	02	02	04	08
V	Statistics	10	02	05	07	14
Total		64	10	25	35	70

Legends: R=Remember, U=Understand, A =Apply and above (Bloom's Revised taxonomy)
Note: This specification table provides general guidelines to assist student for their learning and to teachers to leach and assess students with respect to attainment of UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.

9. SUGGESTED STUDENT ACTIVITIES

Other than the classroom 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 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 Mathematical Tools and solve the problems of Calculus.
d. Identify problems based on applications of matrix and use MATLAB to solve these problems.
e. Prepare models to explain different concepts.
f. Prepare a seminar on any relevant topic

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. 'L' in item No. 4 does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
c. 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 thedevelopment of the UOs/COs through classroom presentations (see implementation guideline for details).
d. With respect to item No.10, teachers need to ensure to create opportunities and provisions for co-curricular activities.
e. Guide student(s) in undertaking micro-projects.

f. Apply the mathematical concepts learnt in this course to branch specific problems.

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. S/he ought to submit it by the end of the semester to develop the industry oriented COs. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. 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.

In the first four semesters, the micro-project could be group-based. However, in higher semesters, it should be individually undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. A suggestive list is given here. Similar micro-projects could be added by the concerned faculty.

a. Prepare charts using determinants to find area of regular shapes.
b. Prepare models using matrices to solve simple problems based on cryptography.
c. Prepare models using matrices to solve simple mixture problems.
d. Prepare charts displaying regular solids.
e. Prepare charts displaying regular closed figures.
f. Prepare charts for grouped and ungrouped data

12. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Higher Engineering Mathematics	Grewal, B.S.	Khanna publications, New Delhi, 2015 ISBN: 8174091955
2	Engineering Mathematics (third edition).	Croft, Anthony	Pearson Education, New Delhi, 2014 ISBN 978-81-317-2605-1
3	Advanced Engineering Mathematics	Das, H.K.	S. Chand & Co.; New Delhi; 2008, ISBN-9788121903455
4	Advanced Engineering Mathematics	Krezig, Ervin	Wiley Publications, New Delhi, 2014 ISBN :978-0-470-45836-5
5	Getting Started with MATLAB-7	Pratap, Rudra	Oxford University Press, New Delhi, 2014, ISBN: 0199731241

13. SOFTWARE/LEARNING WEBSITES

1. www.scilab.org/ - SCI Lab
2. www.mathworks.com/products/matlab/ - MATLAB
3. www.dplot.com/ - DPlot
4. www.allmathcad.com/ - MathCAD

DEPM	Semester I

Program Name	:	Diploma in Electronics Production and Maintenance
Program Code	:	DEPM
Semester	:	First
Course Title	:	Physics
Course Code	:	21D13

1. RATIONALE

Study of Physics aims to give an understanding of physical world by observations and predictions. Concrete use of physical principles and analysis in various fields of engineering and technology is very prominence. The course aims to supplement the factual knowledge gained in the lecture by first hand manipulation of apparatus. This will develop scientific temper and help to apply the basic concepts and principles in solving engineering and technology based problems. In addition, students get necessary confidence in handling equipment and thus learn various skills in measurement.

2. COMPETENCY

The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competencies.

1. Apply principles and concepts of Physics for solving various Engineering Problems

3.COURSE OUTCOMES (COs)

The On completion of the theory and practical parts of the course student demonstrates the following industry oriented COs associated with the above mentioned competency

a. Able to state Newton's laws of motion.
b. Able to Distinguish conductors, semiconductors and insulators
c. List various temperature scales and convert among temperatures.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme											
				Theory						Practical					
L	T	P		Paper Hrs	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
2	-	2	4	3	70	28	30*	12	100	40	25	10	25	10	50	20

(*): Under the theory PA out of 30marks, 10 marks are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the cognitive domain UOs required for the attainment of the COs.

Legends: L-Lecture: T Tutorial/ Teacher Guided Theory Practice: P-Practical: C-Credit, ESE - End Semester Examination: PA - Progressive Assessment.

5. SUGGESTED PRACTICALS / EXERCISES

The practical's 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.

DEPM	Semester I

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	Use Vernier caliper to : (i) Measure dimensions of given objects. (ii) Measure the dimensions objects of known dimensions (iii) Estimate the errors in measurement	I	2*
2	Use Screw gauge to: (i) Measure the dimensions of given objects (ii) Measure the dimensions objects of known dimensions (iii) Estimate the errors in measurement	I	2*
3	Use Spherometer to measure radius of curvature of any curved surface.	I	2
4	Use Ohm's law to solve circuit problems.	I	2*
5	Determine the specific resistance of given wire.	II	2*
6	Use the principle of series resistance in solving electrical engineering problems.	II	2
7	Use the principle of parallel resistance in solving electrical engineering problems.	II	2
8	Use magnetic compass to draw the magnetic lines of forces of magnet of different shapes.	II	2*
9	Use magnetic compass to determine the neutral points when (i) North pole of bar magnets points towards the north pole of earth.	II	2
10	Use p-n junction diode to draw forward bias and reverse bias I-V characteristics.	II	2*
11	Determine forbidden energy band gap in semiconductors.	II	2
12	Determine the pressure-volume relation using Boyle's law.	III	2
13	Use Joule's calorimeter to determine Joule's mechanical/ electrical equivalent of heat.	III	2*
14	Use Searle's thermal conductivity apparatus to find co-efficient of thermal conductivity of a given material.	III	2*
15	Use pin method to determine refractive index of prism.	III	2*
16	Determine the refractive index of glass slab using TIR phenomenon	III	2
	Total		**32**

Note

1..A suggestive list of PrOs is given in the above table More such PrOs can be added to attain the COs and competency .A judicial mix of minimum 12 or more practical need to be performed. out of which. the practical's marked as * are compulsory so that the student

reaches the 'Precision Level. of Dave's Psychomotor Domain Taxonomy' as generally required by the industry

2.The 'Process' and 'Product' related skills associated with each PrO is to be assessed according to a suggested sample given below

S. No.	Performance Indicators	Weightage in %
1	Preparation of experimental set up	20
2	Setting and operation	20
3	Safety measures	10
4	Observations and Recording	10
5	Interpretation of result and Conclusion	20
6	Answer to sample questions	10
7	Submission of report in time	10
	Total	**100**

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field based experiences:

a. Follow safety practices.
b. Practice good housekeeping.
c. Demonstrate working as a leader/a team member.
d. Follow ethical practices

The ADOs are not specific to any one PrO, but are embedded in many PrOs. Hence, the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of practical experiences over a period of time. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in 1^{st} year
- 'Organizing Level' in 2^{nd} year and
- 'Characterizing Level' in 3^{rd} year.

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

The Major equipment with broad specification mentioned here will user in uniformity in conduct of PrOs, as well as aid to procure equipment by authorities concerned

S. No.	Equipment Name with Broad Specifications	Exp. S.No.
1	Vernier Calipers: Range: 0-150mm, Resolution: 0.1mm	1

2	Micrometer screw gauge: Range: 0-25mm, Resolution:0.0Imm, Accuracy: ±0.02mm or better	2
3	Spherometer: range:-10 to +10 mm, LC = 0.01mm	3
4	Digital multimeter: 31/2 digit display, 9999 counts, digital multimeter measures: V., Vdc (1000V max). Ad_a, A_{dc} (10 amp max), Hz, Resistance (0-100 MQ.), Capacitance and Temperature	4, 5, 6, 7, 21, 22, 23
5	Resistance Box: 4 decade ranges from 1 ohm to 11(52 ,accuracy 0.1 %- **1** %	4,5,6,7
6	Battery eliminator: 0- 12V, 2A	6,7, 25, 26
7	Boyle's apparatus: U tube manometer, digital barometer	12
8	Joule's calorimeter: well insulated 'mechanical/Electrical equivalent of heat apparatus' in wooden box, digital/analog thermometer	13
9	Searle's thermal conductivity apparatus : Cylindrical copper, aluminum, brass, glass and iron rod, steam chamber, digital / analogue thermometer, arrangement for fitting tubes and thermometer	14
10	Forbidden energy band gap set up: Oven : temperature range up to 100°C, thermometer, micro ammeter. Ge diode	11
11	pH meter reading up to pH 14: ambient temp. -40 to 70C.; pH/mV resolution: l3 bit	24
12	Electronic balance_ with the scale range of 0.001g to 500gm pan size 100 mm: response time 3-5 sec.: power requirement 90-250 V, 10 watt	13,17, 19, 25, 26, 31
13	Electric oven inner size 18 x18x18: temperature range 100 to 250 C with the capacity o 40 ltrs	31
14	Ammeter 0-2 amp	25,26
I5	Redwood viscometer-I	27
16	Cleveland open cup apparatus	29
17	Abel's close cup apparatus	30

7. UNDERPINNING THEORY COMPONENTS

The following topics/subtopics are to he taught and assessed in order to develop UOs for achieving the COs to attain the identified competency:

DEPM | **Semester I**

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit - I Units and Measurements, Laws of Motion	1a Describe the given measurement device and its application. 1b Describe with justification the device required to measure the radius of curvature of the given object. 1c . State with justification the error in the given measurement quantity. 1d Describe the procedure to determine the dimensions of the given physical quantities. 1e Explain about motion of object 1f Explain about newton laws 1g Distinguish between uniform and non-uniform motion	1.1 Unit, physical quantities: fundamental and derived quantities and their units 1.2 Systems of unit: CGS, MKS, FPS and SI 1.3 Dimensions, dimensional formula 1.4 Errors, types of errors: instrumental, systematic and random error, estimation of errors: absolute, relative and percentage error, significant figures 1.5 Laws of motion 1.6 Uniform and non uniform motion 1.7 Force and inertia 1.8 Newton Laws of motion
Unit- II Electricity, Magnetism and Semiconductors	2a Calculate electric field, potential and potential difference of the given static charge. 2b Describe the concept of given magnetic intensity and flux with relevant units. 2c Explain the heating effect of the given electric current. 2d Apply laws of series and parallel combination in the given electric circuits. 2e Distinguish the given conductors, semiconductors and insulators on the basis of energy bands. 2f Explain the 1-V characteristics and applications of the given p-n junction diodes.	2.1 Concept of charge, Coulomb's inverse square law, Electric field, Electric field intensity, potential and potential difference 2.2 Magnetic field and magnetic field intensity and its units, magnetic lines of force, magnetic flux 2.3 Electric current, ohms law, specific resistance, laws of series and parallel combination of resistance, heating effect of electric current. 2.4 Conductors, Insulators and Semiconductors, Energy bands, intrinsic and extrinsic semiconductors 2.5 p-n junction diode, I-V Characteristics of p-n junction, applications of p-n junction diode

Unit- III Heat and Optics, Sound	3a Convert the given Temperature in different temperature scales. 3b Describe the properties of the given good and bad conductors of heat. 3c Relate the characteristics of the three gas laws. 3d Determine the relation between specific heats for the given materials. 3e Distinguish the phenomena of total internal reflection for the given mediums. 3f Describe light propagation in the type of optical fiber 3g Distinguish between Longitudinal and transverse waves 3h Travel of sound waves 3i Working of sonometer	3.1 Heat, temperature, temperature scales 3.2 Modes of transfer of heat, good and bad conductors of heat, law of thermal conductivity 3.3 Boyle's law, Charle's law, Gay Lussac's law, perfect gas equation 1.4 Specific heat of gas at constant pressure and volume (C_p, and Cv), ratio of specific heats 1.5 Reflection , refraction, laws of refraction, total internal reflection 1.6 Optical fiber: Principle, construction and path of light through optical fiber, applications of optical fibers. 1.7 Longitudinal and transverse wave 1.8 Reflection of sound waves 1.9 Superposition of sound waves 1.10 Stationary waves in strings 1.11 Resonance, Sonometer

Note: To attain the COs and competency. above listed UOs need to be undertaken to achieve the 'Application Leveland above of Bloom's 'Cognitive Domain Taxonomy'

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
	Physics					
I	Units and Measurements	06	04	06	-	10
11	Electricity, Magnetism and Semiconductors	14	06	10	16	32
III	Heat and Optics	12	06	10	12	28
Total		32	16	26	28	70

Legends: R=Remember, U=Understand. A =Apply and above (Bloom's Revised taxonomy)
Note: This specification table provides general guidelines to assist student for their learning and to teachers to teach and assess students with respect to attainment of UOs. The actual

distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary front above table.

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. Market survey of different resins and compare the following points.
   i. Structure
   ii. Properties
   iii. Applications.

b. Library survey regarding engineering material used in different industries.

c. Seminar on any relevant topic.

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. Guide student(s) in undertaking micro-projects.

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. S/he ought to submit it by the end of the semester to develop the industry oriented COs. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. 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.

In the first four semesters, the micro-project could be group-based. However, in higher semesters, it should be individually undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. A suggestive list is given here. Similar micro-projects could be added by the concerned faculty:

a. **Optical Fiber and TIR:** Prepare models by using water and diode laser to demonstrate total internal reflection and the working of optical fiber.
b. **Conductivity:** Collect different materials such as metal, plastics, glass etc. and prepare models to differentiate between good and bad conductor within collected materials.
c. **Gas laws:** Prepare models to demonstrate Boyle's laws, Charles Law and Gay Lussac's law using house hold materials.
d. **Battery and Cell:** Collect wastage material from lab and household and prepare working model of cell.

e. **Series and parallel resistances:** Prepare models for combination of series and parallel resistances using bulbs/ LED.
f. **Systems and units:** Prepare chart on comparison of systems of units for different physical quantities.
g. **Magnetic flux:** Prepare models to demonstrate magnetic lines of lines of forces of different types of magnets.
h. **Dimensional analysis:** Prepare chart on dimensions of fundamental and derived physical quantities and highlights the applications of dimensional analysis.

12. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Physics Textbook Part 1	Narlikar, J. V.; Joshi, A. W.; Mathur,	National Council of Education Research and Training, New Delhi,
2	Physics Textbook Part	Narlikar, J. V.; Joshi, A. W.; Mathur,	National Council of Education Research and Training, New Delhi,
3	Physics Textbook Part I	Narlikar, J.V.; Joshi, A. W.; Ghatak A.K.	National Council of Education Research and Training, New Delhi,
4	Physics Textbook Part II - Class XII	Narlikar, J.V.; Joshi, A. W.; Ghatak A.K.	National Council of Education Research and Training, New Delhi,
5	Engineering Physics	R K Kaur and L S Gupta	Dhanpat Rai Publications

13. SOFTWARE/LEARNING WEBSITES

i. http://npteLac.in/course.php?disciplineId=115
ii. www.physicsclassroom.comwww.physics.org
iii. www.science.howstuffworIcs.com
iv. https://phet.colorado.edu

Program Name : Diploma in **Electronics Production and Maintenance**
Program Code : **DEPM**
Semester : **First**
Course Title : **Chemistry**
Course Code : **21D14**

1. RATIONALE

There are numerous number materials used in fabricating and manufacturing devices for the comfort of life. The selection, characterization and suitability assessment of natural raw materials essentially requires principles and concepts of Chemistry for technicians. On successful completion of this course content will enable technicians to understand, ascertain and analyze the properties of natural raw materials required for producing economical and eco-friendly finished products.

2. COMPETENCY

The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competency.

1. Apply the basic concepts and principals of Chemistry in various engineering applications.

3. COURSE OUTCOMES (COs)

The On completion of the theory and practical parts of the course student demonstrates the following industry oriented COs associated with the above mentioned competency

a. Solve various engineering problems applying the basic knowledge of atomic structure and chemical bonding..
b. Solve the engineering problems using concept of Electrochemistry and corrosion.
c. Explain the properties and uses of the given polymer, elastomer and adhesive

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme													
				Theory								Practical					
L	T	P		Paper Hrs	ESE		PA		Total			ESE		PA		Total	
					Max	Min	Max	Min	Max	Min		Max	Min	Max	Min	Max	Min
2	-	-	2	3	70	28	30*	12	100	40		--	--	--	--	--	--

(*): Under the theory PA out of 30marks, 10 marks are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the cognitive domain UOs required for the attainment of the COs.
Legends: L-Lecture: T Tutorial/ Teacher Guided Theory Practice: P-Practical: C-Credit, ESE - End Semester Examination: PA - Progressive Assessment.

5. SUGGESTED PRACTICALS / EXERCISES

---Nil---

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

---Nil---

7. UNDERPINNING THEORY COMPONENTS

The following topics/subtopics are to he taught and assessed in order to develop UOs for achieving the COs to attain the identified competency:

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit -I Atomic Structure, Chemical bonding and Catalysis	1a Describe about structure of atom 1b Distinguish between elements and Compounds 1c Explain about various postulates 1d Explain the properties of given material based on the bond formation. 1e Describe the molecular structure of given solid, liquid and gases. 1f Describe the crystal structure of the given solids. Select the relevant catalyst for given application.	1.1 Definition and scope 1.2 Elements,Compounds and mixtures 1.3 Law of constant composition 1.4 Boyel's law and Charles Law 1.5 Electronic theory of valency, Chemical bonds: types and characteristics, electrovalent bond, covalent bond, coordinate bond, hydrogen bond, metallic bond, metallic properties, intermolecular force of attraction. 1.6 Molecular arrangement in solid, liquid and gases. 1.7 Structure of solids: crystalline and amorphous solid, properties of metallic solids-, unit cell- of simple cubic, body centre cubic, face centre cubic, hexagonal close pack crystals. Catalysis: Types of catalysis, Catalyst, Types of Catalyst, Positive Catalyst, Negative Catalyst, Auto-catalyst, Catalytic Promoter and Catalytic inhibitor, Industrial Application of Catalyst
Unit-II Metal Corrosion, its prevention and Electrochemistry	2a Describe the phenomenon of the given type of corrosion and its prevention 2b Identify the different factors affecting rate of corrosion for the given type of material.	2.1 Corrosion: Types of corrosion- Dry Corrosion, Wet corrosion. Oxidation corrosion (Atmospheric corrosion due to oxygen gas). mechanism, Types of oxide film, Wet corrosion mechanism (Hydrogen evolution in acidic medium) 2.2 Concentration cell corrosion -oxygen absorption

	2c Select the Protective measures to prevent the corrosion in the given corrosive medium. 2d Differentiate the salient features of the given electrolytic cell and electrochemical cell. 2e Distinguish the given primary and secondary electrolytic cells. 2f Describe the process of electrolysis for the given electrolyte. Describe the process of electroplating of the given material.	mechanism in neutral or alkaline medium, Pitting corrosion, Waterline corrosion, Crevice corrosion. 2.3 Factors affecting the rate of corrosion control: Modification of environment, Use of protective coatings- coating of less active metal like Tin (Tinning), coating of more active metal like Zinc (Galvanizing), Anodic and cathodic protection, Choice of material-using pure metal and using metal alloys 2.4 Electrolyte- strong and weak, Non-Electrolyte, Electrolytic cell, Electrochemical cell. Cathode, Anode, Electrode potential- oxidation and reduction. Construction and working of Daniel cell ionization and dissociation 2.5 Faradays first and second law Primary cell and secondary cell Electrolysis Mechanism, Electroplating and electro-refining of copper.
Unit-III Paints, Varnishes, Insulators, Polymer, Adhesives and Lubricants	3a Identify the ingredients of the given paints. 3b Differentiate salient properties of the given paint and varnish. 3c Describe the properties of insulating materials for the given application. 3d Differentiate the given types of structural polymers. 3e Describe the polymerization process of the given polymer	3.1 Paints: Purpose of applying paint, Characteristics of paints, Ingredients of paints, Function and Examples of each ingredients 3.2 Varnish: Types, Difference between paints and varnishes 3.3 Insulators: Characteristics, Classification, Properties and Application of Glass wool, ThermoCole 3.4 Polymer and Monomer, Classification on the basis of molecular structure on the basis of monomers(homo polymer and copolymer) on the basis of Thermal

	3f Explain the properties and uses of the given polymer, elastomer and adhesive 3g Describe the application of relevant adhesives required for the given material 3h Explain the properties of given type of lubricants	behavior(thermoplastics and thermosetting) 3.5 Types Polymerization Reaction Addition Polymerization,condensation polymerization,synthesis, properties and application of polyethylene, Polyvinylchloride, Teflon polystyrene, phenol formaldehyde, Epoxy Resin 3.6 Adhesives: Characteristics. Classification and their uses Lubricants: Classification,Properties and applications

Note: To attain the COs and competency. above listed UOs need to be undertaken to achieve the 'Application Leveland above of Bloom's 'Cognitive Domain Taxonomy'

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	Chemical bonding and Catalysis	08	04	06	08	18
II	Metal Corrosion, prevention and Electrochemistry	12	06	08	10	24
III	Paints, Varnishes, Insulators, Polymer Adhesives and Lubricants	12	06	10	12	28
Total		32	16	24	30	70

Legends: R=Remember, U=Understand. A =Apply and above (Bloom's Revised taxonomy)
Note: This specification table provides general guidelines to assist student for their learning and to teachers to teach and assess students with respect to attainment of UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary front above table.

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. Market survey of different resins and compare the following points.
   i. Structure
   ii. Properties
   iii. Applications.

b. Library survey regarding engineering material used in different industries.

c. Power point presentation or animation for showing different types of bonds or molecules.

d. Seminar on any relevant topic.

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. Guide student(s) in undertaking micro-projects.

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. S/he ought to submit it by the end of the semester to develop the industry oriented COs. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. 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.

In the first four semesters, the micro-project could be group-based. However, in higher semesters, it should be individually undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. A suggestive list is given here. Similar micro-projects could be added by the concerned faculty:

a. **Adhesives:** Prepare model to demonstrate the applications of various adhesives.

b. **Polymer:** Collect the samples of different polymers and list their uses.

c. **Types of bonds:** Prepare chart and models displaying different types of bonds with examples

d. **Ionization:** Prepare chart displaying ionization phenomenon.

12. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Engineering Chemistry	Jain and Jain	DhanpatRai and sons; New Delhi, 2015,
2	General chemistry	N.L.GlinkaVol 1&2	MIR Publications 3rd Edition

13. SOFTWARE/LEARNING WEBSITES

i. www.chemistryteaching.com
ii. wwwvisionleaming.com
iii. www.cheml.com

DEPM	Semester I

Program Name : Diploma in Electronics Production and Maintenance
Program Code : DEPM
Semester : First
Course Title : Fundamentals of ICT
Course Code : 21D15

1. RATIONALE

This course offers state-of-art information technology education, and imparting skills for building leading-edge and innovative IT applications. On continuous learning and upgrading skills in Information Technology will solve real life & professional problems and apply appropriate techniques using word processing, spread sheets, presentation tools and browsers etc. The objective of this course is to develop the basic competency in students for using these office automation tools to accomplish the job.

2. COMPETENCY

The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competency.

1. Use computers for internet services, electronic documentation, data analysis and slide presentation.

3. COURSE OUTCOMES (COs)

The On completion of the theory and practical parts of the course student demonstrates the following industry oriented COs associated with the above mentioned competency

a. Overview of hardware and software and peripherals of computer system
b. Documentation using word processing.
c. Creating and editing work sheet along with knowledge of working with charts
d. Able to create professional presentations,
e. Explain features of specified web service and knowledge on different types of web browsers.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme											
				Theory						Practical					
L	T	P		Paper Hrs	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
2	-	2	4	3	70	28	30	12	100	40	25	10	25	10	50	20

For the courses having ONLY practical examination, the PA has two components under practical marks i.e. the assessment of practical's (seen in section 5) has a weightage of 60% (i.e15 marks) and micro-project assessment (seen in section 11) has a weightage of 40% (i.e. 10 marks). This is designed to facilitate attainment of COs holistically, as there is no theory ESE.

Legends: L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P - Practical; C– Credit, ESE - End Semester Examination; PA - Progressive Assessment; # No theory exam.

5. SUGGESTED PRACTICALS/ EXERCISES

The practical's 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	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	Identify various Input/output devices, connections and peripherals of computer system	I	1*
2	Manage files and folders : Create, copy, rename, delete, move files and folder	I	1
	Word Processing		
3	Create, edit and save document: apply formatting features on the text - line. Paragraph	II	2*
4	Use bullets, numbering, page formatting	II	2
5	Insert and edit images and shapes, sizing, cropping, color, background, group/ungroup	II	2
6	Insert and apply various table formatting features on it.	Il	2
7	Apply page layout features i. Themes, page background, paragraph, page setup ii. Create multicolumn page iii. Use different options to print the documents	II	2*
8	Use mail merge with options.	II	2
	Spreadsheets		
9	Create, open and edit worksheet i. Enter data and format it, adjust row height and column width ii. Insert and delete cells, rows and columns iii. Apply wrap text, orientation feature on cell.	III	2*
10	Insert formulas, "IF" conditions, functions and named ranges in worksheet.	III	2
11	Apply data Sort, Filter and Data Validation features.	III	2*
12	Create charts to apply various chart options.	III	2*
13	Apply Page setup and print options for worksheet to print the worksheet.	III	1
	Presentation Tool		

14	Create slide presentation i. Apply design themes to the given presentation ii. Add new slides and insert pictures/images, shapes	IV	2*
15	i. Add tables and charts in the slides. ii. Run slide presentation in different modes iii. Print slide presentation as handouts	IV	2
16	Apply animation effects to the text and slides.	IV	2*
17	Add audio and video files in the given presentation	IV	2
	Internet Basics		
18	Configure Internet connection	V	1
19	Use internet for different web services.	V	2*
20	Configure browser settings and use browsers.	V	1*
Total			**32**

* Compulsory practical's to be performed.

Note

i. A suggestive list of practical UOs is given in the above table, more such PrOs can be added to attain the COs and competency.

ii. Hence, the 'Process' and 'Product' related skills associated with each PrOs of the laboratory/workshop/field work are to be assessed according to a suggested sample given below:

S. No.	Performance Indicators	Weightage in %
a	Use of Appropriate tool to solve the problem (Process)	40
b.	Quality of output achieved (Product)	30
c	Complete the practical in stipulated time	10
d	Answer to sample questions	10
e	Submit report in time	10
Total		**100**

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field based experiences:

a. Follow safety practices
b. Practice good housekeeping.
c. Demonstrate working as a leader/a team member
d. Maintain tools and equipment
e. Follow ethical practices.

The ADOs are not specific to any one PrO. but are embedded in many PrOs. Hence. the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of

practical experiences over a period of time. Moreover, the level of achievement of the ADOs according to Krathwohls 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in 1st year
- 'Organizing Level' in 2nd year
- 'Characterizing Level' in 3rd year.

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

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

S. No	Equipment Name with Broad Specifications	Exp. S.No.
1	Computer system with all necessary components like: motherboard. random access memory (RAM). read-only memory (ROM). Graphics cards. sound cards. internal hard disk drives. DVD drive network interface card.	1
2	Double side printing laser printer.	1 .6. 12.13
3	Hubs. Switches. Modems.	1,16.17
4	Any operating system.	2 to l 8
5	Any Office Software.	2 to 15
6	Any browser.	16.17.18

Note: There are no specifications fixed for the above listed systems, devices and instruments depending on the availability in the institute they can be utilized for the purpose.

7. UNDERPINNING THEORY COMPONENTS

The following topics/subtopics are to be taught and assessed in order to develop UOs for achieving the COs to attain the identified competency:

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit — I Introduction to Computer System	1a Explain the given Block diagram of computer system. 1b Classify the given type of software 1c Explain characteristics of specified type of network 1d Describe procedure to manage a file/folder in the given way 1e Describe application of the specified type of network connecting device	1.1 **Basics of Computer System:** Overview of Hardware and Software: block diagram of Computer System, Input/output unit CPU, Control Unit, Arithmetic logic Unit (ALU),Memory Unit 1.2 **Internal components:** processor, motherboards, random access memory RAM), read-only memory (ROM), video cards, sound cards and internal hard disk drives)

		1.3 **External Devices:** Types of input/output devices, types of monitors, keyboards, mouse, printers: Dot matrix, Inkjet and LaserJet, plotter and scanner, external storage devices CD/DVD, Hard disk and pen drive 1.4 **Application Software:** Word processing spreadsheet, database management systems, control software, measuring software, photo-editing software, video-editing software graphics manipulation software System Software compilers, linkers, device drivers, operating systems and utilities 1.5 **Network environments**: network interface cards, hubs, switches, routers and modems, concept of LAN, MAN, WAN, WLAN, WiFi and Bluetooth 1.6 **Working with Operating Systems:** Create and manage file and folders, Copy a file, renaming and deleting of files and folders, Searching files and folders, application installation, creating shortcut of application on the desktop.
Unit— II Word Processing	2a Write steps to create the given text document. 2b Explain the specified feature for document editing. 2c Explain the given pagesetup features of a document 2d Explain the given pagesetup features of a document. Write the specified Table formatting feature.	2.1 **Word Processing**: Overviewof Word processor Basics of Font type, size, colour, Effects like Bold, italic, underline, Subscript and superscript, Case changing options, Previewing a document, Saving a document, Closing a document and exiting application. 2.2 **Editing a Document**: Navigate through a document, Scroll through text, Insert and delete text, Select text, Undoand redo commands, Use drag and drop to move text, Copy, cut and paste. Use the clipboard, Clear formatting. Format and align

		text.. Formatting/Paragraphs. Line and paragraph spacing, add bullet and numbers in lists, add borders and shading, document views, Page settings and margins, Spelling and Grammatical checks 2.3 **Changing theLayout of a Document**: Adjust page margins, Changepage orientation, Create headers and footers, Set and change indentations, Insert and clear tabs 2.4 **Inserting Elements to Word Documents:** Insert and delete a page break, Insert page numbers, Insert the date and time, Insert special characters (symbols), Insert a picture from a file, Resize and reposition a picture 2.5 **Working with Tables:** Insert a table, Convert a table to text, Navigate and select text in a table, Resize table cells, Align text in a table, Format a table, Insert and delete columns and rows, Borders and shading, Repeat table headings on subsequent pages, Merge and split cells. 2.6 **Working with Columned Layouts and Section Breaks:** Columns, Section breaks, Creating columns, Newsletter style columns, Changing part of a document layout or formatting, Remove section break, Add columns to remainder of a document, Column widths, Adjust column spacing, Insert manual column breaks.

Unit— III Spreadsheets	3a .Write steps to create the given spreadsheet. 3b Explain the specified formatting feature of a worksheet. 3c Write steps to insert formula and functions in the given worksheet. 3d Write steps to create charts for the specified data set. Explain steps to perform advance operation on the given data set.	3.1 **Working with Spreadsheets**: Overview Of workbook and worksheet, Create worksheet, Entering sample data, Save, Copy Worksheet, Delete Worksheet Close and open Workbook. 3.2 **Editing Worksheet:** Insert and select data, adjust row height and column width, delete, move data, insert rows and columns, Copy and Paste, Find and Replace, Spell Check, ZoomIn-Out, Special Symbols, Insert Comments, Add Text Box, Undo Changes, Freeze Panes, hiding/un-hiding rows and columns. 3.3 . **Formatting Cells and sheet**: Setting Cell Type, Setting Fonts, Text options, Rotate Cells, Setting Colors, Text Alignments, Merge and Wrap, apply Borders and Shades, Sheet Options, Adjust Margins, Page Orientation, Header and Footer, Insert Page Breaks, Set Background. 3.4 **Working with Formula:** Creating Formulas, Copying Formulas, Common spreadsheet Functions such as sum, average. min, max, date, In, And, or, mathematical functions such as sqrt, power, applying conditions using IF. 3.5 **Working with Charts:** Introduction to charts, overview of different types of charts, Bar, Pie, Line charts, creating and editing charts. Using chart options: chart title, axis title, legend, data labels, Axes, grid lines, moving chart in a separate sheet. 3.6 **Advanced Operations:**Conditional Formatting, Data Filtering, Data Sorting, Using Ranges, Data Validation, Adding Graphics,

		Printing Worksheets, print area, margins, header, footer and other page setup options.
Unit— IV Presentation Tool	4a Write the steps to create the specified slide presentation. 4b Write the steps to insert multiple media in the given presentation. 4c Write steps to apply table features in the given presentation 4d Write steps to manage charts in the given presentation	4.1 **Creating a Presentation:** Outline of an effective presentation. Identify the elements of the User Interface, Starting a New' Presentation Files, Creating a Basic Presentation, Working with textboxes. Apply Character Formats, Format Paragraphs. View a Presentation. Saving work. creating new Slides. Changing a slide Layout. Applying a theme. Changing Colours. fonts and effects. apply custom Colour and font theme. changing the background. Arrange Slide sequence. 4.2 **Inserting Media elements:** Adding and Modifying Graphical Objects to a Presentation - Insert Images into a Presentation. insert audio clips. video/animation, Add Shapes. Add Visual Styles to Text in a Presentation. Edit Graphical Objects on a Slide. Format Graphical Objects on a Slide. Group Graphical Objects on a Slide. Apply an Animation Effect to a Graphical Objects, Add Transitions. Add Speaker Notes. Print a Presentation 4.3 **Working with Tables:** lawn a Table in a Slide. Format Tables, and Import Tables from Other Office 4.4 Applications.**Working with Charts**: Insert Charts in a Slide. Modify a Chart. Import Charts from Other Office Applications.
Unit-V Basics of Internet	5a Explain Use of the given setting option in browsers	5.1 **World Wide Web:** Introduction. Internet Intranet, Cloud. Web Sites, web pages,

	5b Explain features of the specified web service 5c Describe the given characteristic of cloud 5d Explain the specified option used for effective searching in search engine	URL. web servers. basic settings of web browsers- history. extension. default page. default search engine, creating and retrieving bookmarks. use search engines effectively for searching the content 5.2 **Web Services:** e-mail. Chat, Video Conferencing, e-learning, e-shopping, e-reservation, e-Groups. Social Networking.

Note: To attain the COs and competency, above listed UOs need to be undertaken to achieve the 'Application Level' and above of Bloom's 'Cognitive Domain Taxonomy'

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 to Computer System	12	02	04	08	14
II	Word Processing	20	05	06	13	24
III	Spreadsheets	06	02	04	06	12
IV	Presentation Tool	06	02	04	06	12
V	Basics of Internet	04	02	02	04	08
Total		**48**	**13**	**20**	**37**	**70**

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. Prepare journal of practicals
b. Prepare a sample document with all word processing features (Course teacher shall allot appropriate document type to each students)
c. Undertake micro projects

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. 'L' in item No. 4 does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
c. About 15-20% of the topics/sub-topics which is relative!) 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)
d. With respect to item No.10, teachers need to ensure to create opportunities and provisions for co-curricular activities
e. Guide student(s) in undertaking micro-projects
f. Guide student(s) in undertaking various activities in the lab/workshop.
g. Demonstrate students thoroughly before they start doing the practice.
h. Show video/animation films for handling/functioning of instruments
i. Observe continuously and monitor the performance of students in Lab

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. S/he ought to submit it by the end of the semester to develop the industry-oriented COs. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. 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.

In the first four semesters, the micro-project could be group-based. However, in higher semesters, it should be individually undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. A suggestive list is given here. Similar micro-projects could be added by the concerned faculty:

a. **Word documents**: Prepare Time Table, Application, Notes, reports. (Subject teacher shall assign a document to be prepared by the each student)
b. **Slide Presentations**: Prepare slides with all Presentation features such as: classroom presentation, presentation about department. presentation of report. (Subject teacher shall assign a presentation to be prepared by the each student).
c. **Spreadsheets**: Prepare Pay bills, tax statement. student's assessment record using spreadsheet. (Teacher shall assign a spreadsheet to be prepared by each student).

12. SUGGESTED LEARNING RESOURCES

S.No	Title of the Book	Author	Publication

1	Computer Basics Absolute Beginner's Guide,	Miller, Michael	QUE Publishing; 8th edition August 2015, ISBN: 978–0789754516
2	Computer Fundamentals	Goel. Anita	Pearson Education, New Delhi, 2014. ISBN: 978-8131733097
3	Microsoft Office 2010 for Windows: Visual Quick Start	Schwartz, Steve	Pearson Education, New Delhi India, 2012, ISBN:9788131766613
4	Linux: Easy Linux for Beginners	Alvaro, Felix	CreatevSpace Independent Publishing Platform- 2016, ISBN 978-1533683731
5	Computer fundamentals	Dr.Rajendra Kawale	DevrajPublications,DistSolapurMahara stra
6	Microsoft Office 2010: On Demand	Johnson, Steve	Pearson Education, New Delhi India, 2010; ISBN: 9788131770641
7	OpenOffice.org for Dummies	Leete, Gurdy, Finkelstein	Wiley Publishing, New Delhi, 2003 ISBN: 978-0764542220

13. SOFTWARE/ LEARNING WEBSITES

a. https://www.microsoft.com/en-in/leaming/ot'tice-training,aspx
b. http://www.tutorialsforopenoffice.org/
c. https://s3-ap-southeast-l.amazonaws.com/r4Itue295xy0d/ Special_Edition_Using_StarOffice_6_0.pdf

DEPM	Semester I

Program Name : Diploma in Electronics Production and Maintenance
Program Code : DEPM
Semester : First
Course Title : Engineering Drawing
Course Code : 21D16

1. RATIONALE:

Engineering drawing is an effective language of engineers. It is the foundation block which strengthens the engineering & technological structure. Moreover, it is the transmitting link between ideas and realization. It is an attempt to develop fundamental understanding and application of engineering drawing. It covers knowledge & application of drawing instruments & also familiarizes the learner about Bureau of Indian standards. The curriculum aims at developing the ability to draw and read various drawings, curves & projections. The subject mainly focuses on use of drawing instruments, developing imagination and translating ideas. Developing the sense of drawing sequence and use of drawing instruments effectively yields not only with productive preparation of computer aided graphics but also yields with effective industrial applications ranging from marking to performance of operations. This preliminary course aims at building a foundation for the further courses related to engineering drawing and other allied courses in coming semesters.

2. COMPETENCY

The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competencies:

1. Prepare engineering drawings manually with given geometrical dimensions using prevailing drawing standards and drafting instruments.
2. Visualize the shape of simple object from orthographic views and vice versa.

3. COURSE OUTCOMES (COs)

On completion of the theory and practical parts of the course student demonstrates the following industry oriented COs associated with the above mentioned competency

a. Able to utilize drawing instruments effectively.
b. Draw the orthographic views from given pictorial views.
c. Draw isometric views from given orthographic views.
d. Sketch proportionate freehand sketches of given machine elements
e. computer aided drafting approach to create engineering drawings
f. Knowledge on drawing codes conventions and symbols as per IS SP-46 in engineering drawing.

4 . TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme												
				Theory							Practical					
L	T	P		Paper Hrs	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
2	-	4	6	3	70	28	30	12	100	40	25**	10	25~	10	50	20

(**) marks should be awarded on the basis of internal end semester practical exam of 25 marks based on the specification table given in S.No. 8

Legends: L-Lecture; T — Tutorial/Teacher Guided Theory Practice; P - Practical; C— Credit, ESE - End Semester Examination; PA - Progressive Assessment, 4: No theory paper.

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. Following practicals (except 1, 2. 3. 4, 31 and 32) are to be attempted on A2 drawing sheets.

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. H rs. Required
I	Draw horizontal, vertical, 30 degree, 45 degree, 60 and 75 degrees lines, different types of lines, dimensioning styles using Set squares/ drafter.(Problem1)	I	02
2	Write alphabets and numerical (Vertical only) (Problem2)	I	02
3	Draw regular geometric constructions and redraw the given figure(problem 3)	I	02
4	Draw regular geometric constructions and redraw the given figure(problem 4)	I	02
Sheet No. 1(Two problems)			
5	Draw a problem on orthographic projections using first angle method of projection having plain surfaces(Problem 1)	II	02
6	Draw another problem on orthographic projection using first angle method of projection having plain surface(Problem1	II	02
7	Draw another problem on orthographic projections using first angle method of projection having plain and slanting surfaces.	II	02
8	Draw another problem on orthographic projections using first angle method of projection having plain and slanting surfaces. (Problem 2 continued)	II	02
Sheet No. 2(Two problems)			
9	Draw two problems on orthographic projections using first angle	III	02
10	Draw two problems on orthographic projections using first angle method of projection having cylindrical surfaces, ribs (Problem I continued)	III	02
11	Draw two problems on orthographic projections using first angle	III	02
12	Draw two problems on orthographic projections using first angle method of projection having cylindrical surfaces, ribs.	III	02
Sheet No. 3(Two problems)			
13	Draw two problems on Isometric view of simple objects having plain and slanting surface by using natural scale.	III	02

14	Draw two problems on Isometric view of simple objects having plain and slanting surface by using natural scale.	III	02
15	Draw two problems on Isometric view of simple objects having plain and slanting surface by using natural scale	III	02
16	Draw two problems on Isometric view of simple objects having plain and slanting surface by using natural scale.	III	02
Sheet No. 4(Two problems)			
17	Draw a problem on Isometric Projection of objects having cylindrical surface by using isometric scale. (Problem I)	IV	02
18	Draw another problem on Isometric Projection of objects having cylindrical surface by using isometric scale. (Problem 1	IV	02
19	Draw a problem on Isometric Projection of objects having slot on slanting surface by using isometric scale (Problem 2)	IV	02
20	Draw another problem on Isometric Projection of objects having slot on slanting surface by using isometric scale.	IV	02
Sheet No.5(Two Problems)			
21	Draw free hand sketches/conventional representation of machine elements in sketch book such as thread profiles, nuts,	V	02
22	Draw free hand sketches/conventional representation of machine elements in sketch book such as thread profiles, nuts, bolts, studs, set screws. washers. Locking arrangements. (Problem 2)	V	02
Sketch Book(one problem)			
23	Draw two problems on Isometric view of simple objects having plain and slanting surface by using natural scale.	III,IV,V	02
	Total		**46**

S. No.	Practical Outcomes (PrOs) (Learning Outcomes in Psychomotor Domain)	Unit No.	Approx Hrs. Required
24	Draw basic 2D entities like:Rectangle,Rhombus,Polygon using AutoCAD(Print out should be a part of Progressive assessment)(problem 1)	V*	02
25	Draw basic 2D entities like:Circles,Arcs,circular and rectangular array using AutoCAD(Print out should be apart of progressive assessment)(problem2)	**V***	02
26	Draw basic 2D entities like: circular and rectangular array using AutoCAD(Print out should be a part of progressive assessment)(problem 3)	V*	02

27	Draw basic 2D entities comprises of rectangle,rhombus,polygon,circles,arcs,circular and rectangular array,blocks using AutoCAD(Print out should be apart of progressive assessment)(problem2)	V*	02
28	Draw basic branch specific components in 2D using AutoCAD(printout should be a part of term work)(Problem 5)	VI*	02
29	Draw basic branch specific components in 2D using AutoCAD(printout should be a part of term work)(Problem 6)	VI	02
30	Draw complex branch specific components in 2D using AutoCAD(printout should be a part of progressive assessment)(Problem 7)	VI*	02
31	Draw complex branch specific components in 2D using AutoCAD(printout should be a part of progressive assessment)(Problem 8)	VI*	02
32	Draw complex branch specific components in 2D using AutoCAD(printout should be a part of progressive assessment)(Problem 9)	VI	02
Total			**18**

All practicals are to be performed.

Note

i. A suggestive list of PrOs is given in the above table, more such PrOs can be added to attain the COs and competency.

ii. The 'Process' and 'Product' related skills associated with each PrO is to be assessed according to a suggested sample given below:

S.No	Performance Indicators	Weightage in %
1	Neatness, Cleanliness on drawing sheet	10
2	Uniformity in drawing and line work	10
3	Creating given drawing	40
4	Dimensioning the given drawing and writing text	20
5	Answer to sample questions	10
6	Submission of drawing in time	10
	Total	**100**

Note: Use above sample assessment scheme for practical exercises 1 to 23.

S.No	Performance Indicators	Weightage in %
1	Developing using template	20
2	Selecting relevant setup parameters	05
3	creating given drawing using relevant Commands	40
4	Dimensioning the given drawing and writing text using blocks and layers effectively	15

5	Answer to sample questions	10
6	Submission of digital drawing file/plot in time	10
Total		**100**

Note: Use above sample assessment scheme for practical exercises 24 to 32.

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are
best developed through the laboratory/field based experiences:

a. Follow cleanliness and neatness.
b. Follow ethics and standards.

The ADOs are not specific to any one PrO, but are embedded in many PrOs. Hence, the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of practical experiences over a period of time. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in I' year
- 'Organizing Level' in 2nd year
- 'Characterizing Level' in 3rd year.

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

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

S.No	Equipment Name with Broad Specifications	Exp. &No.
1	Drawing Table with Drawing Board of Full Imperial/ Al size.	All
2	Models of objects for orthographic / isometric projections	1 to 20
3	Models/ Charts of objects mentioned in unit no. 4	-
4	Set of various industrial drawing being used by industries	ALL
5	Set of drawings sheets mentioned in section 6.0 could be developed by experienced teachers	All
6	Set of various industrial drawing being used by industries Drawing equipment's and instruments for class room teaching-large size: a. T-square or drafter (Drafting Machine) b. Set squares (45° and 30°- 60°) c. Protractor d. Drawing instrument box (containing set of compasses and dividers) e. Drawing sheets, Drawing pencils, Eraser f. Drawing pins/clips	All

7	Drawing equipment's and instruments for class room teaching-large size: a. T-square or drafter (Drafting Machine) b. Set squares (45° and 30°- 60°) c. Protractor d. Drawing instrument box (containing set of compasses and dividers)	1 to 23
8	Interactive board with LCD overhead projector	ALL
9	CAD Workstation 2GB RAM,320 GB HDD,17"Screen,1 GH (Minimum requirement)	24 to 32
10	Plotter:Print resolution up to 1200 x 600 dpi,16 GB Memory	24 to 32
11	Licensed latest network version of AutoCAD software	24 to 32

7. UNDERPINNING THEORY COMPONENTS

The following topics/subtopics is to be taught and assessed in order to develop UOs for achieving the COs to attain the identified competency:

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit — I Basic elements of Drawing	1a Prepare drawing using drawing instruments. 1b Use of ISSP for dimensioning technique. 1c Use different types of lines. 1d Draw regular geometrical figures. 1e Draw figures having tangency constructions.	1.1 Drawing Instruments and supporting material: method to use them with applications. 1.2 Convention of lines and their applications. 1.3 Scale - reduced, enlarged and full size 1.4 Dimensioning techniques as per SP-46 (Latest edition) — types and applications of chain, parallel and coordinate dimensioning 1.5 Geometrical and Tangency constructions. (Redraw the figure)
Unit- II Orthographic projections	2a Explain methods of Orthographic Projections. 2b Draw orthographic views of given simple 2D entities containing lines, circles and arcs only. 2c Draw the orthographic views from given pictorial views. 2d Use of IS code ISSP-46 for dimensioning technique for given situation.	2.1 Introduction of projections-orthographic, perspective, isometric and oblique: concept and applications.(No question to be asked in examination) 2.2 Introduction to orthographic projection, First angle and Third angle method, their symbols. 2.3 Conversion of pictorial view into Orthographic Views - object containing plain surfaces, slanting surfaces, slots, ribs, cylindrical surfaces. (use First Angle Projection Method Only)

Unit- III Isometric projections	3a Prepare isometric scale. 3b Draw isometric views of given simple 2D entities containing lines, circles and arcs only. 3c Interpret the given Orthographic views 3d Draw Isometric views from given orthographic views.	3.1 Introduction to isometric projections 3.2 Isometric scale and Natural Scale. 3.3 Isometric view and isometric projection 3.4 Illustrative problems limited to Objects containing lines, circles and arcs shapely. 3.5 Conversion of orthographic views into isometric View/projection.
Unit- IV Free Hand Sketches of engineering elements	4a Sketch proportionate freehand sketches of given machine elements 4b Select proper fasteners and locking arrangement for given situation.	4.1 Free hand sketches of machine elements: Thread profiles, nuts, bolts, studs, set screws, washers, Locking arrangements. (For branches other than mechanical Engineering, the teacher should select branch specific elements for free hand sketching)
Unit- V Computer aided drafting interface	5a Explain different components of AutoCAD main window. 5b Open a new/existing file in AutoCAD 5c Set/edit various parameters in a new/given file.	5.1 Computer Aided Drafting: concept. 5.2 Hardware and various CAD software available. 5.3 System requirement and Understanding the interface. 5.4 Components of AutoCAD software window: Title bar, standard tool bar, menu bar, object properties tool bar, draw toolbar, modify toolbar, cursor cross hair. Command window, status bar, drawing area, UCS icon. 5.5 File features: New file, Saving the file, Opening an existing drawing file, Creating Templates, Quit. 5.6 Setting up new drawing: Units, Limits, Grid, Snap. 5.7 Undoing and Redoing action
Unit-VI Computer aided drafting	6a Draw basic 2D entities in AutoCAD software. 6b Prepare 2D drawing of given simple engineering components using AutoCAD software 6c Print given drawing using Printer/plotter.	6.1 Draw, basic entities like Line. Circle, Arc. Polygon, Ellipse, Rectangle, Multiline, Poly Line. 6.2 Methods of Specifying points: Absolute coordinates, Relative Cartesian and Polar coordinates. 6.3 Modify and edit commands like trim, delete, copy, offset, array, block, layers. 6.4 Dimensioning: Linear, Horizontal, Vertical, Aligned, Rotated, Baseline, Continuous, Diameter. Radius. Angular Dimensions.

		6.5 Dim scale variable. 6.6 Editing dimensions. 6.7 Text: Single line Text. Multiline text. 6.8 Standard sizes of sheet. Selecting Various plotting parameters such as Paper size, paper units, Drawing orientation, plot scale, plot offset, plot area, print preview

Note: To attain the COs and competency. above listed UOs need to be undertaken to achieve the 'Application Level' of Bloom's 'Cognitive Domain Taxonomy'.

8. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER(INTERNAL) DESIGN:

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Basic elements of Drawing	04	-	02	04	06
II	Orthographic projections	06	-	04	16	20
III	Isometric projections	08	04	04	12	20
IV	Free hand sketches of engineering elements	04	02	-	04	06
V	Computer aided drafting interface	04	02	04	-	06
VI	Computer aided drafting	06	02	04	06	12
Total		**32**	**10**	**18**	**42**	**70**

Legends: R=Remember, U=Understand, A=Apply and above (Bloom's Revised taxonomy)
Note: This specification table provides general guidelines to assist student for their learning and to teachers to teach and assess students with respect to attainment of UOs. The actual distribution of marks at different taxonomy levels (of R. U and A) in the question paper may vary from above table.

This specification table also provides a general guideline for teachers to frame internal end semester practical theory exam paper which students have to undertake on the drawing sheet.

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. Student should maintain a separate A3 size sketch book which will be the part of term work and submit it along with drawing sheets. Following assignment should be drawn in the sketch book-

i. Single stoke vertical Letters and Numbers.
ii. Type of Lines.
iii. Redraw the figures. Any three,
iv. Engineering Curves. One problem for each type of curve.
v. Orthographic projections. Minimum 5 problems.
vi. Isometric Projections/Views. Minimum 5 problems.
vii. Free hand sketches. All types of engineering elements mentioned in Unit no.-4.
viii. Note- Problems on sheet and in the sketch book should be different.

b. Students should collect Maps, Production drawings, Building Drawings, Layouts from nearby workshops/industries/builders/contractors and try to list
i. Types of lines used
ii. lettering styles used
iii. dimension styles used
iv. IS code referred

c. Name the shapes and curves you are observing around you in real life with name of place and item. (For example ellipse, parabola, hyperbola, cycloid, epicycloids, hypocycloid, involute, spiral helix).

d. Each student should explain at least one problem for construction and method of drawing in sheet to all batch Colleagues. Teacher will assign the problem of particular sheet to be explained to each student batch.

e. Each student will assess at least one sheet of other students (May be a group of 5-6 students identified by teacher can be taken) and will note down the mistakes committed by them. Student will also guide the students for correcting the mistakes, if any

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. 'L' in item No. 4 does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes,
c. About 15-20% of the topics/sub-topics which is relatively simpler or descriptive in nature is given to the students for self-directed learning and assess the development of the COs through classroom presentations (see implementation guideline for details).
d. With respect to item No.10, teachers need to ensure to create opportunities and provisions for co-curricular activities,
    a. Guide student(s) in undertaking micro-projects.
    b. Guide student(s) in fixing the sheet and mini drafter on drawing board.
    c. Show video/animation films to explain orthographic and Isometric projection.
    d. Demonstrate first and third angle method using model.
    e. Use charts and industrial drawing/drawing sheets developed by experienced faculty to teach standard symbols and current industrial/teaching practices.

11. SUGGESTED LIST OF MICRO PROJECTS

Only one micro-project is planned to be undertaken by a student assigned to him/her in the beginning of the semester. S/he ought to submit it by the end of the semester to develop the industry orientedCOs. Each micro-project should encompass two or more COs which are in fact. and integration of PrOs, UOs, and ADOs. The micro-project could be industry

application based, internet-based, workshop-based, laboratory-based or field-based. 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 hoursduring the course.

In the first four semesters, the micro-project could be group-based. However, in higher semesters, it should be individually undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. A suggestive list is given here. Similar micro-projects could be added by the concerned faculty:

a. **Isometric views:** Each student of the batch will try to collect at least one production drawings/construction drawings/plumbing drawings from local workshops/builders /electrical and mechanical contractors and try to generate isometric views from the orthographic views given in the drawings.
b. **Isometric views:** Each student of a batch will select a household/industrial real item and will draw its isometric view in the sketch book.
c. **Isometric views:** The teacher will assign one set orthographic projections and ask the student to develop 3D thermocol models of the same.
d. **Computer aided drafting:** Each batch will collect 5 components/circuits/items specific to their branch and draw their orthographic views using AutoCAD software.
e. **Computer aided drafting:** Prepare Logo of your institute/board using AutoCAD and then create a template of your institute for drawing and printing all the drawings prepared in AutoCAD.

12. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Engineering Drawing Practice for Schools and Colleges IS: SP-46	Bureau of Indian Standards	BIS, Government ofIndia, Third Reprint, October1998; ISBN: 81-7061-091-2
2	Engineering Graphics	Kulkarni, D. M.:	PHI Learning Private Limited-New
3	Engineering Drawing	Shaha, P. J.	S. Chand and Company New Delhi, 2008, ISBN: 81-219-2964-4
4	Engineering Drawing	Dhawan, R. K.	S. Chand and Company New Delhi, ISBN No. 81-219-1431-0
5	Engineering Drawing	Bhatt, N.D.	Charotar Publishing House, Anand, Gujarat 2010; ISBN: 978-93-8035817-8

13. SOFTWARE/LEARNING WEBSITES

a. https://www.youtube.com/watch?v=TJ4jGyD-WCw
b. https://www.youtube.com/watch?v=dmt6_n7Sgcg
c. http://www.me. umn.e du/co urses/me2011/han do uts/engg%2Ographics.pd

DEPM	Semester I

Program Name : Diploma in **Electronics Production and Maintenance**
Program Code : DEPM
Semester : First
Course Title : Workshop Technology
Course Code : 21D17

1. RATIONALE

Workshop technology is the backbone of the real industrial environment which helps to develop and enhance relevant technical hand skills required by the technician working in the various engineering industries and workshops. This course intends to impart basic know-how of various hand tools and their use in different sections of manufacturing. Irrespective of branch, the use of workshop technology in day to day industrial as well domestic life helps to dissolve the problems .The workshop experiences would help to build the understanding of the complexity of the industrial job, along with time and skills requirements of the job. Workshop curricula build the hands on experiences which would help to learn manufacturing processes and production technology courses in successive semesters. This course will develop skills in handling tools, equipment's used in the electronics workshop and perform soldering of components primarily.

2. COMPETENCY

The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competencies.

1.Build simple circuits using relay and other electronics components.

3. COURSE OUTCOMES (COs)

On completion of the theory and practical parts of the course student demonstrates the following industry oriented COs associated with the above mentioned competency:

a. Able to use firefighting equipment and other safety related accessories.
b. Use relevant safety symbol from standard safety chart for a given situation.
c. Use fitting and sheet metal tools in the electronics workshop.
d. Identify active and passive electronic components.
e. Perform soldering and de-soldering using soldering tools.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme													
				Theory							Practical						
L	T	P		Paper Hrs.	ESE		PA		Total		ESE		PA		Total		
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
2	-	4	6	-	-	-	-	-	-	-	25	10	25	10	50	20	

For the courses having ONLY practical examination, the PA has two components under practical marks i.e. the assessment of practical's (seen in section 5) has a weightage of 60% (i.e.15 marks) and micro-project assessment (seen in section 11) has a weightage of 40% (i.e.10 marks). This is designed to facilitate attainment of COs holistically as there is no theory ESE.

Legends: L-Lecture: **T—** Tutorial Teacher Guided Theory Practice: **P -** Practical: **C—**

Credit, **ESE -** End Semester Examination: **PA - Progressive** Assessment.

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	**Practical Outcomes (PrOs)**	Unit No.	Approx Hrs. Required
1	Use relevant safety symbol from standard safety chart for a given situation.	I*	2
2	Perform mock drill session for firefighting using various classes of fire extinguishers and related accessories	I	2
3	Select hand tools and equipment used in fitting Shop	II*	2
4	Select machine tools and equipment used in fitting Shop.	II	2
5	Identify various fitting tools based on given specifications.	II	2
6	Identify various sheet metal tools based on given specifications.	II	2
7	Prepare the given fitting job as per given drawings Part-I	II*	2
8	Prepare the given fitting job as per given drawings Part-II	II	2
9	Prepare the given fitting job as per given drawings Part-III	II	2
10	Prepare the given fitting job as per given drawings Part-IV	II	2
11	Prepare the given fitting job as per given drawings Part-V	II	2
12	Identify the given hand tools, machine tools and equipment used in sheet metal shop to sketch and write the applications and specifications of each — Part I.	II*	2
13	Identify the given hand tools, machine tools and equipment used in sheet metal shop to sketch and write the applications and specifications of each — Part II.	II*	2
14	Prepare two simple sheet metal jobs as per given drawings Part-I	II*	2
15	Prepare two simple sheet metal jobs as per given drawings Part-11	II	2
16	Prepare two simple sheet metal jobs as per given drawings Part-Ill	II	2
17	Prepare two simple sheet metal jobs as per given drawings Part-1V	II	2
18	Perform sheet metal and fitting operation for the given utility job. Part-I	II	2
19	Perform sheet metal and fitting operation for the given utility job. Part-II	II	2
20	Perform sheet metal and fitting operation for the given utility job. Part-III	II	2
21	Perform sheet metal and fitting operation for the given utility job. Part-IV	II	2
22	Identify various:	III*	2

	(a) Passive electronic components in the given circuit. (b) Active electronics components in the given circuit.		
23	Identify various controls available on the front panel of analog and digital multimeter.	III	2
24	Determine the value of given resistor using digital multimeter to confirm with colour code.	III*	2
25	Test the semiconductor diodes using digital multimeter.	III*	2
26	Test the LEDs display using multimeter.	III	2
27	Test 7-segment display using multimeter.	III	2
28	Identify three terminals of a transistor using digital multimeter	III*	2
29	Connect resistors in series and parallel combination on bread board and measure its value using digital multimeter.	III	2
30	Connect capacitors in series and parallel combination on bread board and measure its value using multimeter.	III	2
31	Indentify primary and secondary winding of step down transformer using multimeter.	III	2
32	Identify relay terminals (coil, common, normally open and close)	III	2
33	De-solder the components using de-soldering tools.	IV*	2
34	Build simple circuits using resistors, diode, switch and LED_	III,V	2
35	Build simple circuits using relay and other electronics components.	III,V*	2
36	Test the circuit developed in the experiment No.35 using various testing equipment.	III,V*	2
37	Solder more than two components on PCB for continuity.	V*	2

Note

i. A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. A judicial mix of minimum 24 or more practical need to be performed. out of which. The practicals marked as '*'. are compulsory so that the student reaches the 'Precision Level' of Dave's 'Psychomotor Domain Taxonomy' as generally required by the industry

ii. The 'Process' and 'Product' related skills associated with each PrO is to be assessed according to a suggested sample given below:

S. No.	Performance Indicators	Weightage in %
1	Setting of experimental set up	20
2	Operate equipment skillfully	30
3	Follow Safety measures	10
4	Work in team	10
5	Record Observations	10
6	Interpret Results to conclude	10
7	Answer to sample questions	5
8	Submit report in time	5
	Total	**100**

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field based experiences:

a. Follow safety practices.
b. Practice good housekeeping.
c. Demonstrate working as a leader/a team member.
d. Maintain tools and equipment.
e. Follow ethical practices.

The ADOs are not specific to any one PrO, but are embedded in many PrOs. Hence, the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of practical experiences over a period of time. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in 1st year
- 'Organizing Level' in 2nd year
- 'Characterizing Level' in 3rd year.

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

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

S.No	Equipment Name with Broad Specifications	Exp. No.
1	Mechanical foam type tire extinguisher with ISI mark 9 litter. B and C type fire	I
2	A, B,C portable type fire extinguisher with ISI mark.	I
3	Bench Drilling machine (up to 13 mm drill cap.) with 1/2 RP. Motor 1000 mm. height	II
4	Work Benches: 1800mm*1900mm*750mm	II
5	Power Saw machine 350 mm mechanical with 1HP Motor & all Accessories.	II
6	Bench Grinder 200 mm Grinding Disc diameter 200 mm. with 25 mm. bore 32 mm. with 1/2 HP/1 HP Motor.	II
7	Vernier height Gauge 450 mm	II
8	Surface plate 600 x 900 mm Grade I	II
9	Angle Plate 450 x 450 mm	II
10	Bench Vice 100 mm	II
11	Power Saw machine 350 mm mechanical with 1 HP Motor and all Accessories.	II
12	Circular Saw Machine, Diameter of saw blade 200 mm, Maximum Depth of Cut 50 mm, Table Size -350 x 450 mm, Table Tilting – 450	II
13	CRO: 50MHz, Dual trace, Dual beam, Inbuilt +-5 V supply, Component tester, Function Generator	III

14	Soldering Gun: 40Watts, Holding stand, Temperature Control, Power cord	III,I,V
15	De-soldering Gun: 80 Watts, output voltage 24 V	III,IV,V
16	Multimeter 3 and'/ digit with component tester	IILIV.V
17	Wire Cutter	III,IV,V
18	Wire Stripper	IILIV.V
19	Consumable components: Resisters, capacitors, Diodes, Transistors, ICs, IC Sockets, General Purpose PCBs, LEDs, Relays, Switches, Connectors, Connecting Wires, soldering metal, Soldering Flux, De-soldering mesh.	III,IV,V

7. UNDERPINNING THEORY COMPONENTS

The following topics/subtopics are to be taught and assessed in order to develop UOs for achieving the COs to attain the identified competency.

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit - I General Workshop Practice and Fire Fighting	1a Describe the procedure for extinguishing the given type of fire 1b Describe the procedure to use the given fire fighting equipment 1c Locate the specified equipment in workshop 1d Describe the ways to maintain good housekeeping in the given situation	1.1 Safety Practices, Causes of accidents, General safety rules, Safety signs and symbols. 1.2 First Aid 1.3 Fire, Causes of Fire, Basic ways of extinguishing the fire Classification of fire, Class A, B.C. D. Firefighting equipment, fire extinguishers, and their types 1.4 Workshop Layout 1.5 Issue and return system of tools, equipment and consumables
Unit-II Fitting and sheet metal shop	2a Explain operation of the given fitting shop machines 2b Describe the procedure to use the given fitting tools 2c Describe the operation the given machinery. 2d Describe the procedure to perform the given fitting operations	2.1 Fitting hand tools and their Specifications: bench vice, hammers, chisels, files, hacksaw, surface plate, punch, V block, angle plate, try square, marking block . steel rule, twist drills, reamers, tap set, die set Machineries and their Specifications in fitting

	2e Describe the procedure to maintain the given tools, equipment and machinery 2f Explain the given type of welding procedure 2g Describe the procedure to use the given metal joining tools.	shops- Drilling machine, Power saw, grinder 2.2 Basic process chipping, filling, scraping, grinding, marking, sawing, drilling. tapping, dyeing, reaming etc. 2.3 Sheet metal hand tools and their Specifications: snip, shears sheet gauge, straight edge, L square, scriber, divider, trammel, punches, pliers, stakes, groovers, limit set 2.4 Machinery and their Specifications in sheet metal shops- sheet cutting and bending machine 2.5 Basic process- marking, bending, folding, edging, seaming, staking, riveting.
Unit-III Identification ofElectronic Components	3a Explain working of given type of electronic circuits. 3b Identify given type of active and passive electronic components. 3c Describe steps to use the given type of multimeter. 3d Describe the steps to test the given electronics components using the multimeter	3.1 Sources: AC and DC, Batteries. 3.2 Electronic components: Passive components like resistor, capacitor and inductor, Active components like diode, transistor, IC. 3.3 Switches, relays, LEDs, 7-segment display, step-down transformer, connectors and cables used in electronic circuits. 3.4 Data sheet and the catalog of electronic components, multimeter. 3.5 Tools required for electronic Workshop specifications, cost and other important characteristics(Catalogs of multimeter power supply, and soldering machine to collect the latest information of tools)
Unit-IV Electronic Soldering Shop	4a Select the soldering and de- soldering tools for the given job. 4b Describe procedure for using the given soldering related component.	4.1 Soldering and de-soldering tools like normal soldering gun, temperature controlled soldering gun, soldering metals, soldering flux, soldering pot, De-soldering gun, De-

	4c Explain function of the given type of &soldering device. 4d Describe problems of given type of soldering 4e Threaded Fasteners and Threaded joints : 4f Welding Conventions and Welded joints	soldering pump. Dc-soldering mesh. 4.2 Soldering techniques like hand soldering, wave soldering and dip soldering. 4.3 Dry soldering, problems of dry and loose soldering. 4.4 Rivets and Riveted Joints Various types of standard rivet heads, Single Riveted Lap Joint, Single Riveted Butt Joint Single Strap / Double Strap, Double Riveted Lap Joint Zigzag / Chain type, Double Riveted Butt Joint with Single Strap/ Double Strap Zigzag / Chain type. 4.5 Various types of screws, Bolts, Nuts, Studs, Washers, and Various Locking methods. 4.6 Various types of welds and their specifications as per IS, Butt Welds, Lap Welds, Spot Welds, Seam Welds , Rug Welds, Fillet Welds.
Unit-V Hands on skills	5a Describe the procedure to build given type simple electronic circuit on bread board 5b Explain the procedure of assembling given simple electronic circuit on general purpose PCB 5c Explain the procedure to use the given type of meter for continuity testing 5d Explain the procedure to test the continuity of the given circuit using the given type of digital multimeter.	5.1 Soldering of simple electronics components like resistors, capacitors, diode, switches, LEDs on general purpose PCB. 5.2 De-soldering of the components from the PCB. 5.3 Continuity testing using multimeter. 5.4 Measurement of Series and parallel combination of resistors and capacitors.

Note: To attain the COs and competency, above listed UOs need to be undertaken to achieve the Application Level' and above of Bloom's 'Cognitive Domain Taxonomy'

8. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

- Not applicable —

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. Prepare chart displaying various electronics components and Instrument.
b. Prepare broad specifications of toots and equipment used in the electronics workshop with the help of handbooks and product catalogues available on internet.
c. List specifications of various electronics components.
d. Download the catalogue of multimeter, CRO, soldering gun, relays and connectors of various reputed manufacturers from websites to update the latest developments.
e. Undertake a market survey of local dealers for procurement of workshop tools, equipment machineries and raw material.

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. 'L' in item No. 4 does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
c. 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)
d. With respect to item No.10, teachers need to ensure to create opportunities and provisions for co-curricular activities
e. Guide student(s) in undertaking micro-projects
f. Show video/animation films to explain functions of fire extinguisher and firefighting procedure
g. Arrange visit to nearby electronics manufacturer/testing Industry.
h. Show video/animation films to explain functioning of electronics components and their application
i. Assign micro projects to students on simple electronics circuits

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. S/he ought to submit it by the end of the semester to develop the industry-oriented COs. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. 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.

In the first four semesters, the micro-project could be group-based. However, in higher semesters, it should be individually undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. A suggestive list is given here. Similar micro-projects could be added by the concerned faculty:

a. Prepare chart showing comparison of various types of resistors used in the electronics Industry.
b. Build heat sink for the given specification.
c. Build a cabinet for the given circuit/ equipment/ instrument.
d. Solder components on PCB and check the continuity.

e. Test the active and passive components connected in the given electronic equipment.
f. Prepare small report on market survey on diodes used in the small electronics industry. Prepare the specifications of active and passive components and their manufacturers and their addresses

12. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	A Course in Workshop	Raghuwanshi, B.S.	DhanpatRai sons, New Delhi ; 2011, or latest edition.
2	Principles of Electronics	Mehta ,V.K ; Mehta, Rohit	S. Chand and Co. Ram Nagar, New Delhi-110 055, 2014.
3	A Textbook of Manufacturing Process	Gupta, J.K.: Khurmi, R S	S.Chand and Co. New Delhi, or latest edition, ISBN:81-219-
4	Electronic Components Handbook	Jones. Thomas H.	Reston Publishing, Reston, Virginia, United states latest

13. SOFTWARE/LEARNING WEBSITES

a. www.nptel.iitm.ac.in
b. http://www.eleccircuit.com
c. http://www electroschematics.com
d. http://www.asnu.com.au
e. http://fireextinguishertraing.com/
f. www.youtube.com/watch?v=WE-SisIzSMY
g. www.youtube.com/watch?v=1Uoi01HvC8c
h. https://mightyohm.com/files/soldercomic/FullSolderComic_EN.pdf

DEPM | **Semester I**

Program Name : Diploma in Electronics Production and maintenance
Program Code : DEPM
Semester : Fifth
Course Title : Environmental studies
Course Code : 21D18

1. RATIONALE

Environmental studies is a multidisciplinary academic field which systematically studies human interaction with the environment .A diploma holder must have knowledge of different types of pollution caused due to industries and constructional activities so that he may help in balancing the ecosystem and controlling pollution by various control measures. He should also be aware of environmental laws related to the control of pollution. He should know how to manage the waste. The need of the hour, therefore, is to concentrate on the area of environmental aspects, which shall provide an insight into various environment related issues. It provides an integrated, quantitative, and interdisciplinary approach to the study of environmental system & gives an insight into solutions of environmental problems.

2. COMPETENCY

The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competencies.

1. Diagnose and manage environment related issues.

3. COURSE OUTCOMES (COs)

On completion of the theory and practical parts of the course student demonstrates the following industry oriented COs associated with the above mentioned competency:

a. Comprehend the importance of ecosystem and sustainable
b. Demonstrate interdisciplinary nature of environmental issues
c. Identify different types of environmental pollution and control measures
d. Identify the role of non-conventional energy resources in environmental protection Manage
e. Awareness of social issues and environmental Ethics

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme													
				Theory						Practical							
L	T	P		Paper Hrs.	ESE		PA		Total		ESE		PA		Total		
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
3	-	-	3	3	70	28	30*	15	100	43	--	--	--	--		--	

Online Theory Examination

(*): Under the theory PA, out of 30 marks, 10 marks are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the cognitive domain UOs required for the attainment of the COs.

Legends: L-Lecture; **T** - Tutorial/Teacher Guided Theory Practice; **P** - Practical; **C** - Credit, **ESE** - End Semester Examination; **PA** - Progressive Assessment

5. SUGGESTED EXERCISES

The practical's 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.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1	**NIL**		
	Total		

Note

i. A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. A judicial mix of minimum 12 or more practical need to be performed, out of which, the practical's marked as '*' are compulsory, so that the student reaches the 'Precision Level' of Dave's 'Psychomotor Domain Taxonomy' as generally required by the industry.

ii. The 'Process' and 'Product' related skills associated with each PrO is to be assessed according to a suggested sample given below:

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field-based experiences:

a. Follow safety practices.
b. Practice good housekeeping.
c. Practice energy conservation.
d. Demonstrate working as a leader/a team member.
e. Maintain tools and equipment.
f. Follow ethical Practices.

The ADOs are not specific to any one PrO, but are embedded in many PrOs. Hence, the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of practical experiences over a period of time. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in 1st year
- 'Organizing Level ' in 2nd year
- 'Characterizing Level' in 3rd year.

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

--NIL—

7. UNDERPINNING THEORY COMPONENTS

The following topics are to be taught and assessed in order to below for achieving the COs to attain the identified competency

DEPM | **Semester I**

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit -1 Environment	1a Discuss the scope of Environment. 1b Describe various types of environment 1c Describe the importance of environment studies. 1d Discuss about the need of public awareness about environment. 1e Describe various environmental issues.	1.1 Definitions need of Environmental studies. 1.2 Segments of environment Atmosphere, Hydrosphere Lithosphere, Biosphere. 1.3 Environmental Issues - Green house effects, Climate change, Global warming, Acid rain Ozone layer depletion, Nuclear accidents. 1.4 Concept of 4R (Reduce, Reuse, Recycle and Recover) 1.5 Public awareness about environment.
Unit- II Energy Resources	2a List various natural resources. 2b Describe Renewable, Nonrenewable and Cyclic resources. 2c State the causes and effects of depletion of resources. 2d State advantages and disadvantages of forms of energy. 2e Select appropriate solutions of efficient use of energy. 2f State the impacts of overuse of natural resources.	2.1 Natural Resources - Forest Resources, Water Resources, Energy Resources, Land resources, Mineral resources. 2.2 Renewable, Non-renewable and Cyclic Resources. 2.3 Causes and effects of depletion of resources. 2.4 Energy forms (Conventional and non-conventional). 2.5 Present global energy use and future demands. 2.6 Energy conservation. 2.7 Over use of natural resources and its impacts on environment.
Unit- III Ecosystem and Biodiversity	3a State the aspects and division of ecosystem. 3b State the general characteristics and function of ecosystem. 3c List levels of biodiversity. 3d Enlist the endangered species. 3e Describe value of biodiversity. 3f Suggest methods for biodiversity conservation.	3.1 Ecosystem - Definition, Aspects of ecosystem, Division of ecosystem, General characteristics of ecosystem. 3.2 Functions of ecosystem. Biodiversity - Definitions, Levels, Value and loss of biodiversity. 3.3 Biodiversity assessment initiatives in India.

		3.4 Threats and Hotspots of biodiversity. 3.5 Conservations of biodiversity objects, various laws
Unit- IV Environmental Pollution	4a Define pollution. 4b State the sources of pollution. 4c State the effects of land pollution on environment and lives. 4d State various units and their functions of water treatment plant. 4e State the needs of water conservation. 4f State the impacts of sewage. 4g State various units and their functions of sewage treatment plant. 4h State sources and effects of air pollution. 4i Describe various methods to prevent air pollution. 4j State sources and effects of noise pollution. 4k Describe preventive measures for noise pollution. 4l State characteristics of solid waste. 4m State the impacts of solid waste. 4n Describe incineration, RDF and sanitary landfilling. 4o State the standards limiting/controlling values of various types of pollution.	4.1 Definition of Pollution, types natural and artificial(Man Made) 4.2 Soil / Land Pollution - Causes and effects on environment and lives, preventive measures. 4.3 Water Pollution - Sources of water (surface and sub surface), sources of water pollution, environment and lives, Preventive measures, BIS water quality standards,flow diagram of water treatment plant, Water conservation. 4.4 Wastewater-Generation (domestic and industrial), Impacts, flow diagram of sewage treatment plant, CPCB norms of sewage discharge. 4.5 Air pollution - Causes, effects, prevention, Ambient air quality standards. 4.6 Noise pollution - Sources, effects, prevention, noise levels at various zones of the city. 4.7 Municipal Solid Waste, Bio-medical waste and E-waste - Sources, generation, characteristics, effects, and methods to manage.
Unit-V Social Issues and Environmental Education	5a Elaborate article (48-A) and(51-A (g)) 5b Enlist various acts on environment and its provisions.	5.1 Article (48-A) and (51-A (g)) of Indian Constitution regarding environment, Environmental protection

	5c State the roles and responsibilities of CPCB. 5d Define sustainable development, and EIA. 5e Describe rain water harvesting and groundwater recharge. 5f Differentiate between formal and non-formal education.	and prevention acts, CPCB and MPCB norms and responsibilities, The role of NGOs. 5.2 Concept of sustainable development, EIA and environmental morality. 5.3 Management Measures - Rain Water harvesting, Ground water recharge, Green Belt Development, use of Renewable energy, water shed management, interlinking of rivers. 5.4 Role of information technology in environment and human health.

Note: To attain the COs and competency, above listed UOs need to be undertaken to achieve the 'Application Level' and above of Bloom's 'Cognitive Domain Taxonomy'

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	Environment	06	4	6	2	10
II	Energy Resources	10	4	8	2	16
III	Ecosystem and Biodiversity	08	4	4	4	12
IV	Environmental Pollution	16	8	8	4	20
V	Social Issues and Environmental Education	08	4	4	4	12
	Total	**48**	**24**	**30**	**16**	**70**

Legends: R=Remember, U=Understand, A=Apply and above (Bloom's Revised taxonomy)
Note: This specification table provides general guidelines to assist student for their learning and to teachers to teach and assess students with respect to attainment of UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.

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. Plant and adopt a tree in your nearby locality/Polytechnic campus and prepare report about its growth and survival after six months with photos.
b. Organize seminar on air pollutants of relevant MIDC area/vehicle
c. Organize poster exhibition about global warming and ozone depletion.

d. Visit a nearest water purification/effluent treatment plant.

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. 'L' in item No. 4 does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
c. 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)
d. With respect to item No.10, teachers need to ensure to create opportunities and provisions for co-curricular activities
e. Guide student(s) in undertaking micro-projects
f. Use proper equivalent analogy to explain different concepts.
g. Use Flash/Animations to explain various topics

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 he/she 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 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. Prepare a report on visit to PUC Center.
b. Visit a nearby RO plant and prepare detail technical report.
c. Prepare report on Household water filtration unit
d. Prepare a list of polluted natural resources which are responsible for pollution and collect information on how to manage them.
e. Collection of Data from Hospital: Collect everyday information on percentage of solid hazardous and toxic waste for two months
f. Visit of Municipal Effluent Treatment Plant: Visit effluent treatment plant and prepare report on waste management.
g. Visit of Water Treatment Plant: Visit water treatment plant and prepare report on various units of water treatment and its management.
h. Preparation of report: Prepare the chart of solid waste management showing effects on environment.
i. And any other relevant topic related to the course

12. SUGGESTED LEARNING RESOURCES

s. No.	Title of Book	Author	Publication
1	Environmental Studies	Erach Bharucha	University Grants Commission, New Delhi
2	Environmental Studies	Rajagopalan	Third Edition, Oxford University Press, USA, ISBN: 9780199459759, 0199459754
3	A text book of Environmental Science	Arvind Kumar	APH Publishing New Delhi
4	A text book of Environmental Studies	Shashi Chawla	Tata Mc Graw-Hill New Delhi
5	Environmental Science	Y. K. Singh	New Age International Publishers, 2006, ISBN: 81-224-2330-2
6	Basic Environmental Sciences	Michael Allaby	Routledge Publication, 2nd Edition, 2000, ISBN: 0-415-21176-X

13. SOFTWARE/ LEARNING WEBSITES

a. www.eco-prayer.org
b. www.teriin.org
c. www.cpcb.nic.in
d. www.indiaenvironmentportal.org.in
e. www.whatis.techtarget.com
f. www.sustainabledevelopment.un.org
g. www.conserve-energy-future.com

National Institute of Electronics & Information Technology, Aurangabad

Teaching and Examination Scheme for Diploma in Electronics Production and Maintenance

Program Name: Diploma in Electronics Production and Maintenance

Program Code: DEPM **With Effect from Academic Year: 2021-2022**

Duration of Program: 6 Semesters **Duration: 16 Weeks**

Semester: Second

Sr. No	Course Title	Abbreviation	Sub. code	Teaching Scheme			Credit (L+T+P)	Examination Scheme												Grand Total
								Theory							Practical					
				L	T	P		Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
									Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
1	Mathematics-II	MAT2	21D21	4	2	-	6	3	70	28	30	12	100	40	--	--	--	--	--	--	100
2	Electrical Technology-I	ET1	21D22	4	-	2	6	3	70	28	30	12	100	40	25	10	25	10	50	20	150
3	Analog Electronics-I	ADC1	21D23	4	-	4	8	3	70	28	30	12	100	40	25	10	25	10	50	20	150
4	Material Technology	MTE	21D24	3	-	-	3	3	70	28	30	12	100	40	--	--	--	--	--	--	100
5	Computer Programming	CPR	21D25	4	-	4	8	3	70	28	30	12	100	40	25	10	25	10	50	20	150
6	Business Communication	BCO	21D26	-	-	2	2	-	--	--	--	--	--	--	25	10	25	10	50	20	50
			Total	**19**	**2**	**12**	**33**	–	-	–	-	–	-	–	-	–	-	–	-	–	-

Student Contact Hours Per Week: **33 Hrs.** Medium of Instruction: English

Theory and practical periods of 60 minutes each.

Abbreviations: ESE- End Semester Exam, PA- Progressive Assessment, L - Lectures, T - Tutorial, P - Practical

• Under the theory PA, Out of 30 marks, 10 marks are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the cognitive domain LOs required for the attainment of the COs.

For the courses having ONLY Practical Examination, the PA has two parts, marks for: (1) Practical Part - 60% of total marks (ii) Micro-Project Part - 40% of total marks.

- **Candidate remaining absent in practical examination will be declared as Absent in Mark List and has to reappear for examination. The marks of the part for which candidate was present will not be processed or carried forward.**

DEAN ACADEMICS
NIELIT, Aurangabad.

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Program Name : Diploma in Electronics Production and Maintenance
Program Code : DEPM
Semester : Second
Course Title : Mathematics-II
Course Code : 21D21

1. RATIONALE

The rationale behind applied mathematics (Mathematics-II) is the use of mathematical operations while studying core technological subjects. This course is an extension of Mathematics-I of first semester which is designed for its applications in engineering and technology. Derivatives are useful to find slope of the curve, maxima and minima of the function, radius of curvature. Integral calculus helps in finding the area. Laplace Transforms are useful in solving various first order, second order equations of LCR circuits. It also eases the understanding in Control Systems.

2. COMPETENCY

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

- Solve electrical and electronics engineering related broad-based problems using the principles of applied mathematics

3. COURSE OUTCOMES (COs)

The mission of the Mathematics-II is to prepare students for success in college-level classes and in industry. The outcome is to give students the mathematical skills and literacy required so that the student demonstrates the following industry-oriented COs associated with the above-mentioned competency:

a) Interpret the derivative of a function graphically, numerically and analytically.
b) Students will gain the ability to evaluate indefinite and definite integrals by selecting and correctly applying appropriate integration techniques(s)
c) Students will gain a fundamental understanding of the theory of differential equations.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit	Examination Scheme													
				Theory							Practical						
L	T	P	(L+T+P)	Paper Hrs.	ESE		PA		Total		ESE		PA		Total		
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
4	2	--	6	3	70	28	30*	12	100	40	--	--	--	--	--	--	

(*): Under the theory PA, Out of 30 marks, 10 marks are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken

during the semester for the assessment of UOs required for the attainment of the COs, Legends: L-Lecture; T - Tutorial/Teacher Guided Theory Practice; P -Practical; C - Credit, ESE -End Semester Examination; PA - Progressive Assessment

5. SUGGESTED PRACTICALS/ EXERCISES

The tutorials in this section are sub-components of the COs to be developed and assessed in the student to lead to the attainment of the competency.

Sr. No.	Tutorials	Unit No.	Approx. Hrs. Required
1	Solve problems based on finding value of the function at different points	I	2
2	Solve problems to find derivatives of implicit function and parametric function	I	2
3	Solve problems to find derivative of logarithmic and exponential functions.	I	2
4	Solve problems based on finding equation of tangent and normal.	I	2
5	Solve problems based on finding maxima, minima of function and radius of curvature at a given point.	I	2
6	Solve the problems based on standard formulae of integration.	II	2
7	Solve problems based on methods of integration, substitution, partial fractions.	II	2
8	Solve problems, based on integration by parts.	II	2
9	Solve practice problems based on properties of definite integration,	III	2
10	Solve practice problems based on finding area under curve, area between two curves and volume of revolutions.	III	2
I I	Solve the problems based on formation, order and degree of differential equations.	IV	2
12	Develop a model using variable separable method to related engineering problem.	IV	2
13	Develop a model using the concept of linear differential equation to related engineering problem	IV	2
14	Solve problems based on algebra of complex numbers.	V	2
15	Find Laplace transform and inverse Laplace transform using related properties	V	2
16	Make use of concept of Laplace transform to solve first order first degree differential equation.	V	2
			32

Note: The above tutorial sessions are for guideline only. The remaining tutorial hours are for revision and practice.

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED –

Not applicable

7. UNDERPINNING THEORY COMPONENTS

The following topics/subtopics is to be taught and assessed in order to develop UOs for achieving the COs to attain the identified competency:

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit-I Differential Calculus	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 equation of tangent and normal 1e. Apply the concept of differentiation to calculate maxima and minima and radius of curvature of given problem.	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 (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 Integral Calculus	2a Solve the given problem(s) based on rules of integration. 2b Obtain the given simple integral(s) using substitution method 2c Integrate given simple functions using the integration by parts. 2d. Evaluate the given simple integral by partial fractions.	2.1 Simple Integration: Rules of integration and integration of standard functions. 2.2 Methods of Integration: a) Integration by substitution, b) Integration by parts c) Integration by partial fractions
Unit-III Applications of Definite Integration	3a. Solve given simple problems based on properties of definite integration. 3b. Apply the concept of definite integration to find the area under the given curve(s) 3c. Utilize the concept of definite integration to find area between given two curves. 3d Invoke the concept of definite integration to find the Volume of revolution of given surface.	3.1 Definite Integration: a) Simple examples b) Properties of definite integral (without proof) and simple examples. 3.2 Applications of integration: a) Area under the curve b) Area between two curves c) Volume of revolution

Unit-IV **First Order First Degree Differential Equations**	4a Find the order and degree of given differential equations. 4b Form simple differential equations for given engineering problem(s). 4c Solve the given differential equations using the method of variable separable 4d Solve the given problems based on linear differential equations.	4.1 Concept of differential equation 4.2 Order. degree and formation of differential equation_ 4.3 Solution of differential equation a. Variable separable form_ b. Linear differential equation. 4.4 Application of differential equations and related engineering problems
Unit —V Complex Numbers and Laplace transform.	5a. Solve given problems based on algebra of complex numbers. 5b. Solve the given problems based on properties of Laplace transform 5c. Solve the given problems based on properties of inverse Laplace transforms. 5d. Invoke the concept of Laplace transform to solve first order first degree differential equations.	5 1 Complex numbers: a. Cartesian, polar and exponential form of a complex number, b. Algebra of complex numbers. 5.2 Laplace transform: a. Laplace transforms of standard functions (without proof). b. Properties of Laplace transform such as linearity, first and second shifting properties (without proof). c. Inverse Laplace transform using partial fraction method, linearity and first shifting property. Laplace transform of derivatives and solution of first order first degree differential equations.

Note: To attain the COs and competency, above listed UOs need to be undertaken to achieve the 'Application Level ' and above of Bloom 's 'Cognitive Domain Taxonomy

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	20	04	08	12	24
II	Integral calculus	14	02	06	08	16
III	Applications of Definite Integration	10	02	02	04	08
IV	First Order First Degree Differential Equations	08	02	02	04	08
V	Complex numbers and Laplace transform	12	02	05	07	14
Total		**64**	**12**	**23**	**35**	**70**

Legends: R=Remember, U=Understand, A—Apply and above (Bloom's Revised taxonomy) Note: This specification table provides general guidelines to assist student for their learning and to leachers to teach and assess students with respect to attainment of UOs, The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table

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9. SUGGESTED STUDENT ACTIVITIES

Other than the classroom 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 with the use of free tutorials available on the internet.
b. Use graphical software's: EXCEL, DPLOT, and GRAPH for related topics.
c. Use Mathcad as Mathematical Tools and solve the problems of Calculus.
d. Prepare models to explain different concepts of applied mathematics.
e. Prepare a seminar on any relevant topic based on applications of integration.
f. Prepare a seminar on any relevant topic based on applications of Laplace transform to related engineering 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/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) Guide student(s) in undertaking micro-projects.
d) Apply the mathematical concepts learnt in this course to branch specific problems,
e) Use different instructional strategies in classroom teaching.
f) Use video programs available on the internet to teach abstract topics.

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. S/he ought to submit it by the end of the semester to develop the industry-oriented COs. Each micro-project should encompass two or more COs which are in fact, an integration of UOs and ADOs. The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based, 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,

In the first four semesters, the micro-project could be group-based. However, in higher semesters, it should be individually undertaken to build up the skill and confidence in every

student to become problem solver so that s/he contributes to the projects of the industry. A suggestive list is given here. Similar micro-projects could be added by the concerned faculty:

a. Prepare models using the concept of tangent and normal to bending of roads in case of sliding of a vehicle.
b. Prepare models using the concept of radius of curvature to bending of railway track.
c. Prepare charts displaying the area of irregular shapes using the concept of integration,
d. Prepare charts displaying volume of irregular shapes using concept of integration.
e. Prepare models using the concept of differential equations for mixing problem,
f. Prepare models using the concept of differential equations for radio carbon decay.
g. Prepare models using the concept of differential equations for population growth.
h. Prepare models using the concept of differential equations for thermal cooling,
i. Prepare models using the concept of Laplace transform to solve linear differential equations.
j. Prepare models using the concept of Laplace transform to solve initial value problem of first order and first degree.
k. Prepare charts displaying various algebraic operations of complex numbers in complex plane

12. SUGGESTED LEARNING RESOURCES: -

No.	Title of Book	Author	Publication
1	Higher Engineering Mathematics	Grewal, B.S.	Khanna publications, New Delhi
2	Advanced Engineering Mathematics	Krezig, Ervin	Wiley Publications, New Delhi
3	Advanced Engineering Mathematics	Das, H.K.	S. Chand Publications,New Delhi
4	Engineering ' Mathematics, Volume 1 (4'edition	Sastry, S.S.	PHI Learning, New Delhi
5	Getting Started with MATLAB-7	Pratap, Rudra	Oxford UniversityPress,New Delhi
6	Engineering Mathematics (third edition).	Croft, Anthony.	Pearson Education, New Delhi

13. SOFTWARE/LEARNING WEBSITES

a. www.scilab.org/ - SCI Lab
b. www.mathworks.com/products/matlab/ - MATLAB
c. https://www.khanacademy.org/math?gclid---CNqHuabCys4CFd0JaAoddHoPig

Program Name : Diploma in Electronics Production and Maintenance
Program Code : DEPM
Semester : Second
Course Title : Electrical Technology-I
Course Code : 21D22

1. RATIONALE

A technologist is predicted to possess some basic knowledge of Electrical Technology as they need to figure in several engineering fields and affect various sorts of electrical machines and equipment. Hence, it's necessary to know magnetic circuits, AC fundamentals, polyphase circuits, differing types of electrical machines, their principles and dealing characteristics. This course deals with the essential fundamentals of EE and dealing principles of commonly used AC and DC motors and their characteristics. The essential concepts of Electrical Technology during this course are going to be very useful for understanding of other higher level courses.

2. COMPETENCY

The aim of this course is to assist the scholar to achieve the subsequent industry identified competency through various teaching learning experiences.

- Use electrical equipment in industrial applications.

3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills related to this course are to be taught and implemented, in order that the scholar demonstrates the subsequent industry oriented COs related to the above mentioned competency.

a) Use principles of magnetic circuits.
b) Use single phase AC supply for electrical and electronics equipment.
c) Use three phase AC supply for industrial equipment and machines.
d) Connect transformers and DC motors for specific requirements.
e) Use FHP motors for diversified applications.
f) Use relevant protective devices/switchgear for various requirements.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit	Examination Scheme													
				Theory							Practical						
L	T	P	(L+T+P)	Paper Hrs.	ESE		PA		Total		ESE		PA		Total		
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
4		2	6	3	70	28	30*	12	100	40	25	10	25	10	50	20	

(*): Under the theory PA, Out of 30 marks, 10 marks are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the UOs required for the attainment of the COs,

Legends: L-Lecture; T- Tutorial/ Teacher Guided Theory Practice; P-Practical; C-Credit; ESE - End Semester Examination; PA - Progressive Assessment.

5. SUGGESTED PRACTICALS/ EXERCISES

The tutorials in this section are sub-components of the COs to be developed and assessed in the student to lead to the attainment of the competency.

Sr. No.	Tutorials	Unit No.	Approx. Hrs. Required
1	Determine the permeability of magnetic material by plotting its B-H curve.	I	2
2	Determine frequency, time period, peak value, rms value, peak factor and form factor of a sinusoidal A.C. waveform on C.R.O Part I	II	2
3	Determine frequency, time period, peak value, rms value, peak factor and form factor of a sinusoidal A.C. waveform on C.R.O. Part II	II	2
4	Find the phase difference between voltage and current on C.R.0_ for resistive, inductive and capacitive circuits. Part I	II	2
5	Find the phase difference between voltage and current on C.R.O. for resistive, inductive and capacitive circuits Part II	II	2
6	Connect balanced star and delta load connections to get the required voltage and currents. Part I	III	2
7	Connect balanced star and delta load connections to get the required voltage and currents Part II	III	2
8	Determine voltage and current ratio of single-phase transformer.	IV	2
9	Operate the DC shunt motor using 3-point starter.		2
10	Operate the DC shunt motor using 4-point starter.	IV	2
I I	Reverse the direction of rotation of single-phase induction motor.	V	2
12	Reverse the direction of rotation of Universal motor.	V	2
13	Identify switches, fuses, switch fuse and fuse switch units, MCB, MCCB and ELCB.	VI	2
14	Connect the switches, fuses, switch fuse and fuse switch units, MCB, MCCB and ELCB in a circuit. Part I	VI	2
15	Test circuit using series lamp and multimeter.	VI	2
16	Use the earth tester,	VI	2
17	Use the insulation tester.	VI	2
18	Use different types of digital clamp-on meters	VI	2
			36

Note: -

i) A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. A judicial mix of minimum 12 or more practical need to be performed, out of which, the practical's marked as `*' are compulsory, so

that the student reaches the 'Precision Level' of Dave 's 'Psychomotor Domain Taxonomy' as generally required by the industry.

ii) The 'Process' and 'Product' related skills associated with each PrO is to be assessed according to a suggested sample given below:

Sr. No.	Performance Indicator	Weightage in %
1	Selection of suitable component, apparatus/instrument	20
2	Preparation of experimental set up:	10
3	Setting and operation	10
4	Safety measures	10
5	Observations and Recording	10
6	Interpretation of result and Conclusion	20
7	Answer to sample questions	10
8	Submission of report in time	10
Total		100

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field-based experiences:

a) Follow safety practices.
b) Practice good housekeeping.
c) Demonstrate working as a leader/a team member.
d) Maintain tools and equipment.
e) Follow ethical practices.

The ADOs are not specific to any one PrO, but are embedded in many PrOs, Hence, the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of practical experiences over a period of time. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in lst year.
- 'Organising Level' in 2nd year_
- 'Characterising Level' in 3rd year.

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED –

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

Sr.No.	Equipment Name with Broad Specifications	Exp. S. No.
1	Single Phase Transformer: lkVA, single-phase, 230/115 V, air cooled, enclosed type.	1,5

2	Single phase auto transformer (Dimmerstat) - Single-Phase, Air cooled, enclosed model, **Input: 0 —** 230, 10A, Output: 0 — 270Volts	1,2,3,5
3	CRO — 20 MHz, Dual channel	2.3
4	Three phase Auto Transformer -15 kVA, Input 415 V, 3 phase, 50 Hz, Output 0-415 V, 30 A per Line, Cooling air natural	4
5	Loading Rheostat - 7.5 kW, 230V, 3 phase, 4 wire, Balanced load. (Each branch having equal load), Load : Wire Wound Fixed Resistors	4
6	Lamp Bank - 230 V 0-20 A	5
7	DC shunt motor coupled with DC shunt Generator	6.7
8	Single chase Induction motor — 1/2 HP,230 V,50 Hz, AC supply	8
9	Universal motor -1/4 Hp	9
10	Digital Multimeter - 3 1/2 dioit	Common
11	DC and AC Ammeters: 0-5-10 Amp	
12	DC and AC Voltmeters: 0-150-300 V	
13	Tachometer: Non-contact type, 0-10000 rpm	
14	Rectifier: solid state, Input- 415 V, 3-Phase, AC, **Output —** 230 V DC replated. **20 Amp**	

7. UNDERPINNING THEORY COMPONENTS

The following topics/subtopics are to be taught and assessed in order to develop UOs for achieving the COs to attain the identified competency:

Unit	Unit Outcomes (UOs) in cognitive domain)	Topics and Sub-topics
Unit -I Magnetic Circuits	la.Describe the salient features of lb. Apply Fleming's left-hand rule direction of induced EMF in the given circuit. 1c. Explain the given type(s) of induced emf. hysteresis loop for the given material.	1.1 Magnetic flux, flux density, magneto motive force, magnetic field strength, permeability, reluctance 1.2 Electric and magnetic circuits 1.3 Series and parallel magnetic circuits 1.4 Faraday's laws of electromagnetic induction, Fleming's right-hand rule, Lenz's law 1.5 Dynamically and statically induced emf, self and mutual inductance 1.6 B-H curve and hysteresis, hysteresis loop and hysteresis loss.
Unit- II AC Fundamentals	2a. Describe the salient features of the given type of power supply. 2b. Represent the given AC quantities by phasors, waveforms and mathematical equations. 2c. Explain the response of the	2.1 A.C. and D.C. quantity, advantages of A.C. over D.C. 2.2 Single phase A.C. sinusoidal A.C. wave: instantaneous value, cycle, amplitude, time period, frequency, angular frequency, R.M.S. value, Average value for sinusoidal

	and capacitive AC circuits with sketches 2d. Calculate the parameters of the given circuit. 2e. Calculate impedance, current, power factor and power of the given AC circuit.	waveform, Form factor, Peak factor 2.3 Vector representation of sinusoidal AC. quantity, Phase angle, phase difference, concept of lagging and leading - by waveforms, mathematical equations and phasors 2.4 Pure resistance, inductance and capacitance in A.C. circuit 2.5 R-L and R-C series circuits 2.6 Impedance and impedance triangle 2.7 Power factor and its significance 2.8 Power - active, reactive and
Unit- III Polyphase AC Circuits	3a. Describe the salient features of the given type of AC power supply. 3b. Explain the concept of symmetrical system and phase sequence of the given AC supply. 3c. Distinguish the characteristics of the given type(s) of star (or delta) connections with sketches. 3d. Calculate the current and power of the given three phase balanced system,	3.1 3 Phase system over 1 phase 3.2 3-Phase emf generation and its form 3.3 Phase sequence and balanced and unbalanced load 3.4 Phase and line current, phase and line voltage in star connected and delta connected balanced system 3.5 Current, power, power factor in a 3-phase balanced system_ 3.6 Star and Delta connections
Unit-IV Transformer and DC Motors	4a. Explain the working principle of the given type of transformer. 4b. Distinguish the construction of the given type of transformer. 4c. Describe the construction and working of the given type of DC motor. 4d. Select relevant type of DC motor for the given application with justification.	4.1Transformer: Working principle, emf equation, Voltage ratio, current ratio and transformation ratio, losses 4.2 Auto-transformer - comparison with two winding transformers, Applications 4.3DC motor construction - parts its function and material used 4.4 DC motor -Principle of operation 4.5 Types of D.C. motors, schematic diagram, applications of dc shunt, series and compound motors

Unit-V Fractional Horse Power (FHP) Motors	5a. Explain the working principle of the given type of FHP motor. 5b. Select relevant FHP motor for the given application with justification. 5c. Describe the procedure to connect the given type of FHP motor for the given application with sketches. 5d. Describe the procedure to connect stepper motor for the given application with sketches,	5.1FHP: Schematic representation, principle of operation and applications of split phase Induction motor, capacitor start induction run, capacitor start capacitor run and permanent capacitor motors, shaded pole motors 5.2 Universal motor: principle of operation, reversal of rotation and applications 5.3Stepper motor: types, principle of working and applications
Unit-VI Protective Devices and Switchgear	6a. Describe the features of the given type of protective device. 6b. Select the relevant protective device for the given application with justification 6c.Select suitable switchgear for the given situation with justification. 6d. State the I.E. rule related to be applied for the given type of earthing with justification.	6.1Fuse: Operation, types 6.2 Switch Fuse Unit and Fuse Switch Unit: Differences 6.3 MCB, MCCB and ELCB: Operation and general specifications 6.4 Earthing: Importance of earthing, factors affecting earthing 6.5 Methods of reducing earth resistance. IE rules relevant to earthing

Note: To attain the COs and competency, above listed UOs need to be undertaken to achieve the 'Application Level ' and above of Bloom 's 'Cognitive Domain Taxonomy

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	Magnetic Circuits	10	02	04	04	10
II	AC fundamentals	10	02	04	04	10
III	Polyphase AC circuits	08	02	04	04	10
IV	Transformer and DC motors	14	04	04	06	14
V	Fractional Horse Power (FHP) motors	12	04	04	06	14
VI	Protective Devices and Switchgear	10	02	04	06	12
Total		**64**	**16**	**24**	**30**	**70**

Legends: R=Remember, U=Understand, A—Apply and above (Bloom's Revised taxonomy) Note: This specification table provides general guidelines to assist student for their learning and to leachers to teach and assess students with respect to attainment of UOs, The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.

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. Market survey regarding commonly used electrical equipment which are not covered in the curriculum
b. Prepare power point presentation or animation for showing working of DC or AC motors.
c. Undertake a market survey of different domestic electrical appliances based on the following points:
   - Manufacturers
   - ii. Specifications/ratings
   - iii. Salient features
   - iv. Applications.

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. Teachers need to ensure to create opportunities and provisions for co-curricular activities.
d. Guide student(s) in undertaking micro-projects.

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. S/he ought to submit it by the end of the semester to develop the industry-oriented COs. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based_ 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.

In the first four semesters, the micro-project could be group-based_ However, in higher semesters, it should be individually undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. A suggestive list is given here. Similar micro-projects could be added by the concerned faculty:

a. Magnetic circuits: Each batch will collect B-H curves and hysteresis loops for various types magnetic and nonmagnetic materials from internet. Based on the permeability and shapes of the curves, each student will decide the suitability of each material for different applications.
b. Magnetic circuits: Each batch will prepare a coil without core. Students will note the deflection of galvanometer connected across the coil for: movement of the North Pole of permanent magnet towards and away from the coil (slow and fast movement), movement of the South Pole of permanent magnet towards and away from the coil (slow and fast movement). Students will demonstrate and prepare a report based on their observations.
c. AC fundamentals: Each batch will visit a nearby sub-station or industry and observe the arrangement for power factor correction/improvement. Each batch will prepare a report based on their observation.
d. Polyphase circuits: Each batch will observe the three-phase power distribution panel in their own Institute/Commercial complex/mall etc. and draw single line diagram and prepare a report.
e. Transformer: Each batch will visit nearby pole mounted sub-station and prepare a report based on the following points:
    i. Rating: kVA rating, primary and secondary voltage, connections
    ii. Different parts and their functions
    iii. Earthing arrangement
    iv. Protective devices
f. Fractional horse power motor: Each batch will select a FHP motor for a particular application (assume suitable rating). They will visit local electrical market (if the market is not nearby you may use the Internet) and prepare a report based on the following points:
    i) Manufactures
    ii) Technical specifications
    iii) Features offered by different manufacturers
    iv) Price range

Then select the motor which you would like to purchase Give justification for your selection in short.

g. Each batch will visit Institute workshop and prepare a report which includes the following points:
    i) Different types of prime movers used, their specifications and manufacturers
    ii) Method of starting and speed control
    iii) Different protective and safety devices used
    iv) Maintenance
h. Each batch will select any one electrical device/equipment which is not included in the curriculum and prepare a short power point presentation for the class based on the

following points: construction, working, salient features, cost, merits, demerits, applications, manufacturers etc.

12. SUGGESTED LEARNING RESOURCES: -

Sr. No.	Title of Book	Author	Publication
1	Electrical Technology Vol —1	Theraja, B. L.	S. Chand and Co., New Delhi
2	Electrical Technology Vol — II	Theraja, B. L.	S. Chand and Co., New Delhi
3	Basic Electrical Engineering	Mittle and Mittal	McGraw Hill, New Delhi
4	Fundamentals of Electrical Engineering	Saxena, S. B. Lal	Cambridge University Press, NewDelhi
5	Basic Electrical and Electronics	Jegathesan, V.	Wiley India, New Delhi,

13. SOFTWARE/LEARNING WEBSITES

a. Scilab
b. SIMULINK (MATLAB)
c. PSIM
d. P-SPICE (student version)
e. Electronics Workbench
f. www.nptel.iitm.ac.in

Program Name : Diploma in Electronics Production and Maintenance
Program Code : DEPM
Semester : Second
Course Title : Analog Electronics-I
Course Code : 21D23

1. RATIONALE

The study of basic operating principles and handling of varied electronics devices will help diploma engineers to troubleshoot electronics equipment. This course is developed in such that, students are going to be ready to apply the knowledge to unravel broad electronic engineering application problems.

2. COMPETENCY

The aim of this course is to assist the scholar to achieve the subsequent industry identified competency through various teaching learning experiences

- Maintain electronic circuits comprising of discrete electronic components.

3. COURSEOUTCOMES(COs)

The theory, practical experiences and relevant soft skills related to this course are to be taught and implemented, in order that the scholar demonstrates the subsequent industry oriented COs related to the above mentioned competency

a) Use relevant diode in several electronics circuits.
b) Maintain rectifiers comprising of diodes,
c) Use BJT in electronics circuits.
d) Use FET in electronics circuits.
e) Maintain DC regulated power supply.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit	Examination Scheme											
				Theory						Practical					
L	T	P	(L+T+P)	Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
4		4	8	3	70	28	30*	12	100	40	50	20	50	20	100	40

(*): Under the theory PA, Out of 30 marks, 10 marks are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the UOs required for the attainment of the COs, Legends: L-Lecture; T-Tutorial/Teacher Guided Theory Practice; P-Practical; C-Credit ESE - End Semester Examination; PA - Progressive Assessment.

5. SUGGESTED PRACTICALS/ EXERCISES

The tutorials in this section are sub-components of the COs to be developed and assessed in the student to lead to the attainment of the competency.

Sr. No.	Tutorials	Unit No.	Approx. Hrs. Required
1	Test the performance of PN junction diode.	I	2
2	Test the performance of Zener diode.	I	2
3	Test the performance of photo diode by varying the light intensity as well as distance of the light source.	I	2
4	Build/test half wave rectifier on breadboard	II	2
5	Build/test half wave rectifier on breadboard with filter- Part I	II	2
6	Build/test half wave rectifier on breadboard with filter- Part II		2
7	Build/ test full wave rectifier on breadboard using two diodes.	II	2
8	Build/ test full wave rectifier on breadboard using two diodes.	II	2
9	Build/ test full wave bridge rectifier on breadboard.	II	2
10	Use LC filter with full wave rectifier to measure ripple factor.	II	2
I I	Use it filter with bridge rectifier to measure ripple factor.	II	2
12	Assemble positive clipper circuit on breadboard and test the performances.	II	2
13	Assemble Negative clipper circuit on breadboard and test the performances.	II	2
14	Build the combinational Clipper on breadboard and test the -performance. - Part I	II	2
15	Build the combinational Clipper on breadboard and test the performance. - Part 11	II	2
16	Build positive damper on breadboard and test the performance. - Part I	II	2
17	Build positive damper on breadboard and test the performance. - Part 11	II	2
18	Build Negative damper on breadboard test the performance.	II	2
19	Identify the terminals of the PNP and NPN transistor using different methods. - Part I	III	2
20	Identify the terminals of the PNP and NPN transistor using different methods - Part II	III	2
21	Find specifications of a given transistor using data sheets	III	2
22	Test the performance of BJT working in CE mode.	III	2
23	Test the performance of BJT working in CB mode.	III	2
24	Test the assembled BJT voltage divider bias circuit for given input. - Part I	III	2
25	Test the assembled BJT voltage divider bias circuit for given input. - Part 11	III	2

26	Test the performance of FET drain characteristics, transfer characteristics and calculate trans-conductance. - Part I	IV	2
27	Test the performance of FET drain characteristics, transfer characteristics and calculate trans-conductance. - Part H	IV	2
28	Build / test Zener voltage regulator for the given voltage.	V	2
29	Test the performance of transistorized series voltage regulator for the, given load regulation.	V	2
30	Test the performance of transistorized shunt voltage regulator for the given load regulation	V	2
31	Test the various blocks of regulated dc power supply,	V	2
32	Find out faults at different stages of regulated dc power supply.	V	2
33	Trouble shoot given DC regulated power supply. - Part I	V	2
34	Trouble shoot given DC regulated power supply. - Part II	V	2
Total			**68**

Note: -

i. A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. A judicial mix of minimum 12 or more practical need to be performed, out of which, the practical's marked as `' are compulsory, so that the student reaches the 'Precision Level' of Dave 's 'Psychomotor Domain Taxonomy' as generally required by the industry.*

ii The 'Process' and 'Product' related skills associated with each PrO is to be assessed according to a suggested sample given below:

Sr. No.	Performance Indicator	Weightage in %
1	Selection of suitable component, apparatus/instrument	20
2	Preparation of experimental set up:	10
3	Setting and operation	10
4	Safety measures	10
5	Observations and Recording	10
6	Interpretation of result and Conclusion	20
7	Answer to sample questions	10
8	Submission of report in time	10
TOTAL		100

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field-based experiences:

a) Follow safety practices.
b) Practice good housekeeping.
c) Demonstrate working as a leader/a team member.
d) Maintain tools and equipment.
e) Follow ethical practices.

The ADOs are not specific to any one PrO, but are embedded in many PrOs, Hence, the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of practical experiences over a period of time. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in lst year.
- 'Organising Level' in 2nd year_
- 'Characterising Level' in 3rd year.

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED –

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

Sr. No	Equipment Name with Broad Specifications	Exp. S. No.
1	Variable DC power supply 0- 30V, 2A, SC protection, display for voltage and current.	1, 2, 3, 9, 10, 12, 13, 15, 16, 17, 18, 19, 20, 21
2	Cathode Ray Oscilloscope Dual Trace 20Mhz, 1Mega ohm Input Impedance	4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 22
3	Function Generator 0-2 MHz with Sine, square and triangular output with variable frequency and amplitude	4, 5, 6, 7, 8, 9, 10, 11, 12, 13
4	Digital Multimeter: 3 1/2-digit display, 9999 counts digital multimeter measures: Vac, Vdc (1000V max). Adc, Aac (10 amp max), Resistance (0 - 100 MQ), Capacitance and Temperature measurement	ALL
5	Lux meter 3000 Lumen, Battery-operated hand-held type	3
6	Electronic Work Bench: Bread Board 840 -1000 contact points: Positive and Negative power rails on opposite side of the board , 0-30 V, 2 Amp Variable DC power supply, Function Generator 0-2MHz, CRO: 0-30 MHz, Digital Multimeter	ALL

7. UNDERPINNING THEORY COMPONENTS

The following topics/subtopics is to be taught and assessed in order to develop UOs for achieving the COs to attain the identified competency:

Unit	Unit Outcomes (UOs) in cognitive domain)	Topics and Sub-topics

Unit-I Semiconductor Diode	1a. Describe the construction and working principle of the given type semiconductor diode. 1b. Differentiate between the given type of insulator, conductor and semiconductor based on energy band theory. 1c. Describe working principle, characteristics, and application of the given type of diode.	1.1 Semiconductor theory, conduction in crystal, metals, insulator, doping, unbiased diode static and dynamic resistance of diode, Diode approximation. 1.2 Different types of Semiconductor Diodes and their materials 1.3 Energy band theory and effect of temperature 1.4 Construction, Symbol, working principle, applications, Forward and
Unit-II Applications of diodes	2a. describe working of the given type of rectifier. 2b Describe the need and working of the given type of rectifier filter circuit. 2c. Select clipper or camper for obtaining the given waveform. 2d. Calculate ripple factor, PIV and efficiency of the given type of rectifier.	2.1 Types of Rectifiers: Half Wave, Full Wave Rectifier (bridge and centre tapped): circuit operation I/O waveforms for voltage and current 2.2 Parameters of rectifier: Average DC value of current and voltage ripple factor ripple frequency PIV of diode, TUE. efficiency of rectifier 2.3 Types of Filters: Shunt capacitor, Series inductor, LC and π filter, bledder resistor 2.4 Clipper and Clamper circuits 2.5 Voltage multipliers, Peak to peak detectors, DC returns
Unit-III Bipolar Junction Transistor	3a. Describe the working principle of the given type of transistor. 3b. Compare the performance of the given type of transistor configurations. 3c. Justify the biasing method for the given circuit. 3d. Describe the procedure to minimize the thermal runaway effect for the given type of transistor biasing circuit,	3.1 Current operating device 3.2 Different types of transistors: PNP, NPN 3.3 Transistor configurations: CB, CE, CC, Transistor characteristics (input, output,) in different transistor configurations 3.4 BJT biasing: DC load line, operating point, stabilization, thermal runaway. types of biasing, fixed biasing, base bias with emitter feedback, voltage divider 3.5 The transistor switch, the transistor current source, h parameters, measurements of h parameters from characteristics, transistor datasheets and testing. 3.6 Selection of operating point, bias stabilisation, base bias, emitter feedback bias, collector feedback bias, divider bias, emitter bias, PNP transistor biasing circuits. 3.7 Bypass and coupling capacitors super position theorem for amplifiers, AC

		resistance of emitter diode, AC beta, the grounded emitter amplifier, AC model of CE stages, CC amplifier, AC model of emitter follower, Darlington amplifier.
Unit- IV Field Effect Transistor	4a. Explain the working of FET for the given application, 4b. Explain the given type of FET biasing method. 4c. Compare the working of the given type of MOSFET. 4d. Differentiate the working principle of FET and MOSFET on the basis of the given transfer characteristic curve.	4.1 Voltage operating device Construction of JFET (N-channel and P-channel), symbol, working principle and characteristics (Drain and Transfer characteristics), parameters and Application of JFET. 4.2 FET Biasing: Source self-bias, drain to source bias 4.3 Applications of FET 4.4 MOSFET: Construction, working principle, biasing and characteristics of Enhancement and depletion MOSFE MOSFET handling
Unit- V Regulators and power supply	Describe working of the given transistorized regulator, Describe the working of the given block of the DC regulated power supply in the block diagram_ Calculate output voltage of the given Zener voltage regulator circuit. Calculate load and line regulation of the given transistorized regulator.	5.1 Basic block diagram of DC regulated power supply 5.2 Load and Line regulation 5.3 Zener diode voltage regulator 5.4 Transistorized series and shunt regulator - circuit diagram and working

Note: To attain the COs and competency, above listed UOs need to be undertaken to achieve the 'Application Level ' and above of Bloom 's 'Cognitive Domain Taxonomy

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	Semiconductor Diode	12	3	4	7	14
II	Applications of diodes	14	3	6	7	16
III	Bipolar Junction Transistor	16	3	7	8	18
IV	Field Effect Transistor	12	3	4	5	12

V	Regulators and power supply	10	2	3	5	10
Total		**64**	**14**	**24**	**32**	**70**

Legends: R=Remember, U=Understand, A—Apply and above (Bloom's Revised taxonomy) Note: This specification table provides general guidelines to assist student for their learning and to leachers to teach and assess students with respect to attainment of UOs, The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.

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. Prepare journals based on practical performed in laboratory.
b. Test different diodes using CRO.
c. Give seminar on any relevant topic.
d. Library survey regarding different data books and manuals.
e. Prepare power point presentation for wave shaping circuits.
f. Undertake a market survey of different semiconductor components.

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) a Massive open online course (MOOCs) may be used to teach various topics/sub topics.
b) in item No. 4 does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
c) 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).
d) With respect to item No.10, teachers need to ensure to create opportunities and provisions for co-curricular activities.
e) Guide student(s) in undertaking micro-projects.
f) Use PPTs to explain the construction and working of rectifier.
g) Use PPTs to explain the construction and working of wave shaping circuits.
h) Guide students for using data 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. S/he ought to submit it by the end of the semester to develop the industry-oriented COs. Each micro-project should encompass two or more COs which are in Only one micro-project is planned to be undertaken by a student assigned to him/her in the

beginning of the semester. S/he ought to submit it by the end of the semester to develop the industry-oriented COs. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. The micro-project could be industry application based. internet-based, workshop-based, laboratory-based or field-based, 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_

In the first four semesters, the micro-project could be group-based. However, in higher semesters, it should be individually undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry_ A suggestive list is given here. Similar micro-projects could be added by the concerned faculty:

a. Diode: Build a circuit on general purpose PCB to clip a positive half cycle at 1.5 v of a waveforms with input signal 5Vpp., and prepare the report.
b. Diode: Build a circuit on general purpose PCB to clamp a waveform at 3 OV using diode and passive components.
c. FET: Prepare chart on comparison of specifications of FETs using data sheets of at least three FET
d. FET: Prepare a chart on FETs contains its symbol, advantages and applications.
e. Rectifier: Build a half wave rectifier for 6V, 500mA output current on general purpose PCB.
f. Rectifier: Build a full wave bridge rectifier with capacitor filter for 6V, 500mA output current on general purpose PCB.
g. BJT: Build a circuit to switch on and off the LED by using WI- as switching component.
h. Photodiode: Build a circuit on breadboard to turn the relay on and off by using photo diode and prepare a report.
i. Voltage Regulator: Build a circuit of DC regulated power supply on general purpose PCB for 9V and 500mA output.

12. SUGGESTED LEARNING RESOURCES: -

Sr. No.	Title of Book	Author	Publication
1	Electronic Devices and Circuit: An Introduction	Mottershead. Allen	PHI Learning, New Delhi
2	Electronic Devices and Circuit Theory	Boylestead Robert, Louis Neshelsky	Pearson Education Orn edition. New Delhi
3	Electronics Principles	Malvino. Albert Paul, David	Cambridge University Press, No. Delhi
4	Principles of Electronics	Mehta, V.K. Mehta. Rohit	McGraw Hill Eduction, NeiN Delhi
5	Basic Electronic Engineering	Baru V_. Kaduskar R.,Gaikwad S.T,	S Chand and Company, Ram Nagar, New Delhi

6	A text book of Applied Electronics	Sedha R S	Dreamtech Press, New Delhi

13. SOFTWARE/LEARNING WEBSITES

a. www.nptel.iitm ac.in
b. www.khanacademy.com

Program Name : Diploma in Electronics Production and Maintenance
Program Code : DEPM
Semester : Second
Course Title : Material Technology
Course Code : 21D24

1. RATIONALE

'Electronic Engineering Materials' is the basic course for the Electronics and Communication engineering and Digital Electronics engineering student. Material science has undergone radical changes. This subject will enable the scholar to understand and apply facts, concepts and dealing principles for the choosing material and components for various electronics engineering applications.

2. COMPETENCY

The aim of this course is to assist the scholar to achieve the subsequent industry identified competency through various teaching learning experiences

• Select electronic engineering materials for specified electronics application.

3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills related to this course are to be taught and implemented, in order that the scholar demonstrates the subsequent industry-oriented COs related to the above-mentioned competency

a) Choose relevant metal on basis of conductivity property.
b) Interpret the properties of dielectric materials.
c) Select relevant magnetic materials for the required electronics application.
d) Select relevant semiconductor unit fabrication materials.
e) Select material for the relevant applications.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit	Examination Scheme													
				Theory							Practical						
L	T	P	(L+T+P)	Paper Hrs.	ESE		PA		Total		ESE		PA		Total		
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
3	0	0	3	3	70	28	30*	12	100	40	--	--	--	--	--	--	

(*): Under the theory PA, Out of 30 marks, 10 marks are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the UOs required for the attainment of the COs, Legends: L-Lecture; T— Tutorial/Teacher Guided Theory Practice; P -. Practical; C — Credit ESE - End Semester Examination; PA - Progressive Assessment.

5. SUGGESTED PRACTICALS/ EXERCISES: -

- Not applicable

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED –

- Not applicable

7. UNDERPINNING THEORY COMPONENTS

The following topics/subtopics is to be taught and assessed in order to develop UOs for achieving the COs to attain the identified competency:

Unit	Unit Outcomes (UOs) in cognitive domain)	Topics and Sub-topics
Unit — I Introduction, Special Purpose Materials	la. Explain the given terms related to Atomic structure. lb. Explain the given terms related to Crystal symmetry, System and classes structure.	1.1 Atomic structure, chemical bonding, ionization potential, electron affinity, electro negativity, band energy. 1.2 Crystal symmetry, System and classes structure of solids ironically bonded, covalently bonded, metallically bonded. Bagg's law of X-ray diffraction. 1.3 Fluorescent and phosphorescent, radioactive materials.
Unit — II Conductivity of Materials	la. Explain the given terms related to electrical materials. lb. Describe the effect on conductivity of metal on the basis of the given factor (s), 1c. Explain the given mode(s) of electron emission from metals 1d. Explain the effect of change in temperature on the conductivity of the given metal	1.1 Terms and factors affecting the resistivity of electrical materials 1.2 Electron mobility, energy level diagram of a materials, Electrical Properties of Materials (I-V / FET) 1.3 Materials used for conductors and resistors, properties and characteristics of good conductors. Superconductivity, Properties & applications of Resistors. Materials used for overhead lines, underground cables, electrical machines winding. 1.4 Emission of electrons from metals modes of emission thermionic emission, photo electric emission, field emission, secondary emission, concept, material and applications 1.5 Effect of temperature on conductivity of metals, superconductivity, electrical and thermal conductivity of metals 1.6 Thermoelectric effect concept,

Unit-III Dielectric Materials	a. Describe the effect on the capacitance on the given dielectric material on the basis of the given factor(s). b. Explain the given types of dielectric losses. c. Explain the concept of the given phenomenon of dielectric material. d. Select the dielectric material for the given application	1. Effect of dielectric on the behaviour of capacitor frequency dependence of electronic polarizability, frequency dependence of permittivity 2. Dielectrics losses, dielectric properties of polymeric material 3. Insulating materials - breakdown in gaseous, liquid and solid dielectric materials, requirements of good insulating materials, Classification, Properties (electrical, mechanical, thermal, chemical) 4. Dielectric materials —mica, porcelain polythene, Bakelite, polyvinyl carboide (PVC), rubber, cotton and silk, glass, paper and Boards, wood, enamel covering, transformer oil, polymers properties and applications. 5. Ferro electricity and piezoelectricity concept, materials and applications
Unit—IV Magnetic Properties of Materials	a. Identify the magnetic material Magneticon the basis of given magnetic Properties b. Describe the given Hysteresis loop identifying the material c. Describe the effect on permeability of the material due to the given factor (s). d. Explain the concept anti ferromagnetism	1. Classifications of magnetic materials Permanent magnetic dipole, diamagnetism, Para magnetism, ferromagnetism ferromagnetic domain 2. Magnetisation curve hysteresis loop magnetostriction effect— application for ultrasonic generation, permeability and affecting factors 3. Magnetic material— iron and silicon iron alloy, nickel iron alloy, 4. Anti-ferromagnetism and

Unit— V Semi-Conductor Materials	a. Describe the energy band diagram for the given semiconductor material b.Select the material for given type of impurity add in semiconductor c. Explain the given effect semiconductor material and its application d. Select the relevant material for the given semiconductor device fabrication with justification	1 Energy bands of solids: conductors, semiconductors, non-conductors 2 Types of semiconductors, intrinsic material, impurity type and material for various impurities, Thermistor, LCD, LDR photoconductivity, photovoltaic materials. 3 Diffusion, hall effect, thermal and electrical conductivity of semiconductor materials 4 Materials for fabrication of semiconductor devices — passive materials and process materials, substrate, metal, capacitance material. Junction, coating, device, pooting
Unit -VI Micro-electronic components, special materials, Mechanical Properties and Testing	a Explain with sketches the working of the given type of LASER. b Suggest the relevant combination of materials for the LED of the given wavelength c Suggest the relevant material for the given type of antenna. Identify the relevant micro-device for the given application and the material of which it is made of. d. Explain the term Stress, Strain, Hooke's law e. Explain the plasticity &	1 Photo emissive material, impurities used to emit different colours of light/ wavelength; electroluminescence and junction LASERS 2 Material for flexible and wearable antennas 3 Photovoltaic material 4 Materials used and application micro motors, micro relay and micro switches. 5. Stress, Strain, Hooke's law, Young modulus. Strength, resilience, plasticity & elasticity, toughness, hardness, brittleness, ductility & malleability, fatigue & creep. Tensile test, compressive test & hardness test.

Note: To attain the COs and competency, above listed UOs need to be undertaken to achieve the 'Application Level ' and above of Bloom 's 'Cognitive Domain Taxonomy

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	Conductivity of Materials	10	06	06	06	18
II	Dielectric Materials	10	04	06	06	16
III	Magnetic Properties of Materials	10	04	06	06	16
IV	Semi-Conductor Materials	10	04	04	04	12

V	Microelectronic components and special materials	08	02	02	04	08
Total		**48**	**20**	**24**	**26**	**70**

Legends: R=Remember, U=Understand, A—Apply and above (Bloom's Revised taxonomy) Note: This specification table provides general guidelines to assist student for their learning and to leachers to teach and assess students with respect to attainment of UOs, The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.

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. Library /Internet survey of electrical /electronic material

b. Prepare power point presentation or animation for understanding different material behaviour.

c. Access national digital Library for survey.

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. Teachers need to ensure to create opportunities and provisions for co-curricular activities.

d. Use Flash/Animations to explain various theorems in circuit analysis

e. Guide student(s) in undertaking micro-projects

11. SUGGESTED MICRO-PROJECTS

Only one micro project is planned to be undertaken by a group of 3-4 student assigned to them in the beginning of the semester, They ought to submit it by the end of the semester to develop the industry oriented COs. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. 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.

In the first four semesters, the micro-project could be group-based. However, in higher semesters, it should be individually undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. A suggestive list is given here. Similar micro-projects could be added by the concerned faculty:

a. Prepare the chart of conducting materials
b. Prepare the chart of dielectric materials
c. Collect different samples of insulating material and prepare chart of their applications
d. Collect different samples of conducting material and prepare chart of their applications
e, Collect data for bifuel project erection
f. Make survey for PV cell as per efficiency and pricing.
g. Prepare chart for application of nanomaterial
h. Demonstrate effect of various modes of magnetism.

12. SUGGESTED LEARNING RESOURCES: -

Sr. No.	Title of Book	Author	Publication
1	An Introduction to electrical materials	C S Indulkar and S. Thiruvengadam S	S Chand Publishing New Delhi
2	A course in Electrical engineering Materials	S.P. Seth and P.V. Gupta	Dhanpat Rai and Sons.
3	Material Science and Engg,	William D. Callister	WILLEY India

13. SOFTWARE/LEARNING WEBSITES

a. https://www.nptel.ac.in

Program Name : Diploma in Electronics Production and Maintenance
Program Code : DEPM
Semester : Second
Course Title : Computer Programming
Course Code : 21D25

1. RATIONALE

Automation Industry builds Microcontroller based applications which are being developed using 'C'. This course deals with concepts of programming to reinforce programming skills of diploma students. This course will enable the scholars to inculcate programming concepts and methodology to unravel engineering problems.

2. COMPETENCY

The aim of this course is to assist the scholar to achieve the subsequent industry identified competency through various teaching learning experiences

- Develop 'C' programs to unravel broad-based electronic engineering related problems.

3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills related to this course are to be taught and implemented in order that the scholar demonstrates the subsequent industry-oriented COs related to the above mentioned competency

a. Interpret the essential code of 'C'.
b. Use Arrays and string in 'C' programming.
c. Use functions in 'C' programs for modular programming approach.
d. Use tips that could increase efficiency of programs.
e. Implement basic concept of structure in 'C'.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit	Examination Scheme													
				Theory								Practical					
L	T	P	(L+T+P)	Paper Hrs.	ESE		PA		Total		ESE		PA		Total		
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
4	0	4	8	3	70	28	30*	12	100	40	50	20	50	20	100	40	

(*): Under the theory PA, Out of 30 marks, 10 marks are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the UOs required for the attainment of the COs, Legends: L-Lecture; T-Tutorial/Teacher Guided Theory Practice; P -. Practical; C-Credit ESE - End Semester Examination; PA - Progressive Assessment.

5. SUGGESTED PRACTICALS/ EXERCISES

The tutorials in this section are sub-components of the COs to be developed and assessed in the student to lead to the attainment of the competency.

Sr. No.	Tutorials	Unit No.	Approx. Hrs. Required
1	(a) a) Write a 'C' program to display hexadecimal, decimal, octal format of entered number using %d, %c, %i, %f, %g, %u, %o, %s, %x (b) b) Write algorithm and draw flow chart for following problems: (c) i. Addition of two numbers (d) ii. Exchange value of two variable	I	2
2	Write a program to perform following operations: Display the message "Hello World", name. address, date of birth and email_id using printf ( ) function Logical operations: & (AND) , I (OR) for given values , Bitwise operations :<< (LEFT SHIFT). >> (RIGHT OPERATOR) for given values.	I	2
3	Write a program to display current time and date using time.h header tile. Write a program to display addition of value of resister R, Where, i. R series =R1 + R2+R3 and ii. R parallel =1/ R1 + 1/ R2 + 1/R3 Note. Use math.h header file	I	2
4	Write a program to calculate inductive resistance (FL) with the help of given formula FL = 2 * lef L. Where 7C, f, L are given data. Write a program to calculate capacitive resistance (Fe) with the help of given formula Fc = 1/(2 * z*f C). Where 7C, f, C are given data. Note. Develop above programs using local variables, global variables and arithmetic operators.	I	2
5	Implement decision control statements in C using 'if' (e) Write a program to find whether given number is even or odd. Write a program to find whether given number is Positive, negative or zero.	II	2
6	Write a program to find the largest among n numbers using 'if-else'. Write a program to determine leap year using 'if-else'.	II	2
7	Implement decision control statements in 'C' using 'nested if-else' (a) Determine whether a string is palindrome. Find the greatest of the three numbers using conditional operators.	II	2
8	Write a program to perform addition, subtraction; multiplication and division according to user's choice using switch case statement for given data	II	2
9	Implement loop control statements in 'C' using 'for' loop (a) Write a program to print the table for given no. in one	II	2

	column. Write a program to count the number of digit in a given number.		
10	Implement loop control statements in 'C' (a) Find Fibonacci series for given number (b) Write a program to produce the following output: 1 2 3 4 5 6 7 5 9 10	II	2
1 1	(a) Print the Result sheet: Conditions given are: marks >=40% pass, marks <40 % fail. marks 66>=first class, marks above 75 % distinction, marks >100 and marks < 0 not valid.	II	2
12	Write a program to declare, modify and print elements of a given data array. Write a program to find highest marks in a class of n students using array.	III	2
13	Write a program to copy of one array into second array for given data elements Write a program to create an array by reversing the elements of the given array.	III	2
14	Write a program to sort numbers in ascending and descending in a given array. Write a program to add two matrices of size 3*3 store additions in third matrix for given data elements.	III	2
15	Write a program that accept a string from user and print that string Write a program that accept a string and compare it with existing string.	III	2
16	Write a program to accept and concatenate two strings. Write a program to find length of a string.	III	2
17	Library Functions: Develop Program :o demonstrate: (a). Use of all String handling functions_ Use of few Mathematical functions_	IV	2
18	Write a program to add two numbers using function. Write a program to perform addition, subtraction, multiplication and division using switch case statement and user defined function for given data.	IV	2
19	Write a program to use address operator (8c) and pointer operator (*) for given data Write a grogram to add two integer numbers using pointer.	V V V	2
20	Write a program to calculate the sum of elements of given array using pointer. Write a program to access the array elements using pointer.	V	2
21	Write a program to interchange given values of two variables using call by value mechanism. Write a program to interchange given values of two variables using call by reference mechanism	V	2

22	Write a program to exchange given values of two variables using pointer.	V	2
23	Create structure DATE using 'C' having members' day, month, year and assign initial values to that structure	VI	2
24	Write a program to create a structure for student having data members like Roll No., Name, Class, marks in three subjects and calculate the % of marks.	VI	2
Total			**68**

Note: -

i. A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. A judicial mix of minimum 12 or more practical need to be performed, out of which, the practical's marked as `*' are compulsory, so that the student reaches the 'Precision Level' of Dave 's 'Psychomotor Domain Taxonomy' as generally required by the industry.

ii The 'Process' and 'Product' related skills associated with each PrO is to be assessed according to a suggested sample given below:

Sr. No.	**Performance Indicator**	**Weightage in %**
1	Write algorithm and draw flow chart.	20
2	Use 'C' software tool for programming to create, edit, compile the C program applications	40
3	Debug, test and execute the programs/applications	20
4	Able to answer oral questions.	10
8	Submission of report in time	10
TOTAL		100

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field-based experiences:

a. Follow safety practices.

b. Practice good housekeeping.

c. Demonstrate working as a leader/a team member.

d. Maintain tools and equipment.

e. Follow ethical practices.

The ADOs are not specific to any one PrO, but are embedded in many PrOs, Hence, the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of practical experiences over a period of time. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

•'Valuing Level' in lst year.

•'Organising Level' in 2nd year_

•'Characterising Level' in 3rd year.

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED –

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

Sr. No	Equipment Name with Broad Specifications	Exp. S. No.
1	Hardware: Personal computer, (i3-i5 preferable), RAM minimum 2 GB onwards.	For all Experiments
2	0perating system: Windows XP/Windows 7/LINUX onwards.	
3	Software: Turbo C, or Microsoft Visual Studio 2005 onwards (Optional).	

7. UNDERPINNING THEORY COMPONENTS

The following topics/subtopics is to be taught and assessed in order to develop UOs for achieving the COs to attain the identified competency:

Unit	Unit Outcomes (UOs)	Topics and Sub-topics

Unit-I Overview of C programming	1 a. Describe the given data type. 1 b. Construct algorithm, flow chart for the given problem. 1 c. Use pre-increment and post-increment operators in the given situation. 1 d. Use bitwise operator in the given situation.	1.1 Structure of -C-program, Assembler, Linker, Compiler, Interpreter. 1.2 'C' character set-keywords, identifiers, types of constants (Integer, single character, string, and real) variables, scope of variables, concept of ASCII. a) Tracing flow chats, problem solving methods, need for computer Languages, sample program written in C. 1.3 Data types: integer- unsigned, signed, long, float-float, double, character-char, string, octal, hexadecimal. 1,4 Algorithm and flow chart. 1.5 Formatted input and output statements, Input and output function. 1.6 Operators and expressions: a. Operators in 'C'- arithmetic, logical, assignment, relational, increment and decrement, conditional, bit wise, special operators, assignments and conditional operators. b. Expressions c. Precedence and associatively. 1.7 C character set Identifiers and keywords, declarations, Expressions, statements and symbolic constants. 1.8 Input - Output: Getchar, putchar, scanf, printf, gets, puts, functions. 1.9 Pre- processor commands: #include, #define, #ifdef 1.10 Preparing and running a complete C program.
Unit-II Decision control and Loop Control	2a. Write a 'C' program using the given decision-making structure for two-way branching. 2b. Write a 'C' program using the decision-making structure for multi-way branching. 2c. Write a 'C' program using loop statements to solve the given iterative problem. 2d. Use related statements to alter the program flow in the given loop.	2.1 Decision making if statement (if, if-else, nested if-else), switch -case statement 2.2 Repetition in 'C' (loop control statement) while, do-while and for loop, break and continue statement, nested loop, for statements, break go-to statements, comma operators.

Unit- III Array and Strings	3a. Write steps to access elements of the given array. 3b. Write steps to perform operation on the given array. 3c. Write steps to initialization and declaration of the given string in 'C' program. 3d. Apply relevant control statement on the given strings to manipulate its elements.	3.1 Introduction to Array and its types, Passing arrays to a function, Multidimensional arrays. 3.2 Declaration, initialization of array, accessing elements of an array, adding, deleting, sorting & searching. 3.3 Introduction to string Initializing, declaring and display of string 3.4 String handling functions from standard library (strlen 0, strcpy (), strcat (), strcmp(), strlwr(),strupr()): 3.5 Storage types : Automatic , external, register and static variables.
Unit-IV Functions	4a. Use inbuilt functions for the given problem. 4b. Develop relevant user defined functions for the given problem. 4c. Write 'C. codes to Pass function parameters using the given approach 4d. Write recursive function for the given problem.	4.1 concept and need of function defining and accessing, passing arguments, function prototypes, Static functions. 4.2 library functions: Math functions, String handling functions, other miscellaneous functions, 4.3 'Writing User defined functions, scope of variables, 4.4 Parameter passing: call by value, call by reference. 4.5 Recursive functions
Unit-V Pointers	5a. Use pointer for address access to manipulate the given data. 5b. Use pointers to access memory locations to solve the given problem. 5c. Use pointers for performing the given arithmetic operation. 5d. Develop a program to access array elements using the given pointers.	5.1 Concept of pointer and pointer variables, initialization of pointer, call-by reference, Passing pointers to a function, Operations on pointers, Pointers and arrays, Arrays of Pointers, function pointers. 5.2 Pointer arithmetic. 5.3 Handling arrays using pointers 5.4 Handling functions using pointers

Unit-VI Structures	6a. Create a structure for the given data. 6b. Develop a program to access elements of structure using pointers. 6c. Use the structure for solving the given problem. 6d. Use of enumerated data type in structure to solve the given program. 6e. Explain the file structure 6f. Explain the file handing 6g. use of file structure and file handling	6.1 Introduction and Features and Syntax of structure 6.2 Declaration and Initialization of Structures 6.3 Initializing, assessing structure members using pointers 6.4 Type def, Enumerated Data Type, using structures in C Program 6.5 Operations on structure. 6.6 Definitions, concept of Record, File operations: Storing, Creating, retrieving, Updating Sequential, Relative, Indexed and random-access mode, performance of Sequential Files, Direct mapping techniques. Absolute, relative and indexed sequential files (ISAM) concept of index, levels of index, overflow of handling. 6.7 File operation, Creation, copy, delete, update, text file, binary file.

Note: To attain the COs and competency, above listed UOs need to be undertaken to achieve the 'Application Level ' and above of Bloom 's 'Cognitive Domain Taxonomy

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	Overview of C Programming	08	02	04	04	10
II	Decision control and Loop	12	04	04	04	12
III	Array and Strings	14	04	06	06	16
IV	Functions	12	02	04	06	12
V	Pointers	10	02	04	04	10
VI	Structures	08	02	04	04	10
Total		**64**	**16**	**26**	**28**	**70**

Legends: R=Remember, U=Understand, A—Apply and above (Bloom's Revised taxonomy) Note: This specification table provides general guidelines to assist student for their learning and to leachers to teach and assess students with respect to attainment of UOs, The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.

This specification table also provides a general guideline for teachers to frame internal end semester practical theory exam paper which students have to undertake.

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) Prepare journals based on practical performed in laboratory
b) Give seminar on relevant topic
c) Library/E-Book survey regarding `C. used in electronics industries
d) Prepare power point presentation or animation for showing different types of 'C' applications.
e) Find and Utilize android applications related to 'C'.
f) Undertake a market survey of different 'C' application and compare with the following points.
    1. Available applications.
    2. Application profile.

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. Guide student(s) in undertaking micro-projects

d. No. of practical's selection to be performed should cover all units.

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. S/he ought to submit it by the end of the semester to develop the industry-oriented COs. Each micro-project should encompass two or more COs which are in fact. an integration of PrOs, UOs and ADOs. The micro-project could be industry application based. internet-based, workshop-based, laboratory-based or field-based. 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,
In the first four semesters, the micro-project could be group-based. However, in higher semesters, it should be individually undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. A suggestive list is given here. Similar micro-projects could be added by the concerned faculty:

a. Modern Periodic Table using 'C' - Each group will prepare a periodic table using functions 'Void add ()' and 'Void show ()'

b Simple Calculator - Each batch will prepare a menu driven program to perform any five mathematical operations.

c Employee Record System - Each batch will prepare a menu driven program to perform following operations:

i Add record

iiList record

d Digital clock using 'C'

e String Manipulation project - Each batch will prepare a menu driven program to perform following operations (any five):

i Substrings

ii Palindromes

iii Comparison

iv Reverse string

v String to integer

vi Sort a string

f. Matrix Operations - Each batch will prepare a menu driven program to perform following operations:

i Matrix addition

ii Matrix multiplication

iii Matrix transpose

iv Sum of diagonal of a matrix

g. Basic mathematic functions - Each batch will prepare a menu driven program to perform following operations:

i Pascal triangle

ii Armstrong No.

iii. Floyd ' s triangle iv HCF and LCM.

h. Patterns - Each batch will prepare a menu driven program to obtain following patterns (any three):

1	1	1
121	12	22
12321	123	333
1234321	1234	4444

12. SUGGESTED LEARNING RESOURCES: -

Sr. No.	Title of Book	Author	Publication
1	Programming in 'C'	Balguruswamy, E.	Tata McGraw Hill May 2012, New Delhi
2	Let us ‘C.	Kanetkar, Yashwant	BPB Publication July 2016, New Delhi
3	Basic computation and programming with 'C'	Saha, Subrata; Mukheriee. Subhodi	Cambridge 2016, New Delhi.

13. SOFTWARE/LEARNING WEBSITES

a. Turbo C Editor
b. Dosbox
c. Android application resources for "C'programming from Google Play store.

Program Name : Diploma in Electronics Production and maintenance
Program Code : DEPM
Semester : Second
Course Title : Business Communication
Course Code : 21D26

1. RATIONALE

Communication is the key factor for smooth and efficient functioning of any industry or business activity. Effective business communication is the lifeblood of any organization and is required to maintain quality and progress. The efficacy of business communication skills are essential for engineering professionals for instructing, guiding and motivating subordinates to achieve desired goals at work place. It is very crucial for an entrepreneur to run organization successfully by communicating effectively and skilfully with employees, customers and investors. Thus this course has been designed to enhance the skills to 'Communicate effectively and skilfully at workplace.

2. COMPETENCY

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

- Communicate effectively and skilfully at workplace.

3. 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.

a. Communicate effectively by avoiding barriers in various formal and informal situations
b. Communicate skilfully using non-verbal methods of communication.
c. Give presentations by using audio- visual aids,
d. Write reports using correct guidelines.
e. Compose e-mail and formal business letters

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit	Examination Scheme													
				Theory							Practical						
L	T	P	(L+T+P)	Paper Hrs.	ESE		PA		Total		ESE		PA		Total		
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
0	0	2	2	--	--	--	--	--	--	--	25	10	25	10	50	20	

(*): Under the practical PA, Out of 25 marks, 5 marks are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the UOs required for the attainment of the COs,

Legends: L-Lecture; T— Tutorial/Teacher Guided Theory Practice; P - Practical; C - Credit ESE - End Semester Examination; PA - Progressive Assessment.

5. SUGGESTED PRACTICALS/ EXERCISES

The tutorials in this section are sub-components of the COs to be developed and assessed in the student to lead to the attainment of the competency.

Sr. No.	Tutorials	Unit No.	Approx. Hrs. Required
1	Explain the importance of business communication for an organization using case study.	I	2
2	Draft a job application letter with resume using computer.	V	2
3	Mention the examples of body language use at workplace with suitable pictures and images	II	2
4	Prepare a minute of meeting and mail it to given email address	VI	2
5	Write the importance and guidelines of presentation skills.	III	2
6	Draft a detailed Progress Report.	IV	2
7	Organize a debate on types of communication.	I & III	2
8	Summarize an industry report using techniques of summarizing.	IV	2
9	Draft a complaint letter on given topic.	V	2
10	Design PowerPoint presentation on any technical topic.	III	2
1 1	Explain the eight principles of effective communication	I	2
12	Explain various non-verbal codes with examples.	II	2
13	Explain the importance of personal appearance stating tips of grooming for a professional.	II	2
14	Draft a memo on given topic.	V	2
15	Present any Two barriers to communication using case study.	I	2
16	Present a technical paper using IEEE format.	II	2
Total			**68**

Note: -

i) A suggestive list of practical LOs is given in the above table, more such practical LOs can be added to attain the COs and competency. A judicial mix of minimum 12 or more practical LOs/tutorials need to be performed, out of which, the practical marked as '*' are compulsory, so that the student reaches the 'Precision Level' of Dave's 'Psychomotor Domain Taxonomy' as generally required by the industry The size of batch for the practical should not exceed more than 21 students strictly for the maximum attainment of COs and PrOs

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED –

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

Sr. No	Equipment Name with Broad Specifications	Exp. S. No.
1	LCD projector	For all Experiments
2	Smart board with networking	
3	Language lab with internet	
4	Printer	Wherever applicable

7. UNDERPINNING THEORY COMPONENTS

The following topics/subtopics is to be taught and assessed in order to develop UOs for achieving the COs to attain the identified competency:

Unit	Unit Outcomes (UOs) (in cognitive domain)		Topics and Sub-topics
	Writing Skills	**Speaking Skills**	
Unit-I Introduction to Business Communication	la. Describe the importance of the business communication in the given situation lb. Identify the missing element in the given communication process 1c. Identify the type of communication in the given situation 1d. Identify the type of communication barrier in the given situation and its remedy.	1e. Use different types of verbal and nonverbal communication for the given situation.	1.1 Introduction to Communication-Elements, Importance, Functions. 1.2 Types (meaning and importance) -Verbal (Oral-Written), Formal, Informal, Vertical, Horizontal and Diagon-al communication 1.3 Principles of effective communication 1.4 Barriers to communication -Physical, mechanical, psychological and linguistic 1.5Business communication: Meaning, characteristics and importance.
Unit-II Nonverbal Communication	2a Describe the nonverbal communication required in the given situation. 2b Describe personal appearance required in the given communication situation 2c Describe the given	2d Use relevant facial expressions in the given situation. 2e. Answer questions after listening to presentations	2.1 Introduction to Non-verbal communication (Meaning and importance) 2.2 Body Language: Aspects of body language: gestures, eye contact, posture, facial

	facial expressions.		expressions, personal appearance (dressing and grooming) vocalics 2.3 Body language - positive and negative body language
Unit-III Presentation skills	3a. Prepare seminar presentation for the given situation 3 b Prepare debate points 'for' and 'against' the given topic 3c Prepare the points for computer presentation for the given topic.	3d Make seminar presentation 3e Participate in debate speaking 'for' or 'against' the given topic. 3f. Make effective computer presentations	3 1 Presentation skills- tips for effective presentation. 3.2 Guidelines for developing power point presentation 3.3Presenting Technical papers.
Unit-IV Office Drafting	4a. Draft the given notice using the relevant format. 4b. Draft the given memorandum using the relevant format, 4c. Prepare agenda for the given type of meetings. 4d. Prepare minutes of the given type of meetings 4e. Prepare reports of the given type of events/episodes/ accidents	4f. Read the agenda of the given meeting 4g. Read the report of the given event. 4h. Initiate telephone calls for given situation 4i. Answer official phone calls for given situation	4.1. Office drafting: Formats and Guidelines. 4.1. Formulating notices and memoranda. 4.2. Preparation of agenda and writing minutes of meetings. 4.3. Preparation of reports- progress reports, Accident reports, case study. 4.5. Summarizing techniques.
Unit-V Business Correspondence	5a. Respond to given job advertisements by writing your CV/ Resume. 5b. Draft business letters in the given situations. 5c. Draft complaint letters for the given situations. 5d Compose E- mails with relevant for the given situation.		5.1 Business correspondence, 5.2 Enquiry, order and complaint letters 5.3 E-mails- netiquettes 5.4 Difference -Curriculum Vitae, Bio-data and Resume. 5.5 Job application and resume writing

Note: To attain the COs and competency, above listed Learning Outcomes (UOs) need to be undertaken to achieve the 'Application Level' of Blooms's 'Cognitive Domain Taxonomy' Theory related topic should be covered during practical hours using multimedia

8. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
I	Introduction to Business	02	02	01	05
II	Non-verbal Communication	02	01	02	05
III	Presentation Skills	02	01	02	05
IV	Office Drafting	02	04	04	10
V	Business Correspondence	02	04	04	10
Total		**10**	**12**	**13**	**35**

Legends: R=Remember, U=Understand, A—Apply and above (Bloom's Revised taxonomy) Note: This specification table provides general guidelines to assist student for their learning and to leachers to teach and assess students with respect to attainment of UOs, The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.

This specification table also provides a general guideline for teachers to frame internal end semester practical theory exam paper which students have to undertake.

9. SUGGESTED GUIDELINES FOR ASSESSMENT TOOL TO CONDUCT INTERNAL END SEMETER EXAM (ESE).

Weightage (20 Marks) A	**Weightage (15 Marks) B**	**Total**
Assessment based on PrOs, practicals conducted during semester Based on computer and written skill. (Minimum four questions each five marks) Sample questions: Eg. I Draft an email to the manager regarding the shortage of raw material at production department. Note-submit the printout of mail. (Computer based) Eg. II Write job application with resume. (written)	Oral examination based on UOs Topics mentioned in syllabus. (Minimum five questions each two marks to be asked) Eg. I Explain the importance of communication in professional life. II. State any four guidelines of presentation skills.	(35 Marks) A+B Duration: 2 hours

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. Collect good articles from newspapers and magazines and read them with correct intonation.

b. Listen to Business news on TV and radio

c. Watch videos of effective presentations on television and open learning sources for presentation skills and body language.

d. Undertake micro-projects.

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. Teachers need to ensure to create opportunities and provisions for co-curricular activities.

a) Arrange various communication activities using functional grammar.
b) Show video/animation films to develop listening skills and enhance vocabulary
c) Use real life situations for explanation,
d) Prepare and give oral presentations.
e) Guide micro-projects in groups as well as individually.

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 S/he ought to submit it by the end of the semester to develop the industry oriented COs Each micro-project should encompass two or more COs which are in fact, an integration of CO. UOs and ADOs. The micro-project could be industry application based, internet-based, workshop-based laboratory-based or field-based. Each student will have to maintain dated work diary consisting or 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.

In the first lour semesters, tile micro-project could be group-based. However, in higher semesters, it should be individually undertaken to build up the skill and confidence in every student to become problem solver so that she contributes to the projects of the industry. A suggestive e list is given here. Similar micro-projects could be added by the concerned faculty:

a. Study the personal appearance and grooming of employees visiting sales store, shopping mall in the vicinity,

b. Comparative study of Bio-data, Resume and Curriculum vitae,

c. A detailed study of guidelines required for presentation skills.

d. Summarize technical content using English newspaper, magazines or online resources.

e. Prepare a booklet on aspects of body language in pictorial form.

f. A detailed study of the importance, of technical paper of technical paper presentation.

g. Case study on the importance of Business communication in an organization.

h. Report on various formal/business activities

i Study of oral presentation of famous business leader

j. Detailed study of business etiquettes observed in organization

k. Summarize the business article with the help of English newspapers/magazines and other sources.

12. SUGGESTED LEARNING RESOURCES: -

Sr. No.	Title of Book	Author	Publication
1	Effective Communication Skills	M Ashraf Rizvi	Tata McGraw-Hill
2	Communication Skills	Sanjay Kumar and Pushpa Lata	Oxford University Press
3	Personality Development and soft Skills	Barun K Mitra	Oxford University Press

13. SOFTWARE/LEARNING WEBSITES

a. http://learnenglish.britishcouncil.org/en/content
b. http://www.talkenglish.com/
c. http://www.tutorialspoint.com
d. www.studylecturenotes.com
e. totalcommunicator.com
f. www speaking-tips.com