MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION

Diploma Programme in **Computer Engineering**

I – Scheme

Programme Structure

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 Computer engineering related broad-based problems adapting professional ethics.
PEO 2. Adapt state-of-the-art Computer engineering broad-based technologies to work in multi-disciplinary work environments.
PEO 3. Solve broad-based problems individually and as a team member communicating effectively in the world of work.

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

PO 1. ***Basic knowledge:*** *Apply knowledge of basic mathematics, sciences and basic engineering to solve the broad-based Computer engineering problem.*
PO 2. ***Discipline knowledge:*** *Apply Computer engineering discipline - specific knowledge to solve core computer engineering related problems.*
PO 3. ***Experiments and practice:*** *Plan to perform experiments and practices to use the results to solve broad-based Computer engineering problems.*
PO 4. ***Engineering tools:*** *Apply relevant Computer technologies and tools with an understanding of the limitations.*
PO 5. ***The engineer and society:*** *Assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to practice in field of Computer engineering.*
PO 6. ***Environment and sustainability:*** *Apply Computer engineering solutions also for sustainable development practices in societal and environmental contexts and demonstrate the knowledge and need for sustainable development.*
PO 7. ***Ethics:*** *Apply ethical principles for commitment to professional ethics, responsibilities and norms of the practice also in the field of Computer engineering.*
PO 8. ***Individual and team work:*** *Function effectively as a leader and team member in diverse/ multidisciplinary teams.*
PO 9. ***Communication:*** *Communicate effectively in oral and written form.*
PO 10. ***Life-long learning:*** *Engage in independent and life-long learning activities in the context of technological changes in the Computer engineering field and allied industry.*

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

PSO 1. **Computer Software and Hardware Usage:** Use state-of-the-art technologies for operation and application of computer software and hardware.
PSO 2. **Computer Engineering Maintenance:** Maintain computer engineering related software and hardware systems.

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 practicals** 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).*

Programme Code: **……** **I – Scheme** Diploma Programme in **Computer Engineering**

I – Semester

Weighted mean score	S. No. & (Rank No.) of Survey Report	Industry Questionnaire S.No.	Course Title	Teaching Scheme/Week			Credits (L+T+P)	Examination Scheme				
				L	T	P		Theory		Practical		Grand Total
								ESE	PA	ESE	PA	
3.34	G2(2)	37	English (Common to all)	3	-	2+	5	70	30*	25	25	150
2.79	26(21)	1	Basic Science (Common to all) Physics	2	-	2	4	35	15*	25	25	200
2.21	35(30)	2	Basic Science (Common to all) Chemistry	2	-	2	4	35	15*	25	25	
2.81	24(20)	4	Basic Mathematics (Common to all)	4	2	-	6	70	30*	-	-	100
3.22	G4(4)	45	Fundamentals of ICT (Common to all)	2#	-	2	4	-	-	25	25~[1]	50
2.97	15(13)	6	Engineering Graphics non-Mech.Gp. (EJ, DE, IE, IS, MU, CO, IF)	2#	-	4	6	-	-	50	50~[2]	100
3.24	3(2)	11	Workshop Practice Comp. Gp.(CO, IF)	-	-	4	4	-	-	50	50~[2]	100
Total				**15**	**2**	**16**	**33**	**210**	**90**	**200**	**200**	**700**

***(#):**No theory Exam; **(*):** Under the theory PA, Out of 30 marks, 10 marks are for micro-project assessment (5 marks each for Physics and Chemistry) 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 **(+):** Language Lab Practical; **(~):**For the courses having ONLY practical examination, the PA has two parts – marks, for~[1] (i) practical part - 15 marks(60%) (ii) micro-project part - 10 marks (40%) and for~[2] (i) practical part - 30 marks (60%) (ii) micro-project part - 20 marks (40%).*

Legends

***L:** Lecture* ***T:** Tutorial* ***P**: Practical* ***ESE**: End Semester Exam* ***PA:** Progressive Assessment*

***Note**: Blue highlights are courses common to all programmes and yellow highlights are courses common with other specific programmes.*

Programme Code: ……..			I – Scheme Diploma Programme in **Computer Engineering**										
II – Semester													
Weighted mean score	**S. No. and (Rank No.) of Report**	**Industry Questionnaire S.No.**	**Course Title**	**Teaching Scheme/Week**			**Credits (L+T+P)**	**Examination Scheme**					
				L	**T**	**P**		**Theory**		**Practical**		**Grand Total**	
								ESE	**PA**	**ESE**	**PA**		
2.61	25(20)	2	Applied Mathematics Comp. Gp. (CO. IF)	4	2	-	6	70	30*	-	-	100	
2.39 2.25	26(21), 27(22)	5,7	Basic Electronics Comp. Gp. (CO. IF)	3	-	2	5	70	30*	25	25	150	
2.39	26(21)	5	Elements of Electrical Engineering Elx, Gp.(DE, EJ, IE, IS, CO, IF)	4	-	2	6	70	30*	25	25	150	
3.34	9(5)	4	Programming in 'C' Comp. Gp. (CO. IF)	3	2	2	7	70	30*	25	25	150	
2.7	23(18)	12	Computer Peripheral and Hardware Maintenance Comp. Gp. (CO. IF)	2#	-	2	4	-	-	50@	50~[2]	100	
3.21	12(7)	8	Web Page Designing with HTML Comp. Gp. (CO, IF)	2#	-	2	4	-	-	50	50~[2]	100	
3.75	G 1(1)	33	Business Communication Using Computers (Common to all)	2$	-	-	2	35$	15	-	-	50	
Total				**20**	**4**	**10**	**34**	**315**	**135**	**175**	**175**	**800**	

(#):*No theory Exam;* ***(*):*** *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;* ***(~[2]):*** *For the courses having ONLY practical examination, the PA has two parts – marks for~[2] (i) practical part - 30 marks (ii) micro-project part – 20, @: with external examiner.*

Programme Code: ……..			I – Scheme Diploma Programme in **Computer Engineering**										
III – Semester													
Weighted mean score	**S. No. & (Rank No.) of Report**	**Industry Questionnaire S.No.**	**Course Title**	**Teaching Scheme/Week**			**Credits (L+T+P)**	**Examination Scheme**					
				L	**T**	**P**		**Theory**		**Practical**		**Grand Total**	
								ESE	**PA**	**ESE**	**PA**		
3.39	4(2)	15	Object Oriented Programming using C++ Comp. Gp. (CO. IF)	3	2	2	7	70	30*	25	25	150	
3.39	5(2)	9	Data structure using 'C ' Comp. Gp. (CO. IF)	3	-	2	5	70	30*	25	25	150	
2.93	19(14)	16	Computer Graphics	4	-	2	6	70	30*	25	25	150	
3.45	1(1)	10	Database Management System	4	2	2	8	70	30*	25	25	150	
2.18	28(23)	31	Digital Techniques Elx. Gp. (DE, EJ, IE, IS, MU, CO)	4	-	2	6	70	30*	25	25	150	
Total				**18**	**4**	**10**	**32**	**350**	**150**	**125**	**125**	**750**	

(*): *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*

Programme Code: ……..			I – Scheme Diploma Programme in **Computer Engineering**									
IV – Semester												
Weighted mean score	**S. No. & (Rank No.) of Report**	**Industry Questionnaire S. No.**	**Course Title**	**Teaching Scheme/Week**			**Credits (L+T+P)**	**Examination Scheme**				
				L	**T**	**P**		**Theory**		**Practical**		**Grand Total**
								ESE	**PA**	**ESE**	**PA**	
-	-	IF	Environmental and Sustainable Energy Technologies Comp. Gp. (CO. IF)	3	-	2	5	70	30*	25	25	150
3.39	3(2)	20	Java Programming Comp. Gp. (CO. IF)	3	-	4	7	70	30*	50	50	200
2.96	17(12)	18	Software Engineering Comp. Gp. (CO. IF)	3	-	2	5	70	30*	25	25	150
3.36	7(4)	27	GUI Application Development using VB.net Comp. Gp. (CO. IF)	2#	-	4	6	-	-	50	50~[2]	100
2.95	18(13) Ocp(17)	13	Data communication and Computer Network	4	-	2	6	70	30*	25	25	150
2.16	29(24)	14	Microprocessors	4	-	2	6	70	30*	25	25	150
Total				**19**	**-**	**16**	**35**	**350**	**120**	**200**	**200**	**900**

($):*Online Exam;* ***(*):*** *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* ***(~[2]):*** *For the courses having ONLY practical examination, the PA has two parts – marks for~[2] (i) practical part - 30 marks (ii) micro-project part – 20.*

Note

a) *During Summer Break after* ***IV semester*** *(i.e. between IV and V Semester), Polytechnics would ensure mandatory placement of students for 6 weeks industrial training. Preferably, the industry where students would be placed should be large or medium scale, however if such industries are not available, then students can also be placed in small or very small industries but it should be relevant to the branch or discipline of engineering.* ***This training would be evaluated during V semester.***

b) *The allotment of the group of students and orientation for industrial training shall be done before the end of IV semester.*

c) *Students should prepare report of training, which will be evaluated during V semester.*

Programme Code: ……..			I – Scheme Diploma Programme in **Computer Engineering**									
V – Semester												
Weighted mean score	**S. No. and (Rank No.) of Report**	**Industry Questionnaire S.No.**	**Course Title**	**Teaching Scheme/Week**			**Credits (L+T+P)**	**Examination Scheme**				
				L	**T**	**P**		**Theory**		**Practical**		**Grand Total**
								ESE	**PA**	**ESE**	**PA**	
MSBTE guidelines and industry feedback			Industrial Training (During Summer Break after IV Semester)	-	-	6^	6^	-	-	75	75	150
3.0	16(11)	17	Operating Systems Comp. Gp. (CO. IF)	3	-	2	5	70	30*	25	25	150
3.45	2(1)	23	Advanced Java Programming Comp. Gp. (CO. IF)	4	-	4	8	70	30*	50	50	200
3.36	8(4)	22	Software Testing	4	-	2	6	70	30*	25	25	150
			Elective –I	3	-	2	5	70	30*	25	25	150
2.43	G8(7)	36	Entrepreneurship Development (Common to all)	2$	-	2	4	50$	-	25	25~[1]	100
			Minor project (Common to all)	-	-	4	4	-	-	50	50	100
Total				**16**	**-**	**22^**	**38^**	**330**	**120**	**275**	**275**	**1000**

(*): *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; ***(~[1]):*** *For the courses having ONLY practical examination, the PA has two parts – marks, for~[1] (i) practical part - 15 marks (ii) micro-project part - 10 marks****;*** ***(^)****: Though 6 credits are allocated for Industrial Training it is only for awarding marks. As far as teaching load/time table preparation is considered, each faculty would be assigned with one batch of students (equivalent to practical batch size) for guiding the preparation of industrial training report and its evaluation. For this purpose 1 hour (or two hours on working Saturdays) teaching load would be considered.*

Note

a) *Evaluation of industrial training and its reports is to be done during this semester. Credits of Industrial Training will not affect the framing of the time table.*

b) *Students have to choose any one elective group in V semester* ***as stream specific specialisation,*** *and have to take first course of that group as elective- I in V semester. They would be required to take another two courses of the same group/stream in VI semester as elective - II and elective - III. Their major and minor projects should also have emphasis preferably on the same stream of specialisation.*

Weighted mean score	S. No. and (Rank No.) of Report	Industry Questionnaire S. No.	Group Number and Name of Specialization
			Group A – Web Development
3.38	6(3)	26	**Elective I -** Client side scripting using Java Script (CO. IF)
			Group B – Network Security and Digital Forensic
2.95	18(13)	13	**Elective I -** Advanced Computer Network
			Group C – Data Mining
3.45	1(1)	10	**Elective I -** Advanced Database Management systems

Programme Code**: ……..** **I – Scheme** Diploma Programme in **Computer Engineering**

VI – Semester

Weighted mean score	S. No. & (Rank No.) of Report	Industry Questionnaire S. No.	Course Title	Teaching Scheme/Week			Credits (L+T+P)	Examination Scheme				
				L	T	P		Theory		Practical		Grand Total
								ESE	PA	ESE	PA	
3.16	14(9)	19	Programming With Python	3	-	2	5	70	30*	25	25	150
-	IF(13)	-	Mobile Application Development (CO. IF)	4	-	4	8	70	30*	50	50	200
			Elective-II	3	-	2	5	70	30*	25	25	150
			Elective-III	3	-	2	5	70	30*	25	25	150
3.75	G 1(1)	33	Technical Writing (Common to all)	-	-	2	2	-	-	25	25	50
			Major Project (Common to all)	-	-	6	6	-	-	75	75	150
			Total	**13**	**-**	**18**	**31**	**280**	**120**	**225**	**225**	**850**

(*): *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.*

Note

a) *The* ***Technical Writing*** *course is introduced as practical work, in which English faculty members would facilitate the framing of correct language for writing different chapters and presentation (i.e.PPT. and others) of their project work from English point of view. Name of English teacher has to be included as a 'Language Editor' in the project and this activity will be the part of practical shown against Technical Writing course at VI semester. This work shall be carried out for each batch (size same as for practical).*

b) *Students who have chosen the* ***stream specific specialisation*** *in elective – I in V semester, should choose the same stream/group courses in elective – II and elective – III in VI semester. Their* ***major project*** *should also*

have emphasis preferably on the same group/stream which could further sharpen their skills in that area.

Weighted mean score	S. No. & Rank No.) of Report	Industry Questionnaire S. No.	Group Number and Name of Specialization
			Group A – Web Development
3.38	6(3). IF(20)	26	**Elective II** - Server Side Scripting Using JSP (CO, IF)
3.32	10(6)	25	**Elective III** -(Choose any one) 1) Web based Application development with PHP (CO, IF) 2) Web based Application development with PERL. (CO, IF)
			Group B – Network Security and Digital Forensic
3.16	14(9)	19	**Elective II** - Computer and Network Security (CO, IF)
IF	IF	IF	**Elective III** - Digital Forensic and Hacking Techniques (CO, IF)
			Group C – Analytic and Data Mining Techniques
	IF		**Elective III** - Data Warehousing and Mining
	IF		**Elective II** - Business Intelligence

IF: *Industrial Feedback;* ***FF:*** *Faculty Feedback*

I – Scheme Summary of Teaching Scheme/Week, Credits and Examination Scheme

Computer Engineering

Semester	Teaching Scheme/Week			Credits (L+T+P)	Examination Scheme				
	L	T	P		Theory		Practical		Grand Total
					ESE	PA	ESE	PA	
I	15	2	16	33	210	90	200	200	700
II	20	4	10	34	315	135	175	175	800
III	18	4	10	32	350	150	125	125	750
IV	19	-	16	35	350	120	200	200	900
V	16	-	22	38^	330	120	275	275	1000
VI	13	-	18	31	280	120	225	225	850
Total	**101**	**10**	**92**	**203^**	**1835**	**735**	**1200**	**1200**	**5000**

(^)*: This includes total 6 credits for Industrial Training conducted during Summer Break between IV and V semester.*

MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION (MSBTE)

I – Scheme
I – Semester Course Curriculum

Course Title: **Engineering Graphics** (EJ, DE, IE, IS, MU, CO, IF**)**
(Course Code: .....)

Diploma programme in which this course is offered	Semester in which offered
Electronics and Telecommunication Engineering, Digital Electronics, Industrial Electronics, Instrumentation, Medical Electronics, Computer, Information Technology	First

1. RATIONALE

Engineering graphics is the language of engineers. The concepts of graphical language are used in expressing the ideas, conveying the instructions, which helps to do jobs at various places of industry. This course is useful in developing drafting and sketching skills in the student. It covers the knowledge and application of drawing instruments, familiarizes the learner about Bureau of Indian standards related to engineering drawing and to use computer aided drafting software for developing engineering drawings. It attempts to develop the idea of visualizing the actual object or part, on the basis of drawings and blue prints. This course also focuses on developing the imagination and translating ideas into sketches and also the ability to draw and read various engineering curves, projections and dimensioning styles.

2. COMPETENCY

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

- **Prepare engineering drawings manually using prevailing drawing instruments and computer aided drafting software**.

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. Draw regular geometrical figures.
b. Use drawing codes, conventions and symbols as per IS SP-46 in engineering drawing.
c. Draw the views of given object using principles of orthographic projection.
d. Draw isometric views of given component or from orthographic projections.
e. Draw free hand sketches of given engineering elements.
f. Use computer aided drafting approach to create engineering drawings.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	**T**	**P**	**C**	**ESE**	**PA**	**ESE**	**PA**	100
2#	-	4	6	-	-	50**	50~[2]	

(**) *marks should be awarded on the basis of internal end semester theory exam of 50 marks based on the specification table given in S. No. 9.*

***(~[2])**: For the **practical only courses,** the PA has two components under practical marks i.e. the assessment of practicals (seen in section 6) has a weightage of 60% (i.e.30 marks) and micro-project assessment (seen in section 12) has a weightage of 40% (i.e.20 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 paper.*

5. COURSE MAP (with sample COs, Learning Outcomes i.e.LOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

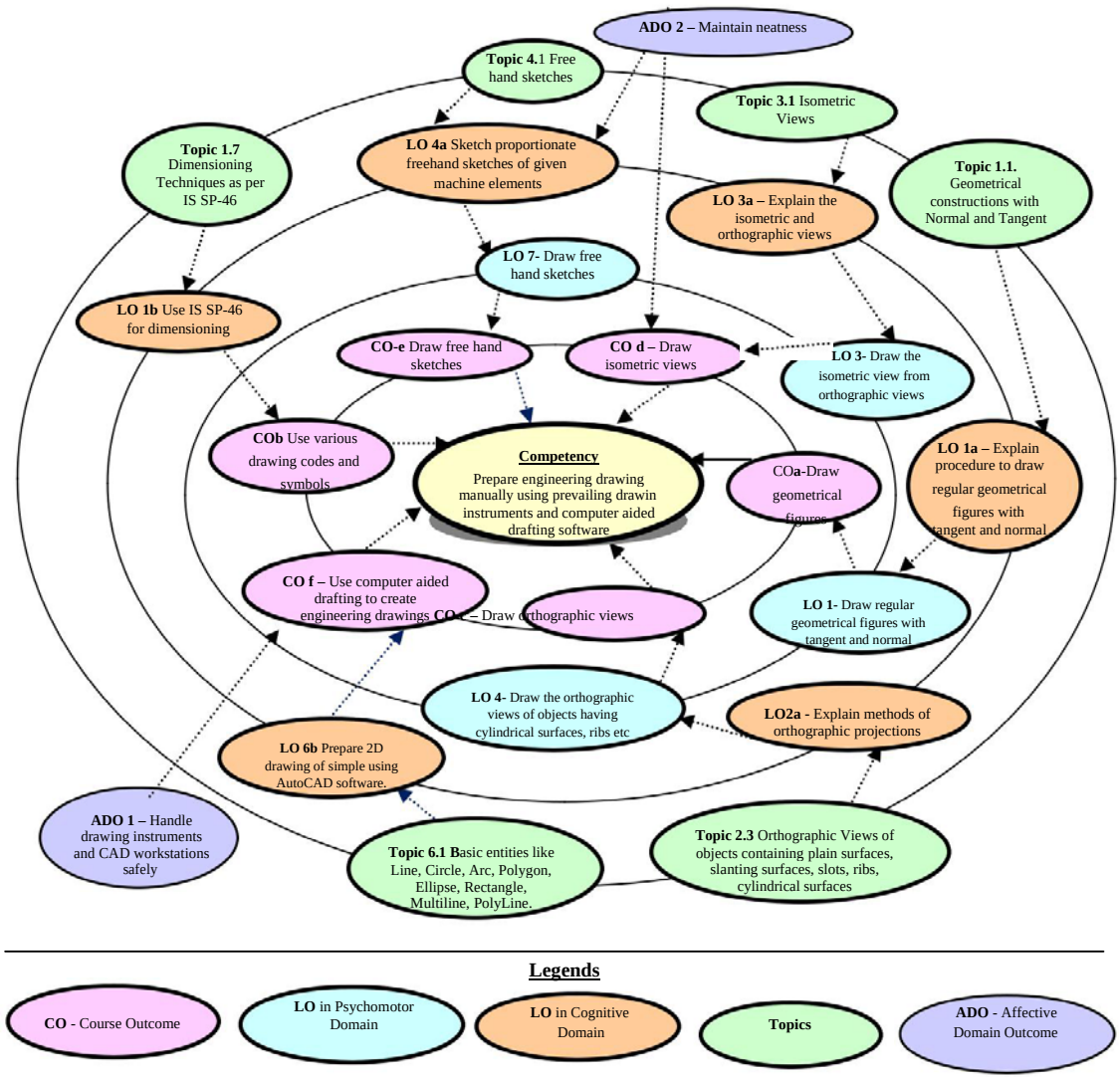

Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

The practicals/exercises/tutorials in this section are psychomotor domain LOs (i.e.sub-components of the COs), to be developed and assessed in the student to lead to the attainment of the competency.

S. No.	Practical Exercises (Learning Outcomes in Psychomotor Domain)	Unit No.	Approx. Hrs. Required
1	Draw horizontal, vertical, 30 degree, 45 degree, 60 and 75 degrees lines, different types of lines, dimensioning styles using Tee and Set squares/ drafter. (do this exercise in sketch book)	I*	02
2	Write alphabets and numerical (Vertical only) (do this exercise in sketch book)	I*	02
3	Draw regular geometric constructions and redraw the given figure (do this exercise in sketch book) Part I	I*	02
4	Draw regular geometric constructions and redraw the given figure (do this exercise in sketch book) Part II	I	02
5	Draw a problem on orthographic projections using first angle method of projection having plain surfaces. Part I	III*	02
6	Draw a problem on orthographic projections using first angle method of projection having slanting surfaces. Part II	III	02
7	Draw another problem on orthographic projections using first angle method of projection having slanting surfaces with slots. Part III	III*	02
8	Draw two problems on orthographic projections using first angle method of projection having cylindrical surfaces, ribs. Part I	III*	02
9	Draw two problems on orthographic projections using first angle method of projection having cylindrical surfaces, ribs. Part II	III	02
10	Draw two problems on orthographic projections using first angle method of projection having cylindrical surfaces, ribs. Part III	III	02
11	Draw two problems on orthographic projections using first angle method of projection having cylindrical surfaces, ribs. Part IV	III	02
12	Draw two problems on Isometric view of simple objects having plain and slanting surface by using natural scale. Part I	IV*	02
13	Draw two problems on Isometric view of simple objects having plain and slanting surface by using natural scale. Part II	IV	02
14	Draw two problems on Isometric view of simple objects having plain and slanting surface by using natural scale. Part III	IV	02
15	Draw a problem on Isometric Projection of objects having cylindrical surface by using isometric scale. Part I	IV*	02
16	Draw another problem on Isometric Projection of objects having cylindrical surface by using isometric scale. Part II	IV	02
17	Draw another problem on Isometric Projection of objects having slanting surface by using isometric scale. Part III	IV	02
18	Draw free hand sketches/conventional representation of machine elements in sketch book such as thread profiles, nuts, bolts, studs, set screws, washers, Locking arrangements. Part I	V*	02

S. No.	**Practical Exercises** (Learning Outcomes in Psychomotor Domain)	Unit No.	Approx. Hrs. Required
19	Draw free hand sketches/conventional representation of machine elements in sketch book such as thread profiles, nuts, bolts, studs, set screws, washers, Locking arrangements. Part II	V	02
20	Draw free hand sketches/conventional representation of machine elements in sketch book such as thread profiles, nuts, bolts, studs, set screws, washers, Locking arrangements. Part III	V	02
21	Draw free hand sketches/conventional representation of machine elements in sketch book such as thread profiles, nuts, bolts, studs, set screws, washers, Locking arrangements. Part IV	V	02
22	Problem Based Learning: Given the orthographic views of at least three objects with few missing lines, the student will try to imagine the corresponding objects, complete the views and draw these views in sketch book. Part I	III, II, V*	02
23	Problem Based Learning: Given the orthographic views of at least three objects with few missing lines, the student will try to imagine the corresponding objects, complete the views and draw these views in sketch book. Part II	III, II, V	02
24	Draw basic 2D entities like: Rectangle, Rhombus, Polygon using AutoCAD (Print out should be a part of progressive assessment). Part I	V*	02
25	Draw basic 2D entities like: Circles, Arcs, circular using AutoCAD (Print out should be a part of progressive assessment). Part II	V*	02
26	Draw basic 2D entities like: Circular and rectangular array using AutoCAD (Print out should be a part of progressive assessment). Part III	V*	02
27	Draw blocks of 2D entities comprises of Rectangle, Rhombus, Polygon, Circles, Arcs, circular and rectangular array, blocks using AutoCAD (Print out should be a part of progressive assessment). Part IV	V*	02
28	Draw basic branch specific components in 2D using AutoCAD (Print out should be a part of term work) Part I	VI*	02
29	Draw basic branch specific components in 2D using AutoCAD (Print out should be a part of term work) Part II	VI	02
30	Draw complex branch specific components in 2D using AutoCAD (Print out should be a part of progressive assessment) Part I	VI*	02
31	Draw complex branch specific components in 2D using AutoCAD (Print out should be a part of progressive assessment) Part II	VI	02
32	Draw complex branch specific components in 2D using AutoCAD (Print out should be a part of progressive assessment) Part III	VI	02
	Total		**64**

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 24 or more practical LOs/tutorials 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. *Hence, the 'Process' and 'Product' related skills associated with each LO of the laboratory/workshop/field work are 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 8.*

S. No.	Performance Indicators	Weightage in %
1	Developing/ using Institute Template	20
2	Selecting relevant set up 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 9 to 11.*

Additionally, the following affective domain LOs (social skills/attitudes), are also important constituents of the competency which can be best developed through the above mentioned laboratory/field based experiences:

a. Follow cleanliness and neatness.
b. Follow ethics and standards.
c. Handle CAD workstations properly.

The development of the attitude related LOs of Krathwohl's 'Affective Domain Taxonomy', the achievement level may reach:

- 'Valuing Level' in 1st year
- 'Organising Level' in 2nd year
- 'Characterising Level' in 3rd year.

7. 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	Experiment S.No.
1	Drawing Table with Drawing Board of Full Imperial/ A1 size.	All
2	Models of objects for orthographic / isometric projections	2,3,4,5,6
3	Models/ Charts of objects mentioned in unit no. 4	-
4	Set of various industrial drawings being used by industries.	All
5	Set of drawings sheets mentioned in section 6.0 could be developed by experienced teachers and made used available on the MSBTE portal to be used as reference/standards.	All
6	Set of various industrial drawings being used by industries. Drawing equipments and instruments for class room teaching-large size: a. T-square or drafter (Drafting Machine). b. Set squires (450 and 300-600) c. Protector. d. Drawing instrument box (containing set of compasses and dividers). 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^{0} and 30^{0}- 60^{0}) c. Protractor d. Drawing instrument box (containing set of compasses and dividers)	1 to 8
8	Interactive board with LCD overhead projector	All
9	CAD Workstation: 2 GB RAM, 320 GB HDD, 17" Screen, 1 GHz. (Minimum requirement)	9 to 11
10	Plotter: Print resolution Up to 1200 x 600 dpi, 16 MB Memory	9 to 11
11	Licensed latest network version of AutoCAD software	9 to 11

8. 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	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – I Basic elements of Drawing	1a. Prepare drawing using drawing instruments. 1b. Use of IS SP-46.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 Orthograp	2a. Explain methods of Orthographic Projections.	2.1 Introduction of projections-orthographic, perspective, isometric and oblique:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
hic 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 IS SP-46 for dimensioning technique for given situation.	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 shape only. 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 tool bar, 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	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
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 Learning Outcomes (LOs) need to be undertaken to achieve the 'Application Level' of Bloom's 'Cognitive Domain Taxonomy'*

9. 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
I	Basic elements of Drawing	04	-	02	04	06
II	Orthographic projections	06	-	02	08	10
III	Isometric projections	08	02	02	06	10
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**	**08**	**14**	**28**	**50**

***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 LOs. 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.

10. 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.

11. 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 LOs/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.

12. 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 oriented COs. Each micro-project should encompass two or more COs which are in fact, an integration of practicals, cognitive domain and affective domain LOs. 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. **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.

13. 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 of India, Third Reprint, October 1998; ISBN: 81-7061-091-2
2.	Engineering Drawing	Bhatt, N.D.	Charotar Publishing House, Anand, Gujarat 2010; ISBN: 978-93-80358-17-8
4.	Engineering Drawing	Jolhe, D.A.	Tata McGraw Hill Edu. New Delhi, 2010, ISBN No. 978-0-07-064837-1
5.	Engineering Drawing	Dhawan, R. K.	S. Chand and Company New Delhi, ISBN No. 81-219-1431-0
6.	Engineering Drawing	Shaha, P. J.	S. Chand and Company New Delhi, 2008, ISBN: 81-219-2964-4
7.	Engineering Graphics with AutoCAD	Kulkarni, D. M.; Rastogi ,A. P.;	PHI Learning Private Limited-New Delhi (2010), ISBN: 978-

S. No.	Title of Book	Author	Publication
		Sarkar, A. K.	8120337831
8.	Essentials of Engineering Drawing and Graphics using AutoCAD	Jeyapoovan, T.	Vikas Publishing House Pvt. Ltd, Noida, 2011, ISBN: 978-8125953005
9.	AutoCAD User Guide	Autodesk	Autodesk Press, USA, 2015
10.	AutoCAD 2016 for Engineers and Designers	Sham ,Tickoo	Dreamtech Press; Galgotia Publication New Delhi, 2015, ISBN: 978-9351199113

14. SOFTWARE/LEARNING WEBSITES

a. https://www.youtube.com/watch?v=TJ4jGyD-WCw
b. https://www.youtube.com/watch?v=dmt6_n7Sgcg
c. https://www.youtube.com/watch?v=_MQScnLXL0M
d. https://www.youtube.com/watch?v=3WXPanCq9LI
e. https://www.youtube.com/watch?v=fvjk7PlxAuo
f. http://www.me.umn.edu/courses/me2011/handouts/engg%20graphics.pdf
g. https://www.machinedesignonline.com

MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION (MSBTE)

I – Scheme
II – Semester Course Curriculum

Course Title: **Workshop Practice** (IF, CO)
(Course Code: .....)

Diploma Programme in which this course is offered	Semester in which offered
Information Technology, Computer Engineering	First

1. RATIONALE

A diploma engineer (also called technologist) in his/her professional life works in a typical business environment where s/he interacts with computers, peripherals and related devices and instruments. They must be able to use and maintain these equipments authentically. They must also possess basic knowledge/skills of wiring system, selecting components, soldering, de-soldering for elementary level testing and maintenance of such hardware. Hence, this course is designed to develop these vital skills in them through various workshop based activities.

2. COMPETENCY

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

- **Perform simple maintenance operations on computer system, peripherals and network**.

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. Use electrical tools, instruments, devices and equipment for basic level maintenance of computers and peripherals.
b. Identify active and passive electronic components.
c. Undertake basic level maintenance of a PC.
d. Use different kinds of printers and scanners.
e. Identify the layout of wired and wireless LAN environment.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	
-	-	4	4	-	-	50	50*	100

***(*)**: For the **practical only courses,** the PA has two components under practical marks i.e. the assessment of practicals (seen in section 6) has a weightage of 60% (i.e.30 marks) and micro-project assessment (seen in section 12) has a weightage of 40% (i.e.20 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. COURSE MAP (with sample COs, Learning Outcomes i.e. LOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

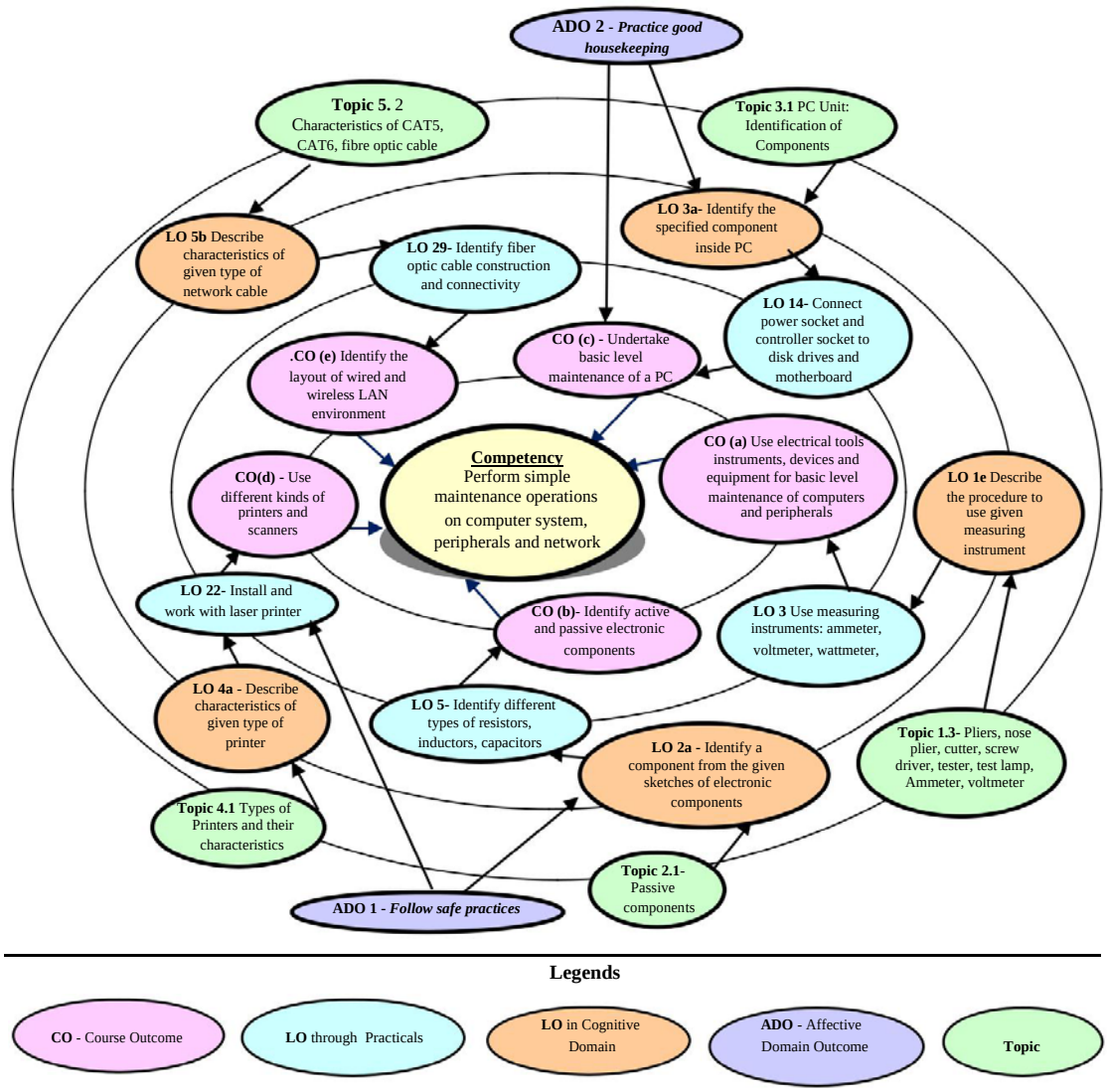

Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

The practicals/exercises/tutorials in this section are psychomotor domain LOs (i.e.sub-components of the COs), to be developed and assessed in the student to lead to the attainment of the competency.

S. No.	Practical Exercises (Learning Outcomes in Psychomotor Domain)	Unit No.	Approx. Hrs. required
1	Use devices: Pliers, nose pliers, cutter, screw driver	I	2

S. No.	Practical Exercises (Learning Outcomes in Psychomotor Domain)	Unit No.	Approx. Hrs. required
2	Use devices: tester, test lamp of different sizes	I	2
3	Use measuring instruments: ammeter, voltmeter, wattmeter	I	2
4	Use measuring instruments: clip on meter, multimeter, Megger	I	2
5	Identify different types of: resistors, inductors, capacitors, potentiometers, Thermistor, Transformer, auto transformer from the given components	II	2
6	Identify the terminals of the following components: Diode, Zener diode, Varactor diode, LED, Photo diode, BJT**,** Photo transistor, FET, LDR, Solar cell, Photocell, Opto-coupler,7 Segment Display, Relays	II	2
7	Perform soldering and de -soldering operations	I	2
8	Connect UPS with mains and batteries	I	2
9	Connect batteries of battery bank	I	2
10	Open PC Panel and Identify Components (Part-I)	III	2
11	Open PC Panel and Identify Components (Part-II)	III	2
12	Clean inside PC - Boards and Slots (Part-I)	III	2
13	Clean inside PC - Boards and Slots (Part-II)	III	2
14	Connect power socket and controller socket to disk drives and motherboard. (Part-I)	III	2
15	Connect power socket and controller socket to disk drives and motherboard. (Part- II)	III	2
16	Connect/disconnect LAN Cable, External Hard disk, Modem	III	2
17	Connect desktop computer and laptop with LCD/DLP Projector	III	2
18	Clean Keyboard and fitting it to computer	IV	2
19	Connect different types of mouse to ports	IV	2
20	Install and work with Dot matrix printer	IV	2
21	Work with Dor matrix printer settings (various types of buttons and their functions, changing ribbon cartridge, paper fitting, eject)	IV	2
22	Install and work with laser printer (various types of configuration settings on printer, removing and mounting cartridge, troubleshooting paper jam)	IV	2
23	Install and work with scanner with default settings	IV	2
24	Change scans settings, scanning documents/images and saving in different formats.	IV	2
25	Connect Modem, Hub/Switches/routers physically.	V	2
26	Prepare and test crossover and straight cable, CAT5,CAT6 Cable, using Crimping tools, Splicer	V	2
27	Connect two Switches/Hubs using normal and uplink port	V	2
28	Write on CD/DVD, single session/multisession	V	2
29	Identify fiber optic cable construction and connectivity	V	2
30	Identify Wi-Fi environment and its setup	V	2
31	Identify wired network environment and its setup	V	2
32	Identify blue tooth based wireless mouse, keyboard and other devices	V	2
	Total		**64**

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 practical LOs/tutorials needs to be performed so that the student reach the 'Precision Level' of Dave's 'Psychomotor Domain Taxonomy' as generally required by the industry.*

ii. *Hence, the 'Process' and 'Product' related skills associated with each LO 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	10
b.	Operate equipment skillfully	30
c.	Follow Safety measures	10
d.	Quality of output achieved	30
e.	Answer to sample questions	10
f.	Submit report in time	10
Total		**100**

Additionally, the following affective domain LOs (social skills/attitudes), are also important constituents of the competency which can be best developed through the above mentioned laboratory/field based experiences:

a. Follow safe 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 development of the attitude related LOs of Krathwohl's 'Affective Domain Taxonomy', the achievement level may reach:

- 'Valuing Level' in 1st year
- 'Organising Level' in 2nd year
- 'Characterising Level' in 3rd year.

7. 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. 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	10, 11, 12, 13, 14, 15, 16, 17,18,19
2	LCD/DLP Projector	17
3	Modems, hubs, switches, Router	25,27
4	Wi-Fi set-up with access point and repeater	30
5	Bluetooth based wireless mouse and keyboard or any other device	32

S. No.	Equipment Name with Broad Specifications	Exp. S.No.
6	Uninterrupted Power supply unit with battery	8,9
7	Cat5/Cat6 cable with RJ 45 Connectors	26, 27
8	Fibre optic cable with SC,ST, LC Connectors	29
9	Dot Matrix Printer, Laser Printer, Inkjet Printer	20, 21, 22
10	Scanner	23, 24
11	Hub/Switches/Routers	25, 27
12	Blank CDs/DVDs	28
13	Pliers, nose pliers, cutter, screw driver, tester, test lamp, Crimping tool	1, 26
14	Resistors, inductors, capacitors, potentiometers, Thermistor, Transformer, auto transformer	5
15	Diode, Zener diode, Varactor diode, LED, Photo diode, BJT**,** Photo transistor, FET, LDR, Solar cell, Photocell, Opto-coupler,7 Segment Display, Relays	6

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

8. 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	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – I Electrical Tools, Cables and Switches	1a. Explain the characteristics of given type of wires, cables, light sources and switches. 1b. Explain use of the given type of switch. 1c. Describe the procedure to use given electrical Tool. 1d. Describe application of the given type of uninterrupted power supply. 1e. Describe the procedure to use the given measuring instrument.	1.1 Electrical: Basic wiring- Single core cable, multicore cable, single strand wire, multi strand wire, shielded wire 1.2 Use of different types of switches ; Toggle switch, Rotary switch, Push button switch, micro switch, circuit breakers; MCB, ELCB, Regulators. 1.3 Using Pliers, nose plier, cutter, screw driver, tester, test lamp, Ammeter, voltmeter, wattmeter, clip on meter, Multimeter, Megger, Solder iron, solder-stand, solder-wire, flux, desolder pump, De-solder wick 1.4 Using Uninterrupted power supply units-online, offline, batteries and their types
Unit– II Electronic Components	2a. Identify a component from the given sketch of electronic components. 2b. Describe the applications of the given active electronic component.	2.1 Passive components**:** Different types of: resistors, inductors, capacitors, potentiometers, Thermistor, Transformer, auto transformer 2.2 Active components**:** Diodes, LED, Photo diode, BJT**,** Photo transistor, LDR, Opto-coupler, seven segment display

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit– III Inside the Computer system	3a. Identify the specified component inside PC. 3b. Describe applications of the specified device drives. 3c. Explain procedure of Connecting the given cable/ device in a PC. 3d. Describe procedure to handle laptop safely.	3.1 PC Unit: Identification of Components- Motherboard, RAM, ROM, Add-on Cards, CMOS battery, SMPS, Hard disk, DVD, flash Memory And PEN DRIVE, Power Connection, Controller Connection, NIC Cards. 3.2 Connecting and disconnecting LAN Cable, External Hard disk, Modem, Motherboard Supply, Basic handling of laptop, Connecting computer with LCD Projector
Unit– IV Computer Peripheral and Devices	4a. Describe characteristics of the given type of printer. 4b. Classify given type of scanner. 4c. Explain procedure to connect given printer/scanner to computer. 4d. Explain procedure of scanning the given document/ image using a scanner. 4e. Describe working principle of the given type of mouse.	4.1 Types of Printers and their characteristics- DOT Matrix, Laser, Inkjet, Connecting and sharing printer, Scanner – flatbed scanner, hand held scanner, setting scanning parameters, scanning documents and saving in different formats 4.2 Keyboards, different types of mouse- Optical, mechanical, Wireless, trackball, Connecting mouse to ports
Unit– V Network Devices and Components	5a. Explain Application of NIC and the given connecting devices. 5b. Describe characteristics of the given type of network cable. 5c. Describe features of the given type of network 5d. Identify components of the given wired/wireless network set-up.	5.1 Applications of Network interface cards (NIC), HUB, Switches, Routers, Modem 5.2 Characteristics of CAT5,CAT6, fibre optic cable, use of crossover and straight cable, RJ-45 connectors, SC, ST, FC, LC type fibre connectors 5.3 Concept of LAN, MAN, WAN Wireless network and devices; Wi-Fi, Access point, repeaters, Bluetooth

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

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

- Not Applicable -

10. 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 chart displaying network set-up layout of their institute.
c. Download videos/ animations to illustrate the following:
   i. Identify components inside the PC.
   ii. Making of Cross/Straight Cat5/Cat6 cables by connecting RJ-45 connector.
   iii. Any other video related to Practical exercises as given above.

11. 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 LOs/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 to explain handling/functioning of different instruments.
i. Continuously observe and monitor the performance of students in Lab/Workshop

12. 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 practicals, cognitive domain and affective domain LOs. 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 a small report on different types of wires, cables, light sources and switches.
b. Prepare a small report on different measuring instrument with their broad specifications.
c. Prepare brief report on different components with their functions inside PC.
d. Prepare a small report of printers and scanners based on their technological differences.
e. Prepare brief report of various networking devices/components installed with their application by doing survey of computer labs.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Peter Norton's New Inside the PC	Norton, Peter; Clark, Scott H.	Sams Publishing, Carmel, Indiana, USA 2010, ISBN: 9780672322891
2	Computer Basics Absolute Beginner's Guide, Windows 10	Miller, Michael	QUE Publishing; Indianapolis, USA, August 2015, ISBN: 978-0789754516
3	Principles of Electronics	Mehta, V. K.; Mehta, Rohit	S. Chand, New Delhi, ISBN:9788121924504

14. SOFTWARE/LEARNING WEBSITES

a. IT Essentials: Computer Lab Procedures and Tool Use
a. http://www.ciscopress.com/articles/article.asp?p=2086239&seqNum=4 Essential Introduction to Computers
b. http://uwf.edu/clemley/cgs1570w/notes/01%20-%20intro_to_computer.htm How to operate laptop:
c. http://www.liutilities.com/how-to/operate-a-laptop-computer/

Maharashtra State Board of Technical Education (MSBTE)

I – Scheme
II – Semester Course Curriculum

Course Title: **Basic Mathematics** (Common)
(Course Code: .....)

Diploma Programme in which this course is offered	Semester in which offered
Common to all programmes	First

1. RATIONALE

Mathematics is the core course to develop the competencies of most of the technological courses. This basic course of Mathematics is being introduced as a foundation which will help in developing the competency and the requisite course outcomes in most of the engineering diploma programmes to cater to the needs of the industry and thereby enhance the employability. This course is an attempt to initiate the multi-dimensional logical thinking and reasoning capabilities. It will help to apply the principles of basic mathematics to solve related technology problems. Hence, the course provides the insight to analyze engineering problems scientifically using logarithms, determinants, matrices, trigonometry, coordinate geometry, mensuration and statistics.

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 broad-based technology problems using the principles of basic mathematics.**

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. Apply the concepts of algebra to solve engineering related problems.
b. Utilize basic concepts of trigonometry to solve elementary engineering problems.
c. Solve basic engineering problems under given conditions of straight lines.
d. Solve the problems based on measurement of regular closed figures and regular solids.
e. Use basic concepts of statistics to solve engineering related problems.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	
4	2	-	6	70	30*	-	-	100

(*): *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.*

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

5. COURSE MAP (with sample COs, Learning Outcomes i.e.LOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

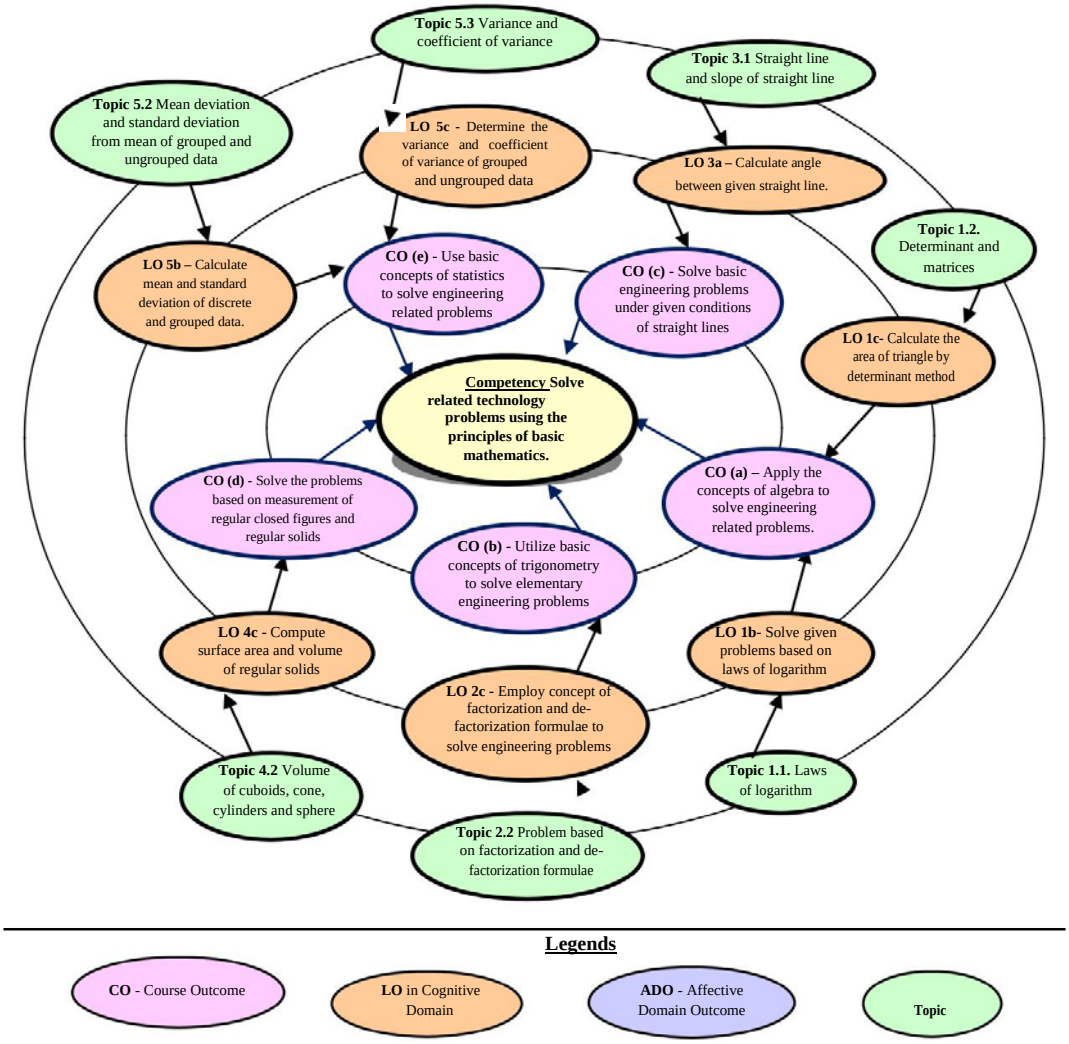

Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

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

S. No.	Tutorials	Unit No.	Appro. 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	I	2

S. No.	Tutorials	Unit No.	Appro. Hrs. required
	of simultaneous equation by Cramer's Rules.		
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.*

7. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

- Not applicable -

8. 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	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – I Algebra 1.1	1a. Solve the given simple problem based on laws of logarithm. 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.	Logarithm: Concept and laws of logarithm 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.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
		d. Types of partial fraction based on nature of factors and related problems.
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. 3d. Calculate perpendicular distance between the given two parallel lines.	3.1 Straight line and slope of straight line a. Angle between two lines. b. Condition of parallel and perpendicular lines. 3.2 Various forms of straight lines. a. Slope point form, two point form. b. Two points intercept form. c. General form. d. Perpendicular distance from a point on the line. e. Perpendicular distance between two parallel lines.
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	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
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. 5d. Justify the consistency of given simple sets of data.	5.1 Range, coefficient of range of discrete and grouped data. 5.2 Mean deviation and standard deviation from 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 Learning Outcomes (LOs) need to be undertaken to achieve the 'Application Level' of Bloom's 'Cognitive Domain Taxonomy'*

9. 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	18	02	08	10	20
III	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 teach and assess students with respect to attainment of LOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.*

10. 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.

11. 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 LOs/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.

12. 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 practicals, cognitive domain and affective domain LOs. 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.

13. 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	Advanced Engineering Mathematics	Krezig, Ervin	Wiley Publications, New Delhi, 2014 ISBN :978-0-470-45836-5
3	Engineering Mathematics (third edition).	Croft, Anthony	Pearson Education, New Delhi, 2014 ISBN 978-81-317-2605-1
4	Getting Started with MATLAB-7	Pratap, Rudra	Oxford University Press, New Delhi, 2014, ISBN: 0199731241

S. No.	Title of Book	Author	Publication
5	Advanced Engineering Mathematics	Das, H.K.	S. Chand & Co.; New Delhi; 2008, ISBN-9788121903455

14. SOFTWARE/LEARNING WEBSITES

a. www.scilab.org/ - SCI Lab
b. www.mathworks.com/products/matlab/ - MATLAB
c. www.dplot.com/ - DPlot
d. www.allmathcad.com/ - MathCAD
e. www.wolfram.com/mathematica/ - Mathematica
f. https://www.khanacademy.org/math?gclid=CNqHuabCys4CFdOJaAoddHoPig
g. www.easycalculation.com
h. www.math-magic.com

Maharashtra State Board of Technical Education (MSBTE)

I – Scheme
I – Semester Course Curriculum

Course Title: **Basic Science** (Common)
(Course Code: .....)

Diploma programme in which this course is offered	Semester in which offered
Common to all	First

1. RATIONALE

Diploma engineers (also called technologists) have to deal with various materials and machines. This course is designed with some fundamental information to help the technologists apply the basic concepts and principles of physics and chemistry to solve broad-based engineering problems. The study of basic principles of sciences and the concepts related to various materials such as metals, alloys, inorganic salts, polymers, lubricants, paints, varnishes, adhesives, heat, electricity, magnetism, optics, semiconductors and others will help in understanding the technology courses where emphasis is on the applications of these in different technology applications.

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 broad-based engineering problems applying principles of physics and chemistry.**

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. Estimate errors in measurement of physical quantities.
b. Apply the principles of electricity and magnetism to solve engineering problems.
c. Use the basic principles of heat and optics in related engineering applications.
d. Apply the catalysis process in industries.
e. Use corrosion preventive measures in industry.
f. Use relevant engineering materials in industry.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)			Examination Scheme				
						Theory Marks		Practical Marks		Total Marks
L	T	P	C			ESE	PA	ESE	PA	
4	-	4	Applied Science	Physics	2+2	35	15*	25	25	200
				Chemistry	2+2	35	15*	25	25	

(*): *Under the theory PA, out of 30 marks, 10 marks are for micro-project assessment (5 marks each for Physics and Chemistry) 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.*

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

5. COURSE MAP (with sample COs, Learning Outcomes i.e.LOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

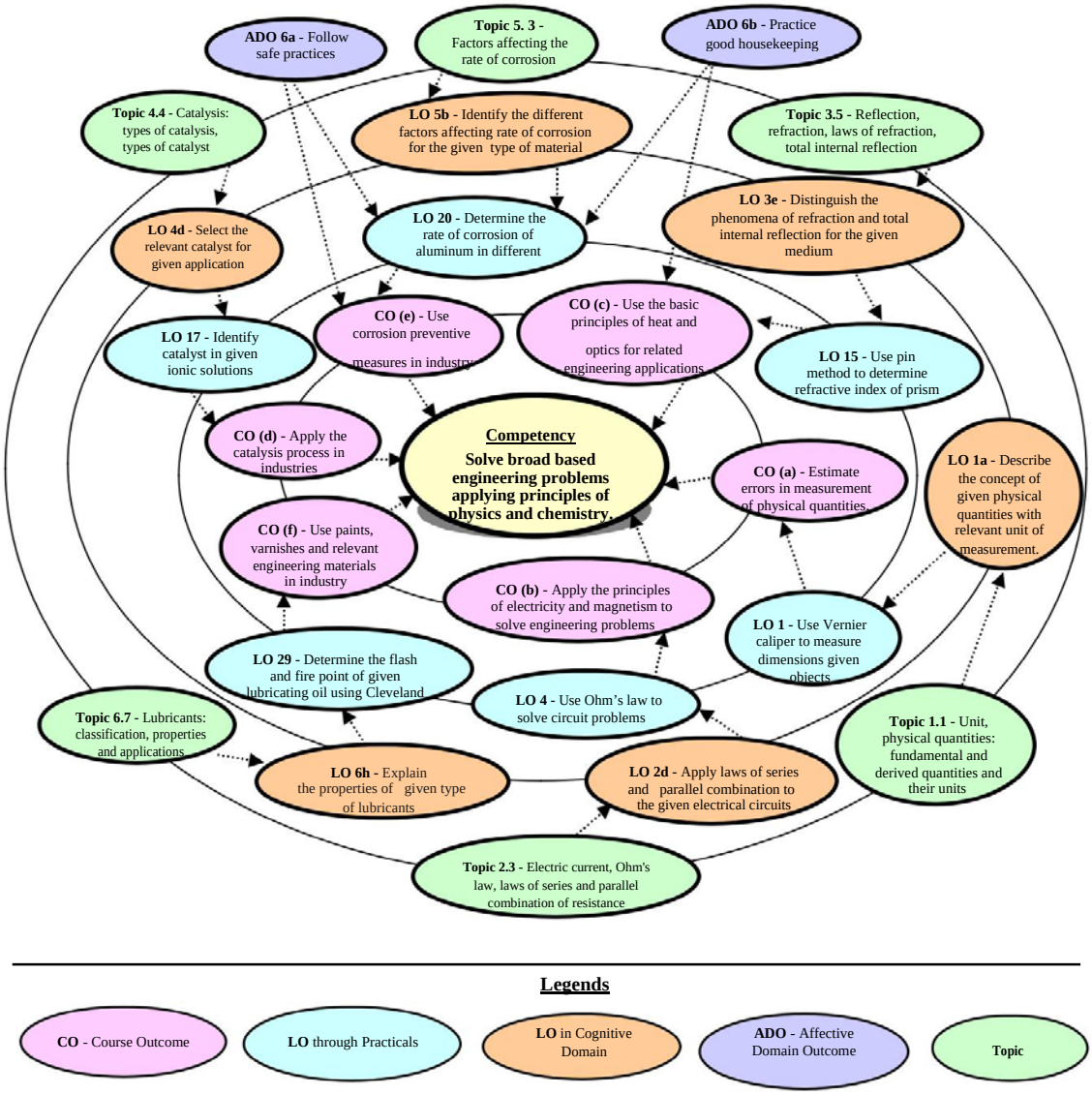

Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

The practicals/exercises/tutorials in this section are psychomotor domain LOs (i.e.sub-components of the COs), to be developed and assessed in the student to lead to the attainment of the competency.

S. No.	Practical Exercises (Learning Outcomes in Psychomotor Domain)	Unit No.	Approx. Hrs. Required
	Physics		
1	Use Vernier caliper to : (i)Measure dimensions of given objects. (ii) Measure the dimensions of objects of known dimensions. (iii) Estimate the errors in measurement.	I	02*
2	Use Screw gauge to: (i)Measure dimensions of given objects. (ii) Measure the dimensions of objects of known dimensions. (iii) Estimate the errors in measurement.	I	02*
3	Use Spherometer to measure radius of curvature of any curved surface.	I	02
4	Use Ohm's law to solve circuit problems.	II	02*
5	Determine the specific resistance of given wire.	II	02*
6	Use the principle of series resistance in solving electrical engineering problems.	II	02
7	Use the principle of parallel resistance in solving electrical engineering problems.	II	02
8	Use magnetic compass to draw the magnetic lines of forces of magnet of different shapes.	II	02*
9	Use magnetic compass to determine the neutral points when (i) North pole of bar magnets points towards the north pole of earth. (ii) South pole of bar magnets points towards the north pole of earth.	II	02
10	Use p-n junction diode to draw forward bias and reverse bias I-V characteristics.	II	02*
11	Determine forbidden energy band gap in semiconductors.	II	02
12	Determine the pressure-volume relation using Boyle's law.	III	02
13	Use Joule's calorimeter to determine Joule's mechanical equivalent of heat.	III	02*
14	Use Searle's thermal conductivity apparatus to find co-efficient of thermal conductivity of a given material.	III	02*
15	Use pin method to determine refractive index of prism.	III	02*
16	Determine the refractive index of glass slab using TIR phenomenon.	III	02
	Chemistry		
17	Identify cation in given ionic solutions.	IV	02*
18	Identify anion in given ionic solutions.	IV	02
19	Determine the percentage of iron in the given sample using redox titration.	IV, V	02*
20	Prepare the corrosive medium for Aluminium at different temperature.	V	02
21	Determine the rate of corrosion on different temperatures for Aluminium.	V	02*
22	Determine the electrode potential of Copper metal.	V	02
23	Determine the electrode potential of Iron metal.	V	02*

S. No.	Practical Exercises (Learning Outcomes in Psychomotor Domain)	Unit No.	Approx. Hrs. Required
24	Determine the voltage generated from chemical reaction using Daniel Cell.	V	02
25	Determine the pH value of given solution using pH meter and universal indicator.	V	02*
26	Determine electrochemical equivalent of Cu metal using Faraday's first law.	V	02
27	Determine equivalent weight of metal using Faraday's second law.	V	02
28	Determine the effect of temperature on viscosity for given lubricating oil using Redwood viscometer-I.	VI	02*
29	Determine the steam emulsification number of given lubricating oil.	VI	02
30	Determine the flash and fire point of given lubricating oil using Cleveland open cup apparatus.	VI	02*
31	Determine the flash point of given lubricating oil using Abel's closed cup apparatus.	VI	02*
32	Determine thinner content in oil paint.	VI	02*
	Total		**64**

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 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. *Hence, the 'Process' and 'Product' related skills associated with each LO of the laboratory/workshop/field work are 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**

Additionally, the following affective domain LOs (social skills/attitudes), are also important constituents of the competency which can be best developed through the above mentioned 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 development of the attitude related LOs of Krathwohl's 'Affective Domain Taxonomy', the achievement level may reach:

- 'Valuing Level' in 1st year
- 'Organising Level' in 2nd year and
- 'Characterising Level' in 3rd year.

7. 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. S.No.
1	Vernier Calipers: Range: 0-150mm, Resolution: 0.1mm	1
2	Micrometer screw gauge: Range: 0-25mm, Resolution:0.01mm, Accuracy: ±0.02mm or better	2
3	Spherometer: range:-10 to +10 mm, LC = 0.01mm	3
4	Digital multimeter: 3½ digit display, 9999 counts, digital multimeter measures: V_{ac}, V_{dc} (1000V max), A_{dc}, A_{ac} (10 amp max), Hz, Resistance (0-100 MΩ), Capacitance and Temperature	4, 5, 6, 7, 21, 22, 23
5	Resistance Box: 4 decade ranges from 1 ohm to 1KΩ ,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 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 100^0C, thermometer, micro ammeter, Ge diode	11
11	pH meter reading up to pH14; ambient temp. -40 to 70^0 C.; pH/mV resolution:13 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''x18''x18''; temperature range 100 to 250^0 C. with the capacity of 40 lt.	31
14	Ammeter 0-2 amp	25,26
15	Redwood viscometer-I	27
16	Cleveland open cup apparatus	29
17	Abel's close cup apparatus	30

8. 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	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
	Physics	
Unit – I	1a. Describe the concept of given	1.1 Unit, physical quantities: fundamental

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Units and Measurements	physical quantities with relevant unit of measurement. 1b. Explain various systems of units and its need for the measurement of the given physical quantities. 1c. Determine the dimensions of the given physical quantities. 1d. State the error in the given measurement with justification.	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
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.	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, Ohm's law, specific resistance, laws of series and parallel combination of resistance, heating effecting of electric current
	2e. Distinguish the given conductors, semiconductors and insulators on the basis of energy bands. 2f. Explain the I-V characteristics and applications of the given p-n junction diodes.	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	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.	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 3.4 Specific heat of gas at constant pressure and volume (C_p and C_V), ratio of specific heats
	3e. Distinguish the phenomena of total internal reflection for the given mediums. 3f. Describe light propagation in	3.5 Reflection , refraction, laws of refraction, total internal reflection 3.6 Optical fiber: Principle, construction and path of light through optical fiber,

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
	the given type of optical fiber.	applications of optical fibers.
	Chemistry	
Unit-IV Chemical bonding and Catalysis	4a. Explain the properties of given material based on the bond formation. 4b. Describe the molecular structure of given solid, liquid and gases. 4c. Describe the crystalstructure of the given solids. 4d. Select the relevant catalyst for given application.	4.1 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. 4.2 Molecular arrangement in solid, liquid and gases. 4.3 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. 4.4 Catalysis: Types of catalysis, Catalyst, Types of Catalyst, Positive Catalyst, Negative Catalyst, Auto-catalyst, Catalytic Promoter and Catalytic inhibitor, Industrial Application of Catalyst
Unit –V Metal Corrosion, its prevention and Electrochemistry	5a. Describe the phenomenon of the given type of corrosion and its prevention. 5b. Identify the different factors affecting rate of corrosion for the given type of material. 5c. Select the protective measures to prevent the corrosion in the given corrosive medium.	5.1 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) 5.2 Concentration cell corrosion -oxygen absorption mechanism in neutral or alkaline medium, Pitting corrosion, Waterline corrosion, Crevice corrosion. 5.3 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
	5d. Differentiate the salient features of the given electrolytic cell and electrochemical cell. 5e. Distinguish the given primary and secondary electrolytic cells.	5.4 Electrolyte- strong and weak, Non-Electrolyte, Electrolytic cell, Electrochemical cell. Cathode, Anode, Electrode potential- oxidation and reduction, Construction and working of Daniel cell Ionisation and dissociation 5.5 Faradays first and second law

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
	5f. Describe the process of electrolysis for the given electrolyte. 5g. Describe the process of electroplating of the given material.	5.6 Primary cell and secondary cell Electrolysis- Mechanism, Electroplating and electro-refining of copper.
Unit-VI Paints, Varnishes, Insulators, Polymer, Adhesives and Lubricants	6a. Identify the ingredients of the given paints. 6b. Differentiate salient properties of the given paint and varnish. 6c. Describe the properties of insulating materials for the given application.	6.1 Paints: Purpose of applying paint, Characteristics of paints, Ingredients of paints, Function and Examples of each ingredients 6.2 Varnish: Types, Difference between paints and varnishes 6.3 Insulators: Characteristics, Classification, Properties and Application of Glass wool, Thermo Cole
	6d. Differentiate the given types of structural polymers. 6e. Describe the polymerization process of the given polymer. 6f. Explain the properties and uses of the given polymer, elastomer and adhesive. 6g. Describe the application of relevant adhesives required for the given material. 6h. Explain the properties of given type of lubricants.	6.4 Polymer and Monomer, Classification: on the basis of Molecular structure, on the basis of monomers (homo polymer and copolymer), on the basis of Thermal behavior(Thermoplastics and Thermosetting) 6.5 Types Polymerization Reaction, Addition Polymerization, Condensation Polymerization, Synthesis, properties and application of Polyethylene, Polyvinyl chloride, Teflon. Polystyrene, Phenol formaldehyde, Epoxy Resin 6.6 Adhesives: Characteristics, Classification and their uses 6.7 Lubricants: Classification, properties and applications

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

9. 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	02	03	-	05
II	Electricity, Magnetism and Semiconductors	14	03	05	08	16
III	Heat and Optics	12	03	05	06	14
	Chemistry					

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
IV	Chemical bonding and Catalysis	08	02	03	04	09
V	Metal Corrosion, prevention and Electrochemistry	12	03	04	05	12
VI	Paints, Varnishes, Insulators, Polymer Adhesives and Lubricants	12	03	05	06	14
Total		**64**	**16**	**25**	**29**	**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 LOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.*

10. 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.

11. 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 LOs/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.

12. 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 practicals, cognitive domain and affective domain LOs. 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, Charle's Law and Gay Lussac's law using house hold materials.
d. **Battery and Cell: C**ollect wastage material from lab and household and prepare working model of cell.
e. **Adhesives:** Prepare model to demonstrate the applications of various adhesives.
f. **Polymer:** Collect the samples of different polymers and list their uses.
g. **Series and parallel resistances:** Prepare models for combination of series and parallel resistances using bulbs/ LED.
h. **Systems and units:** Prepare chart on comparison of systems of units for different physical quantities.
i. **Magnetic flux:** Prepare models to demonstrate magnetic lines of lines of forces of different types of magnets.
j. **Dimensional analysis:** Prepare chart on dimensions of fundamental and derived physical quantities and highlights the applications of dimensional analysis.
k. **Types of bonds:** Prepare chart and models displaying different types of bonds with examples.
l. **Ionization:** Prepare chart displaying ionization phenomenon.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Physics Textbook Part I - Class XI	Narlikar, J. V.; Joshi, A. W.; Mathur, Anuradha; *et al*	National Council of Education Research and Training, New Delhi, 2010, ISBN : 8174505083
2	Physics Textbook Part II - Class XI	Narlikar, J. V.; Joshi, A. W.; Mathur, Anuradha; *et al*	National Council of Education Research and Training, New Delhi, 2015, ISBN : 8174505660
3	Physics Textbook Part I - Class XII	Narlikar, J.V.; Joshi, A. W.; Ghatak A.K. *et al*	National Council of Education Research and Training, New Delhi, 2013, ISBN : 8174506314
4	Physics Textbook Part II - Class XII	Narlikar, J.V.; Joshi, A. W.; Ghatak A.K. *et al*	National Council of Education Research and Training, New Delhi, 2013, ISBN : 8174506713
5	Fundamentals of Physics	Haliday, David; Resnik, Robert and Walker, Jearl	John Wiley and sons, Hoboken, USA, 2014 ISBN : 812650823X

S. No.	Title of Book	Author	Publication
6	Engineering Chemistry	Jain and Jain	Dhanpat Rai and sons; New Delhi, 2015, ISBN : 9352160002
7	Engineering Chemistry	Dara, S. S.	S.Chand. Publication, New Delhi, 2013, ISBN: 8121997658
8	Fundamental of electrochemistry	Bagotsky,V.S.	Wiley International N. J.,2005, ISBN: 9780471700586

14. SOFTWARE/LEARNING WEBSITES

a. http://nptel.ac.in/course.php?disciplineId=115
b. http://nptel.ac.in/course.php?disciplineId=104
c. http://hperphysics.phy-astr.gsu.edu/hbase/hph.html
d. www.physicsclassroom.com
e. www.physics.org
f. www.fearofphysics.com
g. www.sciencejoywagon.com/physicszone
h. www.science.howstuffworks.com
i. https://phet.colorado.edu
j. www.chemistryteaching.com
k. www.visionlearning.com
l. www.chem1.com
m. www.onlinelibrary.wiley.com
n. www.rsc.org
o. www.chemcollective.org

Maharashtra State Board of Technical Education (MSBTE)

I – Scheme
I – Semester Course Curriculum

Course Title: **English** (Common)
(Course Code: .....)

Diploma Programme in which this course is offered	Semester in which offered
Common to all programmes	First

1. RATIONALE

In the era of globalization, the most commonly used medium to express oneself is the English language, especially in the industry, where almost all the service manuals, installation and commissioning manuals of the various equipment are in English and the technologist has to interpret them correctly. English is the dire need, not only for the Indian industry, but also worldwide, where the diploma engineers have the opportunity to take up jobs. Therefore, the basic English reading and writing skills have become almost mandatory for employment in the industry. Hence, English language has become quite a necessity for engineering diploma students. This course is therefore designed to help the students to learn the correct grammatical structures and use the relevant vocabulary while reading and writing.

2. COMPETENCY

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

- **Communicate in English in spoken and written form.**

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. Formulate grammatically correct sentences.
b. Summarise comprehension passages.
c. Formulate different types of dialogues.
d. Use relevant vocabulary to compose paragraphs to express ideas, thoughts and emotions.
e. Use relevant words in writing and delivering short and long speeches.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	**T**	**P**	**C**	**ESE**	**PA**	**ESE**	**PA**	150
3	-	2	5	70	30*	25	25	

(*): *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.*

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

5. COURSE MAP (with sample COs, Learning Outcomes i.e. LOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map**.**

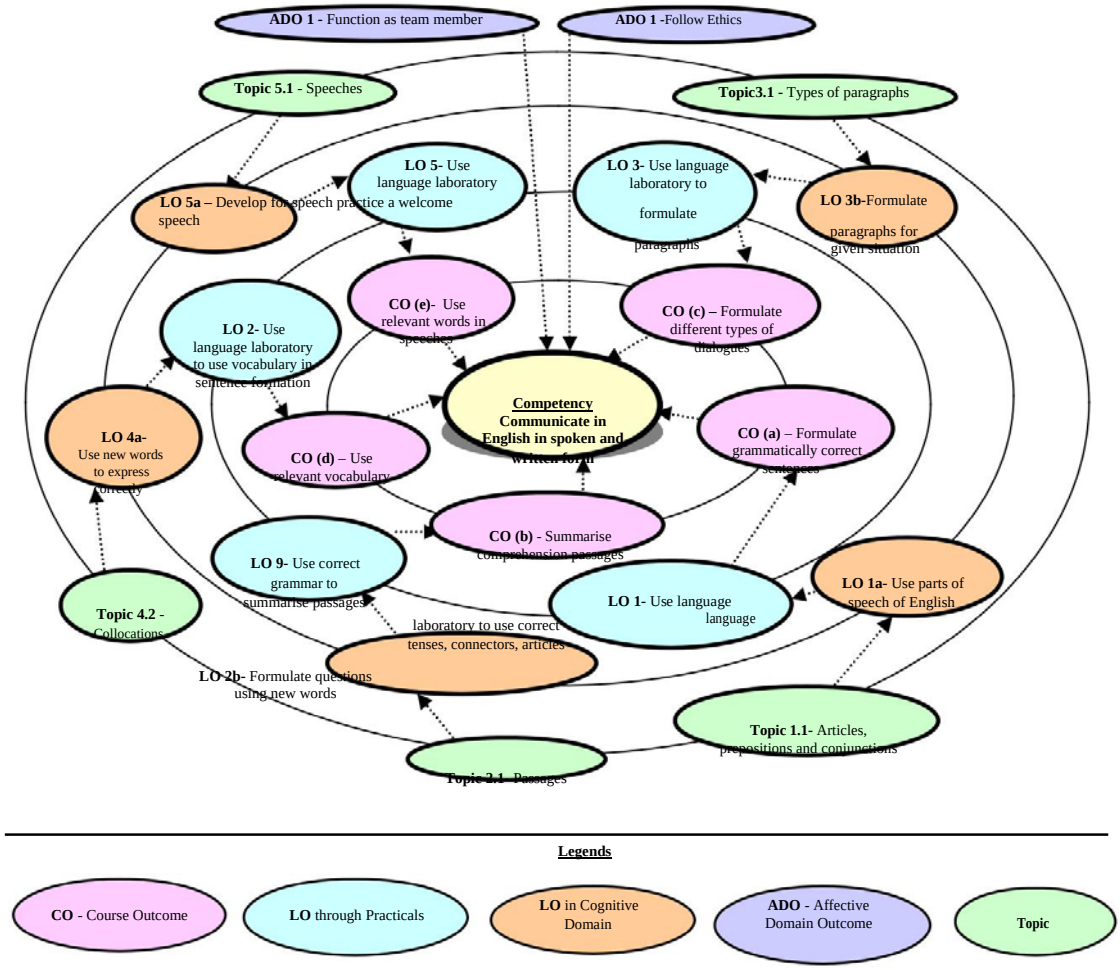

Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

The practicals/exercises/tutorials in this section are psychomotor domain LOs (i.e.sub-components of the COs), to be developed and assessed in the student to lead to the attainment of the competency.

S. No.	Practical Exercises (Learning Outcomes in Psychomotor Domain)	Unit No.	Approx. Hrs. required
	Use 'language laboratory' for different practical tasks		
1	Make sentences using correct articles.	I	2*
2	Make sentences using correct prepositions.	I	2
3	Make sentences using correct conjunctions.	I	2

S. No.	Practical Exercises (Learning Outcomes in Psychomotor Domain)	Unit No.	Approx. Hrs. required
4	Make sentences using correct active and passive voice.	I	2
5	Make sentences using correct direct and indirect speech.	I	2
6	Make sentences using correct tenses.	I	2*
7	Make sentences using correct connectors.	I	2
8	Make oral presentations using correct grammar.	I	2*
9	Write short paragraphs emphasizing on syntax and sentence structure.	II	2*
10	Write different types of dialogues for role plays.	III	2*
11	Write different types of dialogues for drama.	III	2
12	Describe episodes in own words using idioms and phrases.	IV	2
13	Write anecdotes of various situations.	IV	2
14	Construct sentences using various collocations.	IV	2*
15	Use synonyms and antonyms in sentences.	IV	2
16	Read aloud Newspapers with correct pronunciations and intonations.	IV	2
17	Write different types of speeches using new vocabulary.	IV	2
18	Deliver short prepared speeches of 3-5 minutes.	V	2*
19	Deliver extempore short speeches of 3-5 minutes.	V	2
20	Deliver extempore long speeches of 8-10 minutes.	V	2
	Total		**40**

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 practicals marked as '*' are compulsory.*

ii. *Hence, the 'Process' and 'Product' related skills associated with each LO of the laboratory/workshop/field work are 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 team	20
e.	Interpret moral of the stories	20
f.	Answer to sample questions	10
Total		**100**

Additionally, the following affective domain LOs (social skills/attitudes), are also important constituents of the competency which can be best developed through the above mentioned 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 development of the attitude related LOs of Krathwohl's 'Affective Domain Taxonomy', the achievement level may reach:

- 'Valuing Level' in 1st year
- 'Organising Level' in 2nd year
- 'Characterising Level' in 3rd year.

7. 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. 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), Graphics cards, sound cards, internal hard disk drives, DVD drive, network interface card	all
2	LCD Projector with document reader	all
3	Smart Board with networking	all

8. 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	Major Learning Outcomes (in cognitive domain)		Topics and Sub-topics
	Writing Skills	**Speaking Skills**	
Unit – I Applied Grammar	1a. Use relevant articles in constructing sentences. 1b. Apply prepositions to construct meaningful sentences. 1c. Identify conjunctions to connect phrases and clauses in the specified sentences. 1d. Use correct form of tenses in given situation. 1e. Identify the active and passive voice from the specified passage/list. 1f. Apply direct and indirect speech for the given situation.	1g. Formulate grammatically correct sentences for the specified situation. 1h. Use relevant Prepositions for the 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.	1.1. Articles: definite and indefinite 1.2. Prepositions: Types and usage 1.3. Conjunctions: coordinating and subordinating 1.4. Active and Passive voice 1.5. Direct and Indirect Speech 1.6. **Tenses** - Present Tense (Simple, Continuous, Perfect) - Past Tense (Simple, Continuous, Perfect) - Future Tense (Simple) 1.7. **Connectors**: And, But, Or, Nor, Though, Although, If, Unless, Otherwise,

Unit	Major Learning Outcomes (in cognitive domain)		Topics and Sub-topics
	Writing Skills	**Speaking Skills**	
			Because, as, Therefore, So, Who, Whom, Whose, Which, Where, When, Why, What
Unit– II Comprehension Passages	2a. Answer the given questions of the specified passage. 2b. Formulate sentences using the given new words 2c. Describe in a paragraph about the given object/product. 2d. Use correct syntax to construct meaningful sentences for the given situation. 2e. Answer the questions on the given unseen passage.	2f. Pronounce the words correctly in the given passage. 2g. Give oral instructions with correct pronunciation and intonation for the given situation. 2h. Answer the questions orally on the given unseen passage with correct pronunciation.	2.1 Seen passages from MSBTE text book. 2.2 Unseen passages from different sources
Unit– III Paragraph and Dialogue Writing	3a. Differentiate the given types of paragraphs with justification. 3b. Formulate a paragraph in words with synchronized sentence structure on the given situation / topic. 3c. Explain the theme omgiven paragraph precisely.	3d. Summarise 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 Paragraph writing 3.2 Types of paragraph i. Technical ii. Descriptive iii. Narrative iv. Compare and contrast 3.3 Dialogue writing i. Greetings ii. Development of dialogue iii. Closing sentence
Unit– IV Vocabulary Building	4a. Use relevant words to correctly express for the given themes/situation. 4b. Use correct synonyms and antonyms to write	4e. Speak in specified formal situations with correct pronunciation. 4f. Speak in specified informal situations with correct	4.1. Words often confused 4.2. Collocations 4.3. Prefix and suffix 4.4. Synonyms and Antonyms

Unit	Major Learning Outcomes (in cognitive domain)		Topics and Sub-topics
	Writing Skills	**Speaking Skills**	
	paragraphs for given themes/situations. 4c. Use the correct collocations in the given sentences. 4d. Use the correct prefix and suffix in the given sentences.	pronunciation.	
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. Undertake public speaking with correct pronunciation, intonation and using verbal and non-verbal gestures for the given theme/ situation. 5f. Give extempore talks with correct pronunciation, intonation and using verbal and non-verbal gestures for the given theme/ situation. 5g. Compere panel discussions/debates	5.1. Welcome speech 5.2. Farewell speech 5.3. Summarise an event 5.4. Summarise debates 5.5. Summarise panel discussions. 5.6. Compere panel discussions 5.7. Introducing a guest 5.8. Vote of thanks

***Note**: To attain the COs and competency, above listed Learning Outcomes (LOs) need to be undertaken to achieve the 'Application Level' of Blooms's 'Cognitive Domain Taxonomy'*

9. 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	10	02	04	08	14
II	Comprehension Passages	15	05	06	13	24
III	Paragraph and Dialogue Writing	08	02	04	06	12
IV	Vocabulary Building	08	02	03	06	11
V	Speeches	07	02	03	04	09
Total		**48**	**13**	**20**	**37**	**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 LOs. The actual*

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

10. 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 write the summary.
b. Listen to TV news and summarise the major news items
c. Summarise articles from standard English magazines
d. Undertake micro-projects.

11. 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 LOs/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.

12. SUGGESTED TITLES 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 which are in fact, an integration of practicals, cognitive domain and affective domain LOs. 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. Report different types of episodes/anecdotes.
b. Seminar preparation and presentations.
c. Prepare written speeches on given topics.
d. Prepare and participate in debates and extempore speeches.

e. Prepare Brochure for Seminar/ Conference
f. Prepare different types of assignments:
   i. Prepare a seminar brochure
   ii. Prepare a National conference brochure
   iii. Prepare an International conference brochure
   iv. Prepare poster for Inter Polytechnic Paper Presentation competition
   v. Prepare a leaflet(three fold) giving information about your Institute
   vi. Prepare a leaflet about the admission process of Polytechnic
g. Compose review on the following:
   i. Short stories
   ii. Novels
   iii. Films.
h. Prepare a questionnaire and conduct the interview of Principal/Head of Department/ Senior Faculty Members/ Senior Students/ Industry Personnel.
i. Summarise views of the authors of editorial columns of English newspapers.
j. Write 'Letters to Editor' column expressing views on social issues.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	English	MSBTE	MSBTE, Mumbai, 2008
2	Effective English with CD	Kumar, E. Suresh; Sreehari, P.; Savithri, J.	Pearson Education, Noida, New Delhi, 2009 ISBN: 978-81-317-3100-0
3	English Grammar at Glance	Gnanamurali, M.	S. Chand and Co. New Delhi, 2011 ISBN:9788121929042
4	Essential English Grammar	Murphy, Raymond	Cambridge University Press, New Delhi, Third edition, 2011, ISBN: 9780-0-521-67580-9
5	Living English Structure	Allen, W.S.	Pearson Education, New Delhi, Fifth edition, 2009, ISBN:108131728498,99

14. SOFTWARE/LEARNING WEBSITES

a. https://www.britishcouncil.in/english/learn-online
b. http://learnenglish.britishcouncil.org/en/content
c. http://www.talkenglish.com/
d. languagelabsystem.com
e. www.wordsworthelt.com

MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION (MSBTE)

I - Scheme
I – Semester Course Curriculum

Course Title: **Fundamentals of ICT** (Common)
(Course Code: .....)

Diploma Programme in which this course is offered	Semester in which offered
Common to all programmes	First

1. RATIONALE

In any typical business setup in order to carry out routine tasks related to create business documents, perform data analysis and its graphical representations and making electronic slide show presentations, the student need to learn various software as office automation tools like word processing applications, spreadsheets and presentation tools. They also need to use these tools for making their project reports and presentations. The objective of this course is to develop the basic competency in students for using these office automation tools to accomplish the job.

2. COMPETENCY

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

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

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. Use computer system and its peripherals.
b. Prepare business document using word processing tool.
c. Interpret data and represent it graphically using spreadsheet.
d. Prepare professional presentations.
e. Use different types of web browsers.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	
2#	-	2	4	-	-	25	25~[1]	50

(~[1]): For the practical only courses, *the PA has two components under practical marks i.e. the assessment of practicals (seen in section 6) has a weightage of 60% (i.e.15 marks) and micro-project assessment (seen in section 12) 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. COURSE MAP (with sample COs, Learning Outcomes i.e. LOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

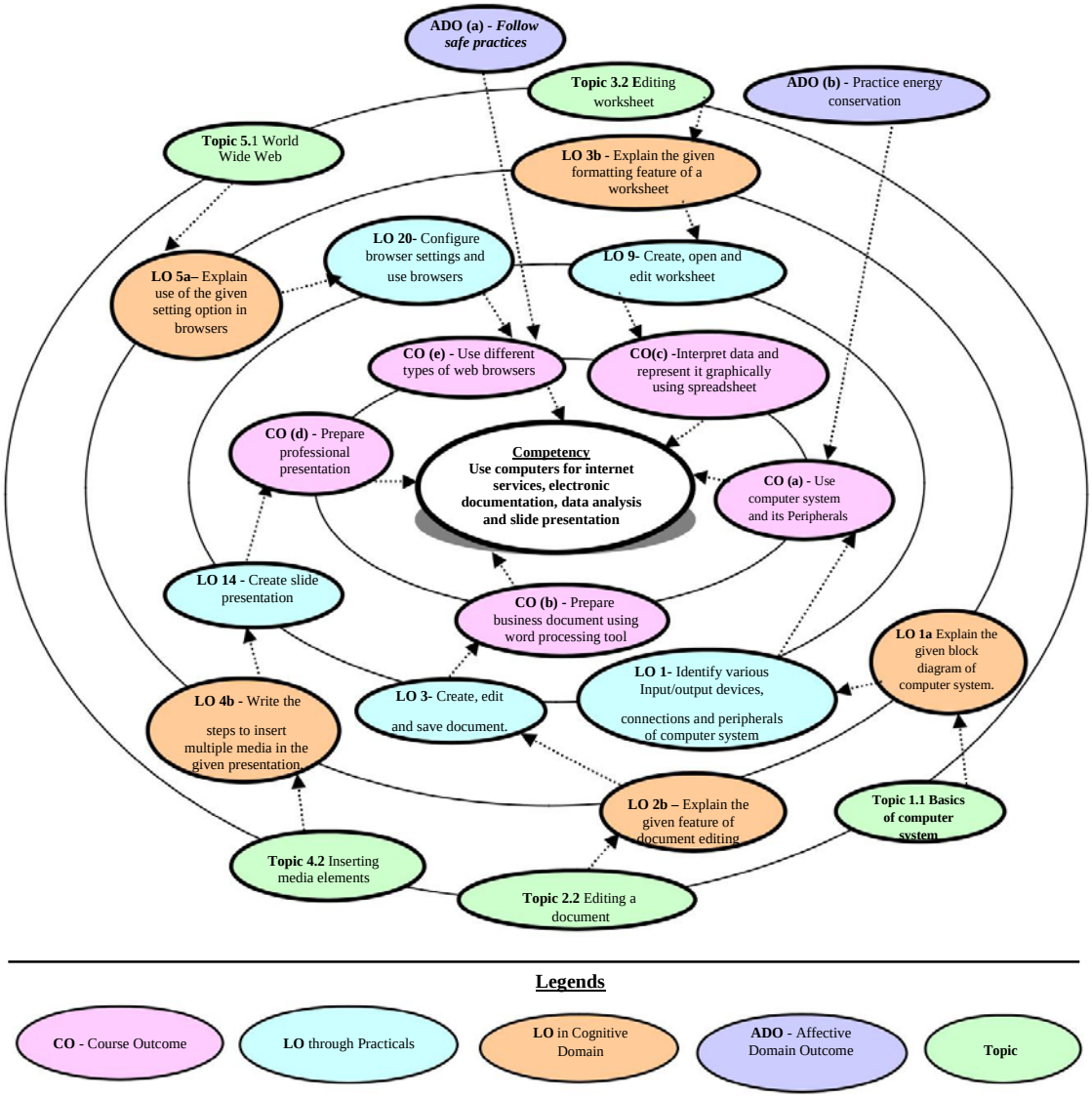

Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

The practicals/exercises/tutorials in this section are psychomotor domain LOs (i.e. sub-components of the COs) are to be developed and assessed in the student to lead to the attainment of the competency.

S. No.	Practical Exercises (Learning Outcomes to be achieved through practicals)	Unit No.	Approx. Hrs. required
	Computer system and Operating system:		
1	Identify various Input/output devices, connections and peripherals of	I	1*

S. No.	Practical Exercises (Learning Outcomes to be achieved through practicals)	Unit No.	Approx. Hrs. required
	computer system		
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, colour, background, group/ungroup	II	2
6	Insert and apply various table formatting features on it.	II	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	1
	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	1
17	Add audio and video files in the given presentation	IV	1
	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 practicals to be performed.*

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.

ii. *Hence, the 'Process' and 'Product' related skills associated with each LO 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**

Additionally, the following affective domain LOs (social skills/attitudes), are also important constituents of the competency which can be best developed through the above mentioned 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 development of the attitude related LOs of Krathwohl's 'Affective Domain Taxonomy', the achievement level may reach:

- 'Valuing Level' in 1st year
- 'Organising Level' in 2nd year
- 'Characterising Level' in 3rd year.

7. 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. 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 to18
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.*

8. 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	Major Learning Outcomes (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 the 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, Wi-Fi 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 page setup features of a document. 2d. Write the specified table formatting feature.	2.1. **Word Processing:** Overview of Word processor Basics of Font type, size, colour, Effects like Bold, italic, underline, Subscript and superscript, Case changing options, Previewing a document, Saving a document, Closing a document and exiting application. 2.2. **Editing a Document:** Navigate through a document, Scroll through text, Insert and delete text, Select text, Undo and redo commands, Use drag and drop to move text, Copy, cut and paste, Use the clipboard, Clear formatting, Format and align text, Formatting Paragraphs, Line and paragraph spacing, using FIND and REPLACE, Setting line

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
		spacing, add bullet and numbers in lists, add borders and shading, document views, Page settings andmargins, Spelling and Grammatical checks 2.3. **Changing the Layout of a Document:** Adjust page margins, Change page 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:** a 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. 3e. Explain steps to perform advance operation on the given data set.	3.1. **Working with Spreadsheets:** Overview of workbook and worksheet, Create Worksheet Enteringsampledata,Save,Copy Worksheet, Delete Worksheet, Close and open Workbook. 3.2. **Editing Worksheet:** Insert and select data, adjust row height and column width, delete, move data, insert rows and columns, Copy and Paste, Find and Replace, Spell Check, Zoom In-Out, Special Symbols, Insert Comments, Add Text Box, Undo Changes, - Freeze Panes, hiding/unhiding 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

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
		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, mat hemat ical funct ions 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 Object, Add Transitions, Add Speaker Notes, Print a Presentation. 4.3 **Working with Tables:** Insert a Table in a Slide, Format Tables, and Import Tables from Other Office Applications.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
		4.4 **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. 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.	5.1 **World Wide Web**: Introduction, Internet, Intranet, Cloud, Web Sites, web pages, URL, web servers, basic settings of web browsers- history, extension, default page, default search engine, creating and retrieving bookmarks, use search engines effectively 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 Learning Outcomes (LOs) need to be undertaken to achieve the 'Application Level' of Bloom's 'Cognitive Domain Taxonomy'*

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

- Not Applicable -

10. 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

11. 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 LOs/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.

12. 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 practicals, cognitive domain and affective domain LOs. 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 students)
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).

13. SUGGESTED LEARNING RESOURCES

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

14. SOFTWARE/LEARNING WEBSITES

a. https://www.microsoft.com/en-in/learning/office-training.aspx
b. http://www.tutorialsforopenoffice.org/
c. https://s3-ap-southeast-1.amazonaws.com/r4ltue295xy0d/ Special_Edition_Using_StarOffice_6_0.pdf

Maharashtra State Board of Technical Education (MSBTE)

'I' Scheme
I - Semester Course Curriculum

Course Title**: Basic Electronics (CO. IF)**
(Course Code: .....)

Diploma Programme in which this course is offered	Semester in which offered
Information Technology, Computer Engineering	Second

1. RATIONALE

In today's world most of the consumer appliances are based on electronic circuits and devices. The foundation for working of computer or any of its peripherals are based on electronics. This course has been designed to develop skills to understand and test simple electronic components and circuits.After studying this course students will develop an insight to identify, build and troubleshoot simple electronic circuits.

2. COMPETENCY

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

- **Use simple electronic circuits of computer system.**

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. Identify electronic components in electronic circuits.
b. Use diodes in different applications.
c. Interpret the working of junction transistor in the electronic circuits.
d. Interpret the working of unipolar devices in the electronic circuits.
e. Use sensors and transducers.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	150
3	-	2	5	70	30*	25	25	

(*): *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.*

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

5. COURSE MAP (with sample COs,Learning outcomes i.e.LOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

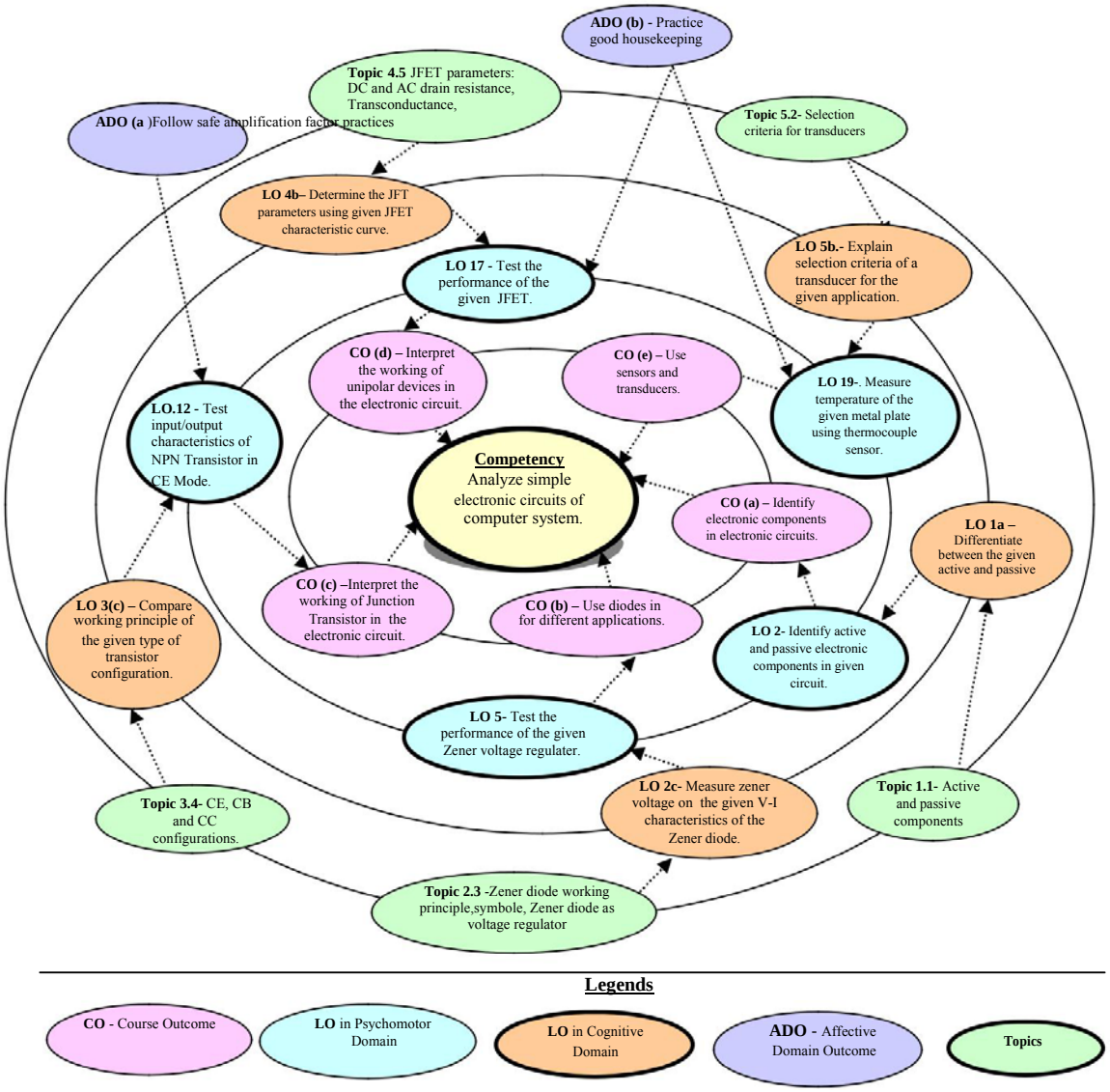

Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

The practicals/exercises/tutorials in this section are psychomotor domain LOs (i.e.sub-components of the COs), to be developed and assessed in the student to lead to the attainment of the competency.

S. No.	Practical Exercises (Learning Outcomes in Psychomotor Domain)	Unit No.	Approx. Hrs. Required
1	Measure amplitude, time period and frequency of sine wave and square wave using CRO .	I	02*

S. No.	Practical Exercises (Learning Outcomes in Psychomotor Domain)	Unit No.	Approx. Hrs. Required
2	Identify active and passive electronic components in the given circuit.	I	02
3	Test the performance of the given PN junction diode.	II	02*
4	Test the performance of the given Zener diode.	II	02
5	Test the performance of the given Zener voltage regulater.	II	02
6	Convert AC signal into DC signal using Half wave rectifier.	II	02
7	Convert AC signal into DC signal using full wave rectifier	II	02
8	Use filters to get regulated DC.	II	02
9	Convert AC signal into DC signal through Bridge rectifier.	II	02
10	Test the performance of the given Bridge rectifier using filter.	II	02
11	Test the performance of the given Zener regulator.	II	02
12	Test input/output characteristics of NPN Transistor in CE Mode.	III	02*
13	Test input/output characteristics of NPN Transistor in CB Mode.	III	02
14	Test input/output characteristics of NPN Transistor in CC Mode.	III	02
15	Determine gain and bandwidth of Single stage RC coupled amplifier.	III	02
16	Determine gain and bandwidth of 2 stage RC coupled amplifier.	III	02
17	Test the performance of the given JFET.	IV	02*
18	Determine the characteristics parameter of the given JFET.	IV	02
19	Measure temperature of the given metal plate using thermocouple sensor.	V	02*
20	Test the performance of the given circuit consist of photoelectric sensor.	V	02
	Total		**40**

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 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. *Hence, the 'Process' and 'Product' related skills associated with each LO of the laboratory/workshop/field work are 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

Additionally, the following affective domain LOs (social skills/attitudes), are also important constituents of the competency which can be best developed through the above mentioned 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 development of the attitude related LOs of Krathwohl's 'Affective Domain Taxonomy', the achievement level may reach:

- 'Valuing Level' in 1st year
- 'Organising Level' in 2nd year
- 'Characterising Level' in 3rd year.

7. 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. S.No.
1	Single/Dual regulated Power supply(0 to 15Volts).	3-18
2	Digital multimeter ,3and ½ digit, seprate range for resistancs and capacitance,component tester, AC and DC measurement.	3 – 20
3	Dual trace CRO/DSO, 50MHz., with function generator and component tester.	1,4-18
4	Function generator, 20MHz.	1,4-18
5	Trainer kits / breadboard for Rectifiers, regulator, Transistors, JFET and RC coupled single / two stage amplifiers.	4-18
6	Heater, Thermocouple and photoelectric sensor	19,20

8. 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	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – I Electronic Components and Signals	1a. Differentiate between the given active and passive electronic components. 1b. Calculate value of the given resistor and capacitor using colour code. 1c. Compare the characteristics of the given voltage and current source. 1d. Interpret with sketches the given signal.	1.1 Active and passive components 1.2 Resistor,capacitor,inductor symbols,working principles, applications,colour codes, specifications. 1.3 Voltage and Current Source 1.4 Signal waveform, Time and frequency domain representation, Amplitude, Frequency, Phase, Wavelength 1.5 Types of Signals: sinusoidal, triangular and square 1.6 Integrated Circuits – analog and

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
		digital.
Unit– II Diodes and Their Applications	2a. Explain with sketches working of the given diode using V-I characteristics. 2b. Measure zener voltage on the given V-I characteristics of the zener diode. 2c. Describe with sketches the working principle of given type of filter. 2d. Compare the salient features of the given type of rectifiers.	2.1 Symbol, construction and working principle of P-N junction diode 2.2 Rectifiers:Half wave, Full wave and Bridge Rectifier,working principle , circuit diagram, performance parameters PIV, ripple factor,efficiency, Need for filters: circuit diagram and working of 'L', 'C' and 'π'' filter. 2.3 Zener diode working principle, symbole, as voltage regulator 2.4 Symbol, construction and working principle of light emitting diode(LED) 2.5 Working principle and block diagram of regulated power supply.
Unit– III Bipolar Junction Transistor	3a. Describe with sketches the construction and working of the given type of device. 3b. Explain with sketches the working principle of the given transistor configuration 3c. Determine the current gain of the given transistor configuration. 3d. Explain with sketches the specified transistor parameter. 3e. Explain with sketches the concept of the specified transistor biasing.	3.1 Unipolar and Bipolar devices 3.2 Symbol, construction and working principle of NPN transistor. 3.3 Transistor as switch and amplifier. 3.4 CE, CB and CC configurations. 3.5 Regions – Cut-off, saturation and Active region. 3.6 Transistor parameters- alpha, beta, input and output resistance and relation between alpha and beta 3.7 Transistor biasing- DC load line, Q-point and Fix bias and voltage divider biasing. 3.8 RC coupled amplifier.
Unit-IV Field Effect Transistors	4a. Explain with sketches the construction and working principle of the given type of FET. 4b. Determine the FET parameters from the given FET charasteristic curve. 4c. Describe the specified JFET paramenter. 4d. Describe the specified MOSFET paramenter.	4.1 FET-Types: JFET and MOSFET 4.2 Classification of JFET 4.3 Symbol, construction and working principle of N-channel and P-channel JFET, Drain and transfer characteristics of JFET 4.4 JFET parameters: DC and AC drain resistance, Transconductance, amplification factor 4.5 Symbol, construction and working principle of MOSFET.
Unit –V	5a. Differentiate between the	5.1 Working of sensors and transducers

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Sensors and Transducers	given type of sensor and transducer 5b. Explain selection criteria of a transducer for the given application. 5c. Describe with sketches the working of photodiode and photo transistor as control device for the given application. 5d. Describe the steps to measure the temperature of a given metal using the given transducer.	5.2 Selection criteria for transducers 5.3 Active and passive transducers 5.4 Inductive, capacitive, resistive pressure and Piezoelectric transducer 5.5 Photodiode and phototransistor transducers 5.6 Thermocouple and Proximity sensors.

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

9. 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	Electronic Components and Signals	08	02	04	06	12
II	Diodes and Their Applications	10	04	04	08	16
III	Bipolar Junction Transistor	14	04	06	08	18
IV	Field Effect Transistor	08	02	03	06	11
V	Sensors and Transducers	08	03	04	06	13
Total		**48**	**15**	**21**	**34**	**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 LOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.*

10. 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. Study of datasheet of electronic components.
c. Prepare charts of symbols of Electronic components.
d. Search information about Ratings and specifications of Regulator, diode transistors, CRO, function generator.
e. Collect information of analog and digital ICs and prepare charts of the same.
f. Collect information of passive transducers and prepare charts of the same.
g. Prepare posters to illustrate the use of photoelectric sensors in remote controls.

11. 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 LOs/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 students in preparing charts and display boards.
g. Guide students in searching information regarding datasheets and electronic components.
h. Show Video/Animation clippings for functioning of instruments.
i. Observe continuously and monitor the performance of students in lab.

12. 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 practicals, cognitive domain and affective domain LOs. 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 waveform with input signal 5Vpp., and prepare the report.
b. **Diode:** Build a circuit on general purpose PCB to clamp a waveform at 3.0V 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 BJT 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.
j. **Transistor as a switch:** Build / test transistor switch circuit on breadboard/General purpose PCB for various input signal.
k. **Use of sensors for driving relays / output devices:** Students will build/test circuit on breadboard/General purpose PCB. Verify output of designed circuit by appling different inputs.
l. **Prepare display boards consisting of electronic components**: prepare display boards/ models/ charts/ Posters to visualize the appearance of electronic active and passive components.

13. SUGGESTED LEARNING RESOURCES

S.No.	Title of Book	Author	Publication
1	Electronic Instrumentation	Kalsi, H.S.	McGraw Hill Education, New Delhi,2010, **ISBN:** 978-0070702066
2	Electronics Principles	Malvino, Albert Paul, David	McGraw Hill Eduction, New Delhi, **ISBN:** 978-0070634244
3	A text book of Applied Electronics	Sedha, R.S.	S.Chand and Co. ,New Delhi, 2008,**ISBN** 978-8121927833
4	A course in electrical and electronic measurements and instrumentation	Sawhney, A.K.	Dhanpat Rai & Company, New Delhi, 2014 edition, **ISBN-:** 978-8177001006
5	Principles of Electronics	Mehta, V.K. Mehta, Rohit	S. Chand and Co. Ram Nagar, New Delhi-110 055, 11th Edition,2014 , ISBN 9788121924504

14. SOFTWARE/LEARNING WEBSITES

a. https://learn.sparkfun.com/tutorials/transistors
b. http://www.pitt.edu/~qiw4/Academic/ME2082/Transistor%20Basics.pdf
c. http://faculty.cord.edu/luther/physics225/Handouts/transistors_handout.pdf
d. http://www.technologystudent.com/elec1/transis1.htm
e. http://www.learningaboutelectronics.com/Articles/N-channel-JFET
f. http://www.electrical4u.com/jfet-or-junction-field-effect-transistor
g. www.nptel.com
h. http://www.electronics-tutorials

Maharashtra State Board of Technical Education (MSBTE)

'I' Scheme
II – Semester Course Curriculum

Course Title: **Web Page Designing with HTML (**IF, CO)
(Course Code: .....)

Diploma programme in which this course is offered	Semester in which offered
Computer Engineering, Information Technology	Second

1. RATIONALE

Website design is a broad term that encompasses a wide variety of tasks, all involved in the formation of web pages. There are essentially two types of web design approaches, which are dynamic and static design. Static web design is typically based on basic HTML code. It is essential for diploma student to learn HTML since the task of static website design is performed by using HTML coding. Even in dynamic websites, the task of presentation of content is handled through HTML coding. This course introduce web page design using HTML5 and also give emphasis on learning Cascading Style Sheets (CSS) which is a style sheet language used for describing the presentation of a document written in a markup language for formatting and styling of content. This learning enables students to design static web sites and host it on Internet/Intranet.

2. COMPETENCY

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

- **Develop static interactive web-sites.**

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. Use block level formatting tags to present content on web page.
b. Use text level formatting tags to present content on web page.
c. Apply hyper linking on web page.
d. Organize the content using table and frames.
e. Apply presentation schemes on content using CSS.
f. Publish websites on Internet or Intranet.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	
2#	-	2	4	-	-	50	50~[2]	100

(~[2]): For the practical only courses, *the PA has two components under practical marks i.e. the assessment of practicals (seen in section 6) has a weightage of 60% (i.e.30 marks) and micro-project assessment (seen in section 12) has a weightage of 40% (i.e.20 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. COURSE MAP (with sample COs, Learning Outcomes i.e.LOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map**.**

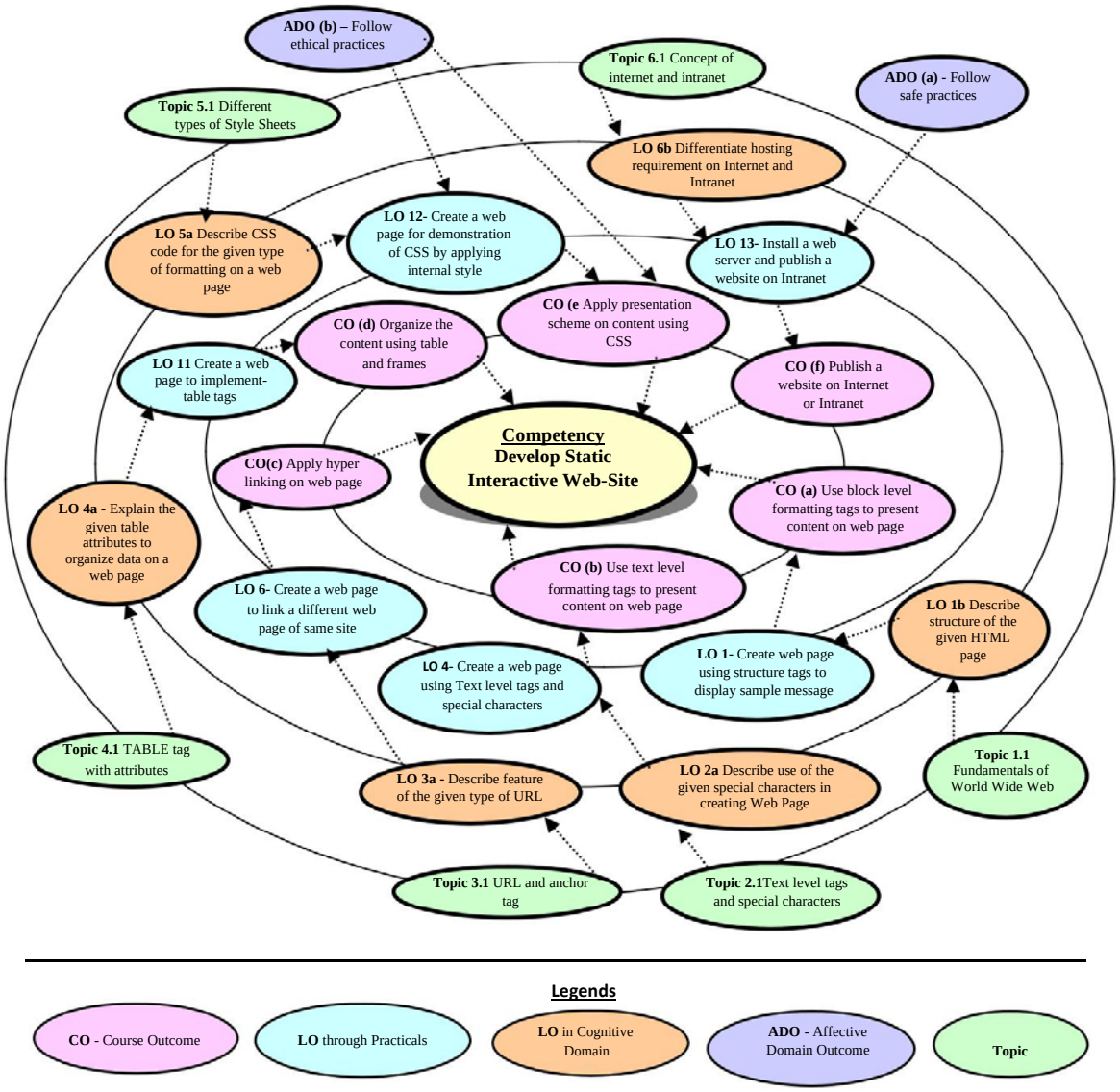

Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

The practicals/exercises/tutorials in this section are psychomotor domain LOs (i.e.sub-components of the COs), to be developed and assessed in the student to lead to the attainment of the competency.

S. No.	Practical Exercises (Learning Outcomes to be achieved through practicals)	Unit No.	Approx. Hrs. Required
1	Create web page using structure tags to display sample message.	I	02
2	Create a web page for displaying a paragraph using block level tags, HR tags (Part-I)	I	02*
3	Create a web page for displaying a paragraph using block level tags, HR tags (Part-II)	I	02
4	Create a Web Page using Text level tags and Special Characters	II	02
5	Create a web page for implementing different types of Lists.	II	02*
6	Create a web page to link- a) A different web page of same site. b) A different location on the same web page c) A specific location on different web page of same site.	III	02
7	i) Create a web page to link- a) An external page of different web site b) To an email ID ii) Write tags to change colors of links	III	02*
8	Insert images on web page using various attributes	III	02
9	Implement image as a button and set image as background.	III	02
10	Create a web page to implement Frame tags.	IV	02*
11	Create a web page to implement Table tags.	IV	02
12	Create a web page for demonstration of CSS by applying Internal/External/ Inline style	V	06*
13	Install a web server and publish a website on Intranet.	VI	02
14	Publish a website on Internet by acquiring space on free hosting site.	VI	02*
	Total		**32**

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

S. No.	Performance Indicators	Weightage in %
a.	Debugging ability	20
b.	Quality of output achieved (Product)	40
c.	Complete the practical in stipulated time	10
d.	Answer to sample questions	20
e.	Submit journal in time	10
Total		**100**

Additionally, the following affective domain LOs (social skills/attitudes), are also important constituents of the competency which can be best developed through the above mentioned 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 development of the attitude related LOs of Krathwohl's 'Affective Domain Taxonomy', the achievement level may reach:

- 'Valuing Level' in 1st year
- 'Organising Level' in 2nd year
- 'Characterising Level' in 3rd year.

7. 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. S. No.
1	Computer with a text editor and browser	ALL
2	Scanner : A4 size, supporting image quality 200 DPI or higher	7
3	Computer system with Internet connection	12
4	Web server.	12

8. 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	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – I Basics of HTML	1a. Differentiate characteristics of the given type of web sites. 1b. Describe structure of the given HTML page. 1c. Explain use of head tag and body tag in the given web page. 1d. Describe the procedure of using the given block level tag on a web page.	**1.1 Fundamentals of World Wide Web(www):** Information about Web Browsers, Web Servers and types of sites. Static vs. dynamic web sites Web page structure: DOCTYPE, head, body, title and other meta tags with attributes. **1.2 Block Level Tags And Horizontal Rules:** Headings, Paragraphs, Breaks, Divisions, Centered Text, Block Quotes, Preformatted text, types of Address, HR tag.
Unit– II Text Level Tags and List	2a. Describe use of the given special characters in creating Web Page. 2b. Use relevant tag to display the given special characters. 2c. Explain use of the given type of list in Web Pages.	**2.1 Text Level Tags And Special Characters:** Bold, Italic, Teletype, Underline, Strikethrough, Superscript, Subscript , DIV tag, displaying special characters. **2.2 Lists:** Ordered Lists, Unordered Lists, Definition Lists, Nested Lists.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
	2d. Describe the procedure of using the given text level tags in creating a Web Page.	
Unit– III URL And Images	3a. Describe feature of the given type of URL. 3b. Describe the given image attribute on a web page. 3c. Explain process of using the given colors/images as page background on a Web Page. 3d. Describe the procedure for creating the given type of hyper linking.	**3.1 URL And Anchor Tag:**URL : Types of URLs, Absolute URLs, Relative URLs, pros and cons of relative and absolute URLs, Anchor Tag: Linking various documents for internal and external links. **3.2 Images, Colors And Backgrounds:** Inserting Images, formatting image for sizing, alignment. Border and using other attributes with IMG tag. Inserting image as page background. Creating solid color page background.
Unit-IV Table And Frames	4a. Explain the given table attributes to organize data on a web page. 4b. Use the given table attribute to change default table setting. 4c. Describe the given type of 'frame' with examples. 4d. Describe the procedure to organize display as per given screen layout using frames.	**4.1 Table**: Table tag with attributes. TABLE, TR, TH, TD tags. Border, cell spacing, cell padding, width, align, bgcolor attributes. **4.2 Frames** :Types of Frames with their attributes, Creating frames: FRAMESET tag – rows, cols attributes.
Unit –V Cascading Style sheets	5a. Describe CSS code for the given type of formatting on a web page. 5b. Describe the given style sheet properties. 5c. Explain the given property of CSS. 5d. Describe the procedure to create CSS for applying the given presentation scheme on a web page.	**5.1 Cascading Style Sheets:** Different types of Style Sheets, Benefits of using CSS. Adding style to the document: Linking to style sheets, Embedding style sheets, Using inline style, Selectors: CLASS rules, ID rules. **5.2 Style sheet properties:** Font, text, box, color and background properties; Creating and Using a simple external CSS file; Using the internal and inline CSS; background and color gradients in CSS Setting font and text in style sheet using table layout.
Unit-VI Website Hosting	6a. Describe the procedure to configure a webserver. 6b. Differentiate hosting requirement on Internet and	**6.1 Website Hosting:** Concept of Internet and Intranet. Publishing website on Intranet, Installing and configuring web server,

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
	intranet 6c. Describe the procedure for hosting the given website. 6d. Explain process of uploading the given files on a website.	uploading files on intranet site, access intranet based website**;** Publishing website site on Internet, hiring Web space, uploading files using FTP, Virtual Hosting, access internet based website

Note*: To attain the COs and competency, above listed Learning Outcomes (LOs) need to be undertaken to achieve the 'Application Level' of Bloom's 'Cognitive Domain Taxonomy'*

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

- Not Applicable-

10. 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. Browse and Observe features of different types of website.
c. Identify different host servers for hosting static website.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various learning 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 LOs/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. Demonstrate students thoroughly before they start doing the practice.
g. Encourage students to refer different websites to have deeper understanding of the subject.
h. Observe continuously and monitor the performance of students in Lab.

The practical exercises as listed in point no. 6 above may be undertaken keeping in mind to develop a sample web site as final output. Some sample topics/domains are suggested below.

12. 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 practicals, cognitive domain and affective domain LOs. 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:

Create sample website with minimum ten web pages Containing text, images, colors & background, frames, tables, and CSS with suitable hyper linking.

a. Website for Universities or Colleges.
b. Web site for books shops, grocery store, others.
c. Web site for any Vehicle Showroom.
d. Website for Hospital facilities.
e. Web site for Travel and Tourism Agency.
f. Web site related to any Sports. (Ex. Cricket, Tennis,) Any other suggested topic by subject teacher.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1.	HTML and XHTML – The complete reference	Powell, Thomas	Tata McGraw Hill, New Delhi, 2014, ISBN: 9780070701946
2.	Learning Web Design	Robbins	O'Reilly, London, 2012 ISBN 10:1-4493-1927-0
3.	Teach Yourself HTML & CSS in 24 Hours	SAMS	Pearson Education Publication, New Delhi, 2015, **ISBN:** 978-672336140
4.	HTML,XHTML and CSS	Bohem, Anne	Murach's Publication, New York, 2013, ISBN 13: 978-1890774578
5.	HTML 5 Black Book(second edition)	DT Editorial services	Dreamtech Publication, New Delhi, **ISBN:** 978-9350040959

14. SOFTWARE/LEARNING WEBSITES

a. http://www.w3schools.com/html
b. http://www.html.net/
c. http://www.2createawebsite.com
d. http://webdesign.about.com

Maharashtra State Board of Technical Education (MSBTE)

I – Scheme
II – Semester Course Curriculum

CourseTitle: **Applied Mathematics (**CO, IF)
(Course Code: .....)

Diploma programme in which this course is offered	Semester in which offered
Computer Engineering, Information Technology	Second

1. RATIONALE

The core technological studies can be understood with the help of potential of mathematics. This course is being introduced into diploma course to provide mathematical background. The course will give them the insight to understand and analyze engineering problems scientifically using calculus, integration, differential equations and numerical methods. This subject enhances the multidimensional, logical thinking and reasoning capabilities. It also improves the systemic approach in computer programming language.

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 computer related broad-based engineering problems using principles of applied mathematics.**

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. Calculate the equation of tangent, maxima, minima, radius of curvature by differentiation.
b. Solve the given problems of integration using suitable methods.
c. Apply the concept of integration to find area and volume.
d. Solve the differential equation of first order and first degree using suitable methods.
e. Apply the concepts of numerical methods in computer programming languages.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	100
4	2	-	6	70	30*	-	-	

(*): *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.*

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

5. COURSE MAP(with sample COs, Learning Outcomes i.e. LOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

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

S. 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

S. No.	Tutorials	Unit No.	Approx. Hrs. Required
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	Solveproblems 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
11	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 finding the roots of algebraic equations using RegulaFalsi Method.	V	2
15	Solve problems based on finding the roots of transcendental equations using Newton Raphson's Method.	V	2
16	Solve problems based on solution of system of equations using Gauss elimination method and Gauss Seidal Method	V	2
Total			32

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

7. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED:

- Not applicable -

8. 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	Major Learning Outcomes (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 derivatives of given logarithmic, exponential functions. 1d. Apply the concept of	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.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
	differentiation to find equation of tangent and normal for given problem. 1e. Apply the concept of differentiation to calculate maxima and minima and radius of curvature for the given problem.	b) 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 simple 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 equation(s). 4b. Form simple differential equations for given simple engineering problems 4c. Solve given differential equations using the method of variable separable. 4d. Solve the given simple problem(s) 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 Numerical methods	5a. Find the roots of given algebraic equations using Bisection method and Regula falsi method. 5b. Determine the roots of given nonlinear equation(s) using	5.1 Solutions of algebraic equations: a. Bisection Method. b. Regula falsi Method. c. Newton Raphson Method. 5.2 Numerical solutions of simultaneous

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
	Newton's-Raphson method. 5c. Obtain the solutions of given simultaneous equations using Gauss elimination method. 5d. Solve given system of linear equations using Jacobi's method and Gauss Seidal method.	equations: a. Gauss elimination method b. Jacobi's Method. c. Gauss Seidal Method.

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

9. 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	Numerical Methods	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 teachers to teach and assess with respect to attainment of LOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.*

10. SUGGESTED STUDENT ACTIVITIES

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

a. Identify engineering problems based on real world problems and solve with the use of free tutorials available on the internet.
b. Use graphical software: EXCEL, DPLOT, and GRAPH for related topics.
c. Use Mathcad as Mathematical Tools and solve the problems of Calculus.
d. Identify problems based on applications of differential equations and solve these problems.
e. Prepare models to explain different concepts of applied mathematics.
f. Prepare a seminar on any relevant topic based on applications of integration.
g. Prepare a seminar on any relevant topic based on some Numerical methods.

11. SUGGESTEDSPECIAL 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 LOs/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.
g. Use different instructional strategies in classroom teaching.
h. Use video programs available on the internet to teach abstract topics.

12. 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 practicals, cognitive domain and affective domain LOs. 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. Write algorithm to find the approximate roots of algebraic equations.
j. Write algorithm to find the approximate roots of transcendental equations.
k. Write algorithm to solve system of linear equations.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Higher Engineering Mathematics	Grewal, B.S.	Khanna publications, New Delhi, 2013 ISBN:8174091955
2	Advanced Engineering	Krezig, Ervin	Wiley Publications, New Delhi, 2016

S. No.	Title of Book	Author	Publication
	Mathematics		ISBN:978-81-265-5423-2,
3	Advanced Engineering Mathematics	Das, H.K.	S. Chand Publications, New Delhi, 2008, ISBN-9788121903455
4	Engineering Mathematics, Volume 1 (4th edition)	Sastry, S.S.	PHI Learning, New Delhi, 2009 ISBN: 978-81-203-3616-2,
5	Getting Started with MATLAB-7	Pratap, Rudra	Oxford University Press, New Delhi,2009 ISBN: 0199731241
6	Engineering Mathematics (third edition).	Croft, Anthony.	Pearson Education, New Delhi,2010 ISBN: 978-81-317-2605-1

14. SOFTWARE/LEARNING WEBSITES

a. www.scilab.org/ - SCI Lab
b. www.mathworks.com/products/matlab/ - MATLAB
c. Spreadsheet applications
d. www.dplot.com/ - DPlot
e. www.allmathcad.com/ - MathCAD
f. www.wolfram.com/mathematica/ - Mathematica
g. http://fossee.in/
h. https://www.khanacademy.org/math?gclid=CNqHuabCys4CFdOJaAoddHoPig
i. www.easycalculation.com
j. www.math-magic.com.

Maharashtra State Board of Technical Education (MSBTE)

'I' Scheme
II – Semester Course Curriculum

Course Title: **Computer Peripheral and Hardware Maintenance** (IF, CO)
(Course Code: .....)

Diploma Programme in which this course is offered	Semester in which offered
Information Technology, Computer Engineering	Second

1. RATIONALE

Maintenance and troubleshooting of computer system and its peripherals is an important skill to upkeep the computer systems and peripherals. Diploma pass out must be able to use and maintain these system peripherals authentically. They must also possess basic skills of assembling desktop computers, interfacing with peripheral devices, installing new devices and carry out preventive and breakdown maintenance and troubleshooting. This course is designed to develop these vital skills in them through lab based activities to solve problems associated with computer hardware.

2. COMPETENCY

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

- **Maintain computer hardware and peripherals.**

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. Identify different types of computer systems.
b. Troubleshoot common motherboard problems.
c. Select processors required for relevant systems.
d. Partition/format hard disk drives.
e. Troubleshoot peripherals and networks.
f. Test power supplies.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	
2#	-	2	4	-	-	50	50~[2]	100

(~[2]): For the practical only courses, *the PA has two components under practical marks i.e. the assessment of practicals (seen in section 6) has a weightage of 60% (i.e.30 marks) and micro-project assessment (seen in section 12) has a weightage of 40% (i.e.20 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. COURSE MAP (with sample COs, Learning Outcomes i.e.LOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

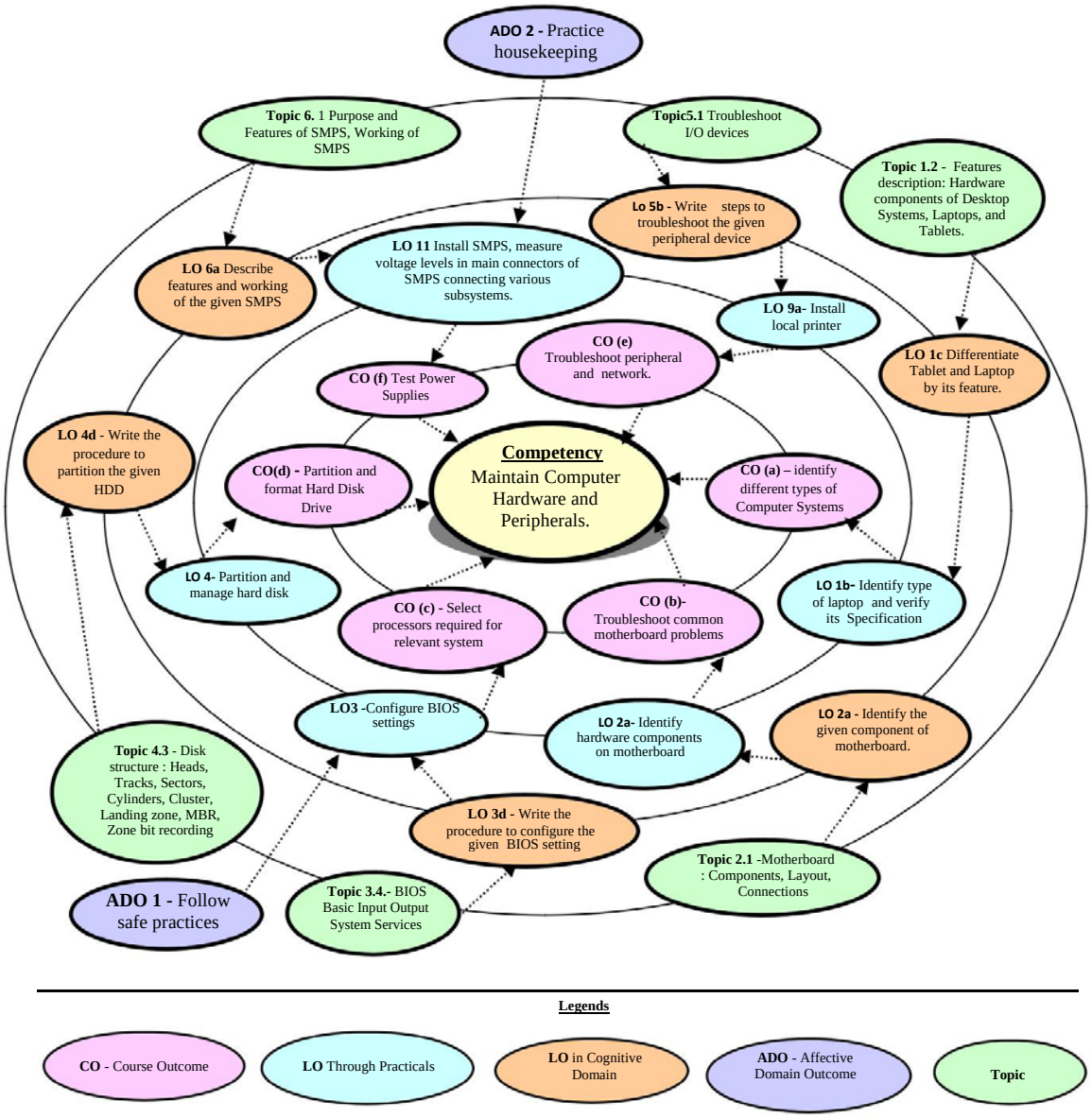

Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

The practicals/exercises/tutorials in this section are psychomotor domain LOs (i.e.sub-components of the COs), to be developed and assessed in the student to lead to the attainment of the competency.

S. No.	Practical Exercises (Learning Outcomes in Psychomotor Domain)	Unit No.	Approx. Hrs. Required

S. No.	Practical Exercises (Learning Outcomes in Psychomotor Domain)	Unit No.	Approx. Hrs. Required
1	a. Identify desktop and server by its type and verify its specifications	I	2*
	b. Identify type of laptop and verify its Specification		
2	a. Identify hardware components on motherboard	II	2*
	b. Troubleshoot common problems of motherboard.		
3	Configure BIOS settings	III	2*
4	Partition and manage hard disk: format hard drives with different file systems. (Part-I)	IV	2*
5	Partition and manage hard disk, format hard drives with different file systems. (Part-II)	IV	2
6	Install Operating System – Windows family (such as Windows 7/ Windows 10,Windows server 12)	IV	2
7	Install Operating System –Unix family (such as Linux/Ubuntu/Centos)	IV	2
8	Troubleshoot Hard disk problems.	IV	2
9	a. Install local printer (Software configuration settings on printer and troubleshooting)	V	2*
	b. Share Printer in Network(Software configuration settings on printer and troubleshooting)		
10	Set keyboard, mouse, monitor, Speaker, Microphone and LCD Projector	V	2
11	Install SMPS, measure voltage levels in main connectors of SMPS connecting various subsystems.	VI	2*
12	Assemble and Disassemble Desktop System (Part-I)	VI	2
13	Assemble and Disassemble Desktop System (Part-I)	VI	2
14	Troubleshoot computer system by diagnosing the problem	VI	2
15	Use diagnostic software for fault finding and viruses	VI	2
16	Undertake Preventive Maintenance of PC using vacuum cleaner and simple tools.	VI	2
Total			**32**

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 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. *Hence, the 'Process' and 'Product' related skills associated with each LO 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	10
b.	Operate equipment skillfully	30
c.	Follow Safety measures	10
d.	Completed the exercise in stipulated time	30
e.	Answer to sample questions	10

S. No.	Performance Indicators	Weightage in %
f.	Submit report in time	10
Total		**100**

Additionally, the following affective domain LOs (social skills/attitudes), are also important constituents of the competency which can be best developed through the above mentioned 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 development of the attitude related LOs of Krathwohl's 'Affective Domain Taxonomy', the achievement level may reach:

- 'Valuing Level' in 1st year.
- 'Organising Level' in 2nd year.
- 'Characterising Level' in 3rd year.

7. 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. 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	All
2	LCD/DLP Projector	Student Activity
3	Mouse :Mechanical, Optical, Opto-Mechanical	8
4	Laptop	All
5	Bluetooth based wireless mouse and keyboard or any other device	8
6	Dot Matrix Printer, Laser Printer, Inkjet Printer	7
7	Computer Maintenance kit	All
8	Logic probe, logic pulser, current tracer.	11
9	Digital voltmeter	9
10	Operating systems	5,6,7,8,,11,12
11	Power Supply	All
12	Diagnostics Software	12
13	Vacuum Cleaner/Blower	13

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

8. 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	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – I Features of Computer Hardware	1a. Explain characteristics of the given type of computer systems. 1b. Describe features of the given desktop systems. 1c. Describe features of the given Tablet systems. 1d. Describe features of the given server systems.	1.1 Computers: Desktop Computers, Tablet, Laptop, Mainframe, Supercomputer. 1.2 Features description: Hardware components of Desktop Systems, Laptops, and Tablets. 1.3 Types of Servers, Server Feature descriptions and its applications.
Unit– II Motherboard	2a. Identify the given component of motherboard. 2b. Describe features of the given motherboard. 2c. Differentiate hardware based and software based problems of motherboard. 2d. Describe the procedure to identify the given type of motherboard problems.	2.1 Motherboard : Components, Layout, Connections 2.2 Motherboards : Types and Features 2.3 Enhancing features of motherboard: Adding and or replacing components. 2.4 Troubleshooting problems of a motherboard.
Unit– III Processor and BIOS	3a. Describe architecture of given type of Multi-core processors. 3b. Explain the purpose of the given type of co-processors. 3c. Explain the level and purpose of cache memory. 3d. Write the procedure to configure the given BIOS setting.	3.1 Processor : Common Features, Types of Processors, Basic Structure of CPU, Different levels of cache, system bus, clock speed, packaging 3.2 Multiple Core Processors: Description, Two core processor architecture and multi-core processor architecture 3.3 Co-processors: Graphics, Math. 3.4 BIOS: Basic Input Output System Services, Bios Interaction, date and time, Boot device priority, boot setting configuration, password security.
Unit– IV Hard Disk	4a. Describe features of the given type of hard disk interface. 4b. Describe features of the given type of disk structure. 4c. Explain characteristics of the given disk performance parameter. 4d. Write the procedure to partition the given HDD. 4e. Describe the given type of file system.	4.1 Hard Disk Drive 4.2 Hard Disk Interfaces: EIDE, Serial ATA, SCSI, USB and IEEE 1394 (Firewire), RAID, Solid State Drive (laptop) 4.3 Disk structure : Heads, Tracks, Sectors, Cylinders, Cluster, Landing zone, MBR, Zone bit recording 4.4 Disk performance parameters Characteristics: Seeks and Latency, Data Transfer Rate 4.5 File system: FAT16, FAT32, NTFS, Unix file system, EXT2/EXT3, RAID
Unit– V	5a. Describe features of the	5.1 Troubleshoot I/O devices: Keyboard,

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
I/O and Modem	given I/O device. 5b. Write steps to troubleshoot the given peripheral device 5c. Explain use of the given I/O cable. 5d. Explain features of given type of Interface. 5e. Describe the procedure to troubleshoot the given network problem.	Switches, Mouse, Scanners, Webcam, Monitors, Printers, Speaker and Mike, LCD Projector 5.2 I/O Cables: Specification of I/O Cables, Types of I/O cables, Types of I/O Ports, Internal and External modem, Block diagram and specifications. 5.3 Network Interface: Definition of network interface, Types of network interface, troubleshooting of network connectivity, Antivirus
Unit–VI Power Supply	6a. Describe features and working of the given SMPS 6b. Describe features and working of the given UPS. 6c. Differentiate the salient features of the specified type of UPS. 6d. Describe the steps to troubleshoot the given tpe of SMPS.	6.1 Purpose and Features of SMPS, Working of SMPS 6.2 Fault finding in power supply 6.3 Uninterrupted Power Supply: Characteristics of UPS, Types of UPS, online and offline 6.4 Preventive Maintenance of Power Supply

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

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

-Not Applicable --

10. 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 specification chart of different types/family of processors (Ex. Intel/AMD)
b. Prepare journal of practical.
c. Prepare a presentation to display Layout of different motherboards and different System components and present it in groups.

11. 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 LOs/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. Demonstrate students thoroughly before they start doing the practice
g. Show video/animation films to explain handling/functioning of different instruments.
h. Continuously observe and monitor the performance of students in Lab/Workshop

12. 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 practicals, cognitive domain and affective domain LOs. 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. **SMPS**: List down the components available in SMPS. Measure different output voltages from SMPS.
b. **Computer motherboard:** Prepare brief report by identifying different electronics components in a given motherboard. Classify them in passive and active components.
c. **Microprocessor:** Prepare a small report of different microprocessors being used in industry (Any four) by doing market survey.
d. **Computer Specifications:** Prepare a small report on major specification of different types of computer systems available in your lab.
e. **Peripheral Specifications:** Prepare a small report based on technological differences and installation procedure of printers and scanners.
f. **Network Layout:** Prepare a small report by doing survey of computer labs. List various networking devices/components with its application.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1.	The computer hardware installation, interfacing, troubleshooting and maintenance	James, K.L.	PHI Learning, New Delhi, 2014 ISBN: 978-81-203-4798-4
2.	Comdex: Hardware and Networking Course Kit	Gupta, Vikas	Dreamtech Press, New Delhi ISBN: 978-93-5119-265-7
3.	The Complete PC Upgrade And maintenance Guide	Minasi, Mark	BPB Publication, New Delhi ISBN:978-81-265-0627-9
4.	Computer Architecture and Maintenance Vol.1	Kadam, Sachin	Shroff Publication, Mumbai ISBN: 978-9350230244

14. SOFTWARE/LEARNING WEBSITES

a. http://www.howstuffworks.com/
b. http://www.gcflearnfree.org/computerbasics/keeping-your-computer-clean/1/
c. https://www.youtube.com/watch?v=4iaxOUYalJU
d. http://www.instructables.com/id/Computer-Assembly/

Maharashtra State Board of Technical Education (MSBTE)

'I' – Scheme
II – Semester Course Curriculum

Course Title: **Programming in 'C'** (IF, CO)
(Course Code: .....)

Diploma programme in which this course is offered	Semester in which offered
Information Technology, Computer Engineering	Second

1. RATIONALE

Diploma engineers (also called technologists) have to write programs to cater with various IT solutions. In order to develop a program to solve a given problem, they have to build logic, develop algorithms and flow charts. This course is designed keeping in view developing these skills. Besides its use to write codes for low level programming such as developing operating systems, drivers, and compilers; 'C' has been widely used as a general-purpose language to develop basic applications. This course deals with fundamental syntactic information about 'C' that will help the students to apply the basic concepts, program structure and principles of 'C' programming paradigm to build given application. The course is basically designed to create a base to develop foundation skills of programming language.

2. COMPETENCY

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

- **Develop 'C' programs to solve broad-based computer related problems.**

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. Develop flowchart and algorithm to solve problems logically.
b. Write simple 'C' programs using arithmetic expressions.
c. Develop 'C' programs using control structure.
d. Develop 'C' programs using arrays and structures.
e. Develop/Use functions in C programs for modular programming approach.
f. Develop 'C' programs using pointers.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	**T**	**P**	**C**	**ESE**	**PA**	**ESE**	**PA**	
3	2	2	7	70	30*	25	25	150

(*): *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.*

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

5. COURSE MAP (with sample COs, Learning Outcomes i.e.LOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map**.**

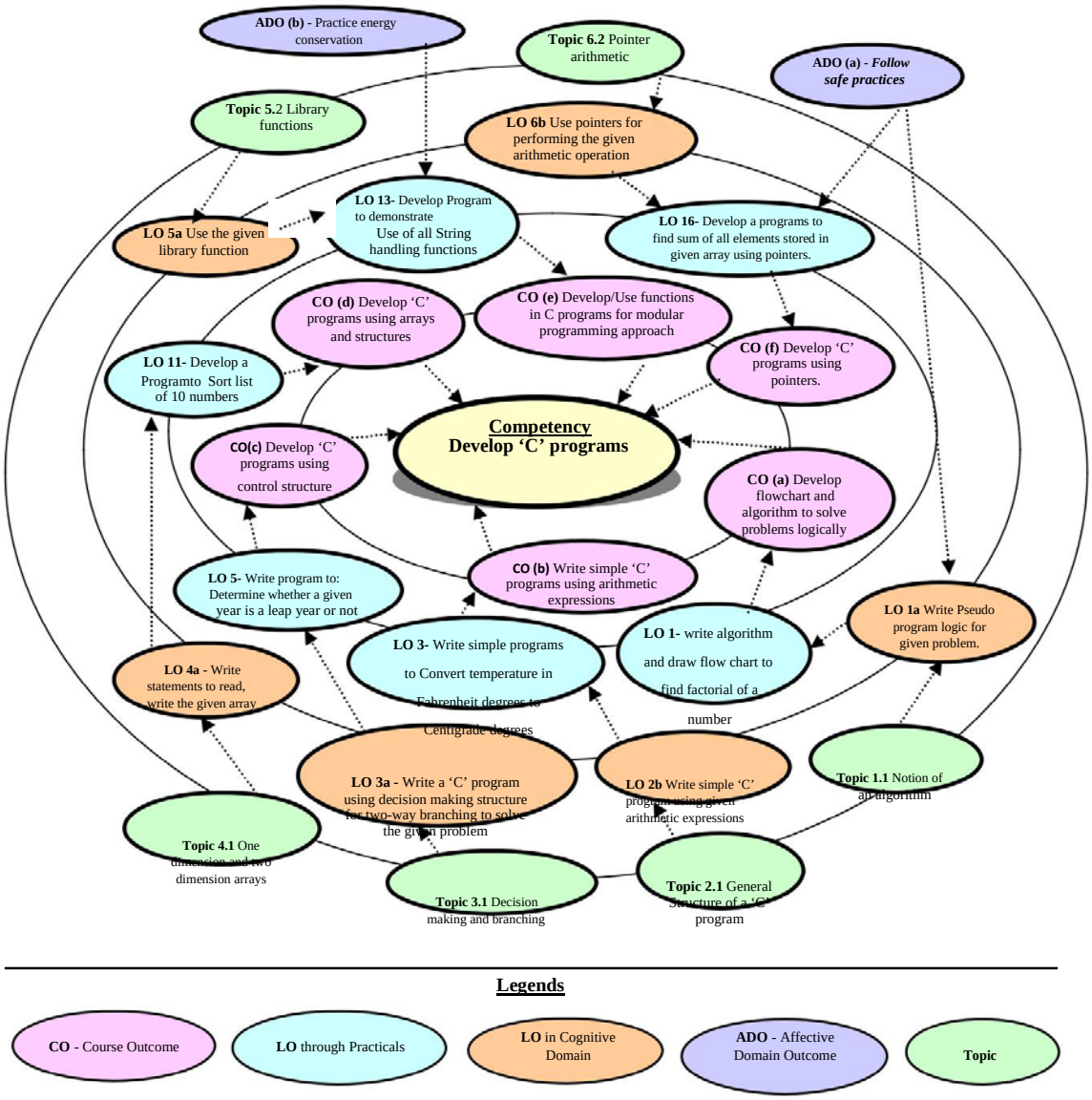

Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

The practicals/exercises/tutorials in this section are psychomotor domain LOs (i.e.sub-components of the COs), to be developed and assessed in the student to lead to the attainment of the competency.

S. No.	Practical Exercises (Learning Outcomes to be achieved through practicals)	Unit No.	Approx. Hrs. Required
1	**Write/compile/execute simple 'C' program:** Develop minimum 2 programs using Constants, Variables, arithmetic expression.	II	02*
2	**Write/compile/execute simple 'C' program:** Develop minimum 2 programs increment/decrement operators, exhibiting data type conversion	II	02
3	Write simple programs to convert temperature in Fahrenheit degrees to Centigrade degrees.	II	2
4	Write simple programs to calculate the area and perimeter of the rectangle, and the area & circumference of the circle	II	2
5	**Decision Making and branching using if, if-else structure** Write program to: (i) Determine whether a given year is a leap year or not. (ii) Determine whether a string is palindrome.	III	02*
6	Write program to: (i) Find the greatest of the three numbers using conditional operators (ii) Find if a given character is vowel.	III	02
7	**Using switch statement:** Write programs to : (i) Print day of week by taking number from 1 to 7 . (ii) Print a student's grade by accepting percent marks.	III	02
8	**Using switch statement:** Write programs to check whether the triangle is isosceles, equilateral, scalene or right angled triangle	III	02
9	**Looping:** Write a program to : (i) Find sum of digits of a given number. (ii) Generate multiplication table up to 10 for numbers 1 to 5.	III	02
10	Write a program to : (iii) Find Fibonacci series for given number. (iv) Write a program to produce the following output: 1 2 3 4 5 6 7 8 9 10	III	02
11	**Array:** Develop a Program to: (i) Sort list of 10 numbers. (ii) Perform addition of 3x3 matrix.	IV	02*
12	**Structure:** Develop a Program to: (i) Create a structure called library to hold details of a book viz. accession number, title of the book, author name, price of the book, and flag indicating whether book is issued or not. Fetch some sample data and display the same. (ii) Develop and execute C Program to Add Two Distances given in kilometer-meter Using Structures	IV	02
13	**Library Functions:** Develop Program to demonstrate: (i) Use of all String handling functions. (ii) Use of few Mathematical functions. (iii) Use of few other miscellaneous functions.	V	02*

S. No.	Practical Exercises (Learning Outcomes to be achieved through practicals)	Unit No.	Approx. Hrs. Required
14	**User Defined Functions:** Develop a Program to: (i) Create a function to find GCD of given number. Call this function in a program. (ii) Find Factorial of given number using recursion.	V	02
15	**Pointers:** Develop a Program to Print values of variables and their addresses.	VI	02*
16	Develop a Program to Find sum of all elements stored in given array using pointers.	VI	02
	Total		**32**

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

S. No.	Performance Indicators	Weightage in %
a.	Correctness of algorithm	40
b.	Debugging ability	20
c.	Quality of input and output displayed (messaging and formatting)	10
d.	Answer to sample questions	20
e.	Submit report in time	10
Total		**100**

Additionally, the following affective domain LOs (social skills/attitudes), are also important constituents of the competency which can be best developed through the above mentioned 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 development of the attitude related LOs of Krathwohl's 'Affective Domain Taxonomy', the achievement level may reach:

- 'Valuing Level' in 1st year
- 'Organising Level' in 2nd year
- 'Characterising Level' in 3rd year.

7. 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. S. No.
1	Computer system (Any computer system with basic configuration)	All
2	'C' Compiler	

8. 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	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – I Program Logic Development	1a. Write Pseudo program logic for the given problem. 1b. Identify the given symbols of a flow chart. 1c. Explain guidelines for preparing flowchart with example. 1d. Create flowchart to logically solve the given problem.	1.1 **Fundamentals of algorithms:** Notion of an algorithm. Pseudo-code conventions like assignment statements and basic control structures. 1.2 **Algorithmic problems:** Develop fundamental algorithms to solve simple problems such as: (i) solve simple arithmetic expression (ii) find the greatest of three numbers (iii) determine whether a given number is even or odd (iv) determine whether a given number is prime. 1.3 **Flowchart:** Flowchart, Symbols of flowchart, Guidelines for preparing Flowchart
Unit– II Basics of C programming	2a. Identify the given building block of a C program. 2b. Write simple 'C' program using the given arithmetic expressions 2c. Write a simple 'C' Program demonstrating the given data type conversion 2d. Write I/O Statements for the given data.	**2.1 Introduction to C**: History of 'C' General Structure of a 'C' program: Header files, 'main' function. **2.2 Data Concepts:** Character set, tokens, keywords, Identifiers, Variables, Constant, data types, C operators, Arithmetic operators, Arithmetic expression, declaring variables, and data type conversion. **2.3 Basic Input output:** Input and Output statements, using printf() and scanf(), character input/output statements, Input/output formatting, Use of comments
Unit– III Control Structures	3a. Write a 'C' program using decision making structure for two-way branching to solve the given problem.	3.1 **Decision making and branching:** Relational and logical operators, if statement, if else statement, nested if-else, if-else ladder' The switch

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
	3b. Write a 'C' program using decision making structure for multi-way branching to solve the given problem. 3c. Write a 'C' program using loop statements to solve the given iterative problem. 3d. Use related statements to alter the program flow in the given loop.	statement 3.2 **Looping:** While loop, Do… While loop For loop, Go to statement, Use of break and continue statements
Unit-IV Array and Structure	4a. Write statements to read, write the given array. 4b. Manipulate the given array of characters and numbers. 4c. Use the structure for solving the given problem. 4d. Write a sample program to demonstrate use of the given enumerated data type.	4.1 Characteristics of an array, One dimension and two dimension arrays 4.2 Array declaration and Initialization 4.3 Array of characters, Operation on array 4.4 Character and String input/output 4.5 Introduction and Features of Structures, Declaration and Initialization of Structures 4.6 Type def, Enumerated Data Type, using structures in C Program
Unit –V Functions	5a. Use the given Library function. 5b. Develop relevant user defined functions for the given problem. 5c. Write 'C' codes to pass the given function parameters using "call by value" and "call by reference" approach. 5d. Write recursive function for the given problem.	5.1 Concept and need of functions 5.2 Library functions: Math functions, String handling functions, other miscellaneous functions. 5.3 Writing User defined functions, scope of variables. 5.4 Parameter passing: call by value, call by reference. 5.5 Recursive functions
Unit-VI Pointers	6a. Use pointers to access memory locations using pointer to solve the given problem. 6b. Use pointers for performing the given arithmetic operation. 6c. Develop a program to access elements of the given array using pointers. 6d. Develop a program to access elements of the given structure using pointers.	6.1 Concepts of pointers: declaring, initializing, accessing. 6.2 Pointer arithmetic. 6.3 Handling arrays using pointers 6.4 Handling functions using pointers 6.5 Handling structures using pointers

***Note**: To attain the COs and competency, above listed Learning Outcomes (LOs) need to be undertaken to achieve the 'Application Level' of Bloom's 'Cognitive Domain Taxonomy'*

9. 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	Program Logic Development	04	02	02	04	08
II	Basics of C programming	06	02	04	04	10
III	Control Structures	10	02	02	08	12
IV	Arrays and Structures	12	02	02	10	14
V	Functions	10	02	04	08	14
VI	Pointers	06	02	02	08	12
Total		**48**	**12**	**16**	**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 LOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.*

10. 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. Undertake micro-projects.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various learning 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 LOs/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. Demonstrate students thoroughly before they start doing the practice.
g. Encourage students to refer different websites to have deeper understanding of the subject.
h. Observe continuously and monitor the performance of students in Lab.

12. 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 practicals, cognitive domain and affective domain LOs. 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 sample mark sheet for 10 students.
b. Generate salary slips of employees in an organization.
c. Develop book issue system of library.
d. Any other micro-projects suggested by subject faculty on similar line.

(Use structure and other features of 'C' to develop above listed applications)

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Programming in ANSI C	Balgurusamy, E.	McGraw Hill Education, New Delhi 2012, ISBN: 978-1259004612
2	The C Programming Language	Brian, W. Kernighan, Ritchie Dennis	PHI Learning Private Limited, New Delhi 1990, ISBN: 978-8120305960
3	Let us C	Kanetkar, Yashawant	BPB Publications, New Delhi 2016, ISBN:978-8183331630

14. SOFTWARE/LEARNING WEBSITES

a. http://nptel.ac.in/courses/106105085/4
b. www.w3schools.com
c. www.programiz.com/c-programming
d. https://www.codecademy.com/courses/getting-started-v2/0/1
e. http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-087-practical-programming-in-c-january-iap-2010/
f. http://spoken-tutorial.org/

Maharashtra State Board of Technical Education (MSBTE)

I – Scheme
II – Semester Course Curriculum

Course Title: **Elements of Electrical Engineering** (DE, EJ, IE, IS, CO, IF)
(Course Code: **.....)**

Diploma Programme in which this course is offered	Semester in which offered
Digital Electronics, Electronics and Telecommunications Engineering, Industrial Electronics, Instrumentation Engineering and Computer Engineering, Information Technology	Second

1. RATIONALE

A technologist is expected to have some basic knowledge of electrical engineering as they have to work in different engineering fields and deal with various types of electrical machines and equipment. Hence, it is necessary to understand magnetic circuits, AC fundamentals, polyphase circuits, different types of electrical machines, their principles and working characteristics. This course deals with the basic fundamentals of electrical engineering and working principles of commonly used AC and DC motors and their characteristics. The basic concepts of electrical engineering in this course will be very useful for understanding of other higher level courses.

2. COMPETENCY

The aim of this course is to help the student to attain the following 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 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. 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 different requirements.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	
4	-	2	6	70	30*	25	25	150

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

5. COURSE MAP (with sample COs, Learning Outcomes i.e. LOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

The practicals/exercises/tutorials in this section are psychomotor domain LOs (i.e.sub-components of the COs), to be developed and assessed in the student to lead to the attainment of the competency.

S. No.	Practical Exercises (Learning Outcomes in Psychomotor Domain)	Unit No.	Approx. Hrs. Required
1	Determine the permeability of magnetic material by plotting its B-H curve.	I	02*
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	02*
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	02
4	Find the phase difference between voltage and current on C.R.O. for resistive, inductive and capacitive circuits. Part I	II	02
5	Find the phase difference between voltage and current on C.R.O. for resistive, inductive and capacitive circuits. Part II	II	02
6	Connect balanced star and delta load connections to get the required voltage and currents. Part I	III	02*
7	Connect balanced star and delta load connections to get the required voltage and currents. Part II	III	02
8	Determine voltage and current ratio of single phase transformer.	IV	02*
9	Operate the DC shunt motor using 3-point starter.	IV	02
10	Operate the DC shunt motor using 4-point starter.	IV	02
11	Reverse the direction of rotation of single phase induction motor.	V	02*
12	Reverse the direction of rotation of Universal motor.	V	02
13	Identify switches, fuses, switch fuse and fuse switch units, MCB, MCCB and ELCB.	VI	02
14	Connect the switches, fuses, switch fuse and fuse switch units, MCB, MCCB and ELCB in a circuit. Part I	VI	02
15	Test circuit using series lamp and multimeter.	VI	02*
16	Use the earth tester.	VI	02
17	Use the insulation tester.	VI	02
18	Use different types of digital clamp-on meters	VI	02
	Total		**36**

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

S.No.	Performance Indicators	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

S.No.	Performance Indicators	Weightage in %
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**

Additionally, the following affective domain LOs (social skills/attitudes), are also important constituents of the competency which can be best developed through the above mentioned 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 development of the attitude related LOs of Krathwohl's 'Affective Domain Taxonomy', the achievement level may reach:

- 'Valuing Level' in 1st year.
- 'Organising Level' in 2nd year.
- 'Characterising Level' in 3rd year.

7. 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. S. No.
1	Single Phase Transformer: 1kVA, 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 phase Induction motor – ½ HP,230 V,50 Hz, AC supply	8
9	Universal motor -1/4 Hp	9
10	Digital Multimeter - 3 1/2 digit	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 regulated, 20 Amp	

8. 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	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – I Magnetic Circuits	1a. Describe the salient features of the given type of circuits. 1b. Apply Fleming's left hand rule and Lenz's law to determine direction of induced EMF in the given circuit. 1c. Explain the given type(s) of induced emf. 1d. Interpret the B-H curve and 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 given pure resistive, inductive 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.	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 waveform, Form factor, Peak factor 2.3 Vector representation of sinusoidal A.C. 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 apparent, power triangle
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	3.1 3 phase system over 1 phase system 3.2 3-phase emf generation and its wave 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

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
	delta) connections with sketches. 3d. Calculate the current and power of the given three phase balanced system.	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.	4.1 Transformer: Working principle, emf equation, Voltage ratio, current ratio and transformation ratio, losses 4.2 Auto-transformer – comparison with two winding transformer, applications 4.3 DC motor construction - parts its function and material used . 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.	5.1 FHP: 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 5.3 Stepper 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.	6.1 Fuse: 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, I.E rules relevant to earthing

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

9. 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 teachers to teach and assess students with respect to attainment of LOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.*

10. 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:
   i. Manufacturers
   ii. Specifications/ratings
   iii. Salient features
   iv. Applications.

11. 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 LOs/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.

12. 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 practicals, cognitive domain and affective domain LOs. 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)*** s***tudent 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 non magnetic 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.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Electrical Technology Vol – I	Theraja, B. L.	S. Chand and Co., New Delhi, ISBN: 9788121924405
2	Electrical Technology Vol – II	Theraja, B. L.	S. Chand and Co., New Delhi, ISBN: 9788121924375
3	Basic Electrical Engineering	Mittle and Mittal	McGraw Hill, New Delhi, ISBN: 978-0-07-0088572-5
4	Fundamentals of Electrical Engineering	Saxena, S. B. Lal	Cambridge University Press, New Delhi, ISBN : 9781107464353
5	Basic Electrical and Electronics Engineering	Jegathesan, V.	Wiley India, New Delhi, ISBN : 97881236529513

14. SOFTWARE/LEARNING WEBSITES

a. Scilab
b. SIMULINK (MATLAB)
c. PSIM
d. P-SPICE (student version)
e. Electronics Workbench
f. www.nptel.iitm.ac.in
g. www.onlinelibrary.wiley.com
h. xiendianqi.en.made-in-china.com/
i. ewh.ieee.org/soc/es/
j. www.electrical-technologies.com/
k. www.howstuffworks.com.

Maharashtra State Board of Technical Education (MSBTE)

I – Scheme
II – Semester Course Curriculum

Course Title: **Business Communication** (Common)
(Course Code: .....)

Diploma Programme in which this course is offered	Semester in which offered
Common to all programmes	Second

1. RATIONALE

The IT revolution and globalization have brought the concept of business communication to the forefront of academia and industry. Communication has become an integral part of business. It is essential to develop ethics and etiquettes of business communication as per industry requirements. The diploma engineers need to be equipped with these skills to face the challenges of industry. This course will develop the competency to 'communicate effectively to fulfill business requirements'.

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 to fulfill business requirements.**

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. Avoid communication barriers for effective business communication.
b. Make the relevant use of body language to communicate.
c. Use audio – visual aids to communicate effectively and efficiently.
d. Develop notices, memoranda and reports in relevant formats.
e. Draft different types of business letters, E-mails using correct formats.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	
2$	-		2	35$	15*			50

(*): *Under the theory PA of 15 mark, 10 marks are for developing speaking skills and 5 marks for micro-projects for the assessment of the cognitive domain LOs 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. COURSE MAP (with sample COs, Learning Outcomes i.e. LOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the

course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map**.**

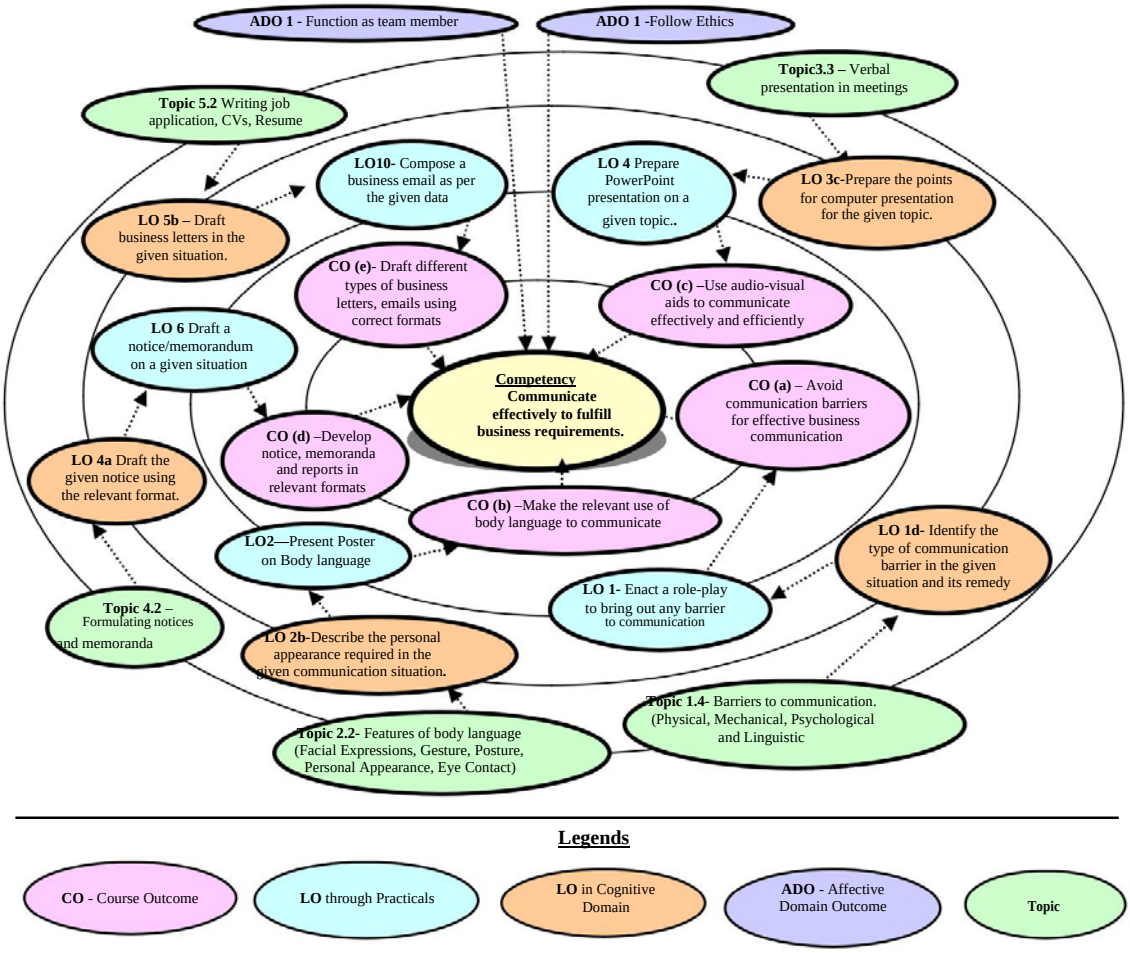

Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

The practicals/exercises/tutorials in this section are psychomotor domain LOs (i.e.sub-components of the COs), to be developed and assessed in the student to lead to the attainment of the competency.

S. No.	Practical Exercises (Learning Outcomes in Psychomotor Domain)	Unit No.	Approx. Hrs. required
	Use 'language laboratory' for different practical tasks		
1	Enact role-play to bring out any barrier to communication.	I	2
2	Present Poster on Body language.	II	1
3	Use relevant body language during Oral Presentation.	II	2
4	Prepare PowerPoint presentation on a given topic.	III	2
5	Speak with correct voice modulation after listening to the given conversation	III	2
6	Draft a notice/memorandum on a given situation.	IV	1
7	Prepare a report on a student related issue.	IV	1
8	Prepare Resume with a cover letter.	V	1

S. No.	Practical Exercises (Learning Outcomes in Psychomotor Domain)	Unit No.	Approx. Hrs. required
9	Draft an enquiry or order letter on the given topic.	V	1
10	Compose a business email as per the given data.	V	1

Note

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 10 or more practical LOs/tutorials needs to be performed.

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**

Additionally, the following affective domain LOs (social skills/attitudes), are also important constituents of the competency which can be best developed through the above mentioned laboratory/field based experiences:

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

The development of the attitude related LOs of Krathwohl's 'Affective Domain Taxonomy', the achievement level may reach:

- 'Valuing Level' in 1st year
- 'Organising Level' in 2nd year
- 'Characterising Level' in 3rd year.

7. 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. 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), Graphics cards, sound cards, internal hard disk drives, DVD drive, network interface card	all
2	LCD Projector with document reader	all
3	Smart Board with networking	all

8. 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	Major Learning Outcomes (in cognitive domain)		Topics and Sub-topics
	Writing Skills	**Speaking Skills**	
Unit – I Introduction to Business Communication	1a. Describe the importance of the business communication in the given situation. 1b. 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 non–verbal communication for the given situation.	1.1 Business communication: meaning, importance, scope and characteristics. 1.2 Process of communication - encoding, decoding, message, channel and feedback. 1.3 Types - verbal, non-verbal, formal, informal, vertical, horizontal and diagonal communication 1.4 Barriers to communication - Physical, mechanical, psychological and linguistic
Unit– II Non-Verbal Communication and Body Language	2a. Describe the non-verbal communication required in the given situation. 2b. Describe the personal appearance required in the given communication situation. 2c. Describe the given facial expressions and emogies	2d. Use relevant facial expressions in the given situation. 2e. Answer questions after listening to presentations.	2.1 Role and importance of non-verbal communication. 2.2 Features of body language: gestures, eye contact, posture, facial expressions, emogies, personal appearance 2.3 Corporate body language [delete these words] 2.4 Ppositive and negative body language. 2.5 Listening skills.
Unit– III Presentation skills	3a. Prepare seminar presentation for the given situation. 3b. 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. Partake in debate speaking ‘for ‘or ‘against’ the given topic. 3f. Make effective computer presentations	3.1 Seminar presentation and panel discussions 3.2 Debates: speaking ‘for’ and ‘against’ in given topics 3.3 Verbal presentation in meetings 3.4 Computer presentations, using the different types of computer software: text with different types of fonts, pictures, animations and ppts,
Unit– IV	4a. Draft the given notice	4f. Read the	4.1. Purpose and structure of

Unit	Major Learning Outcomes (in cognitive domain)		Topics and Sub-topics
	Writing Skills	**Speaking Skills**	
Office Communication and Report Writing	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	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.	office communication. 4.2. Formulating notices and memoranda. 4.3. Preparation of agenda, writing minutes of meetings. 4.4. Preparation of reports of events /episodes/ accidents 4.5. Summarising after quick reading of reports/ booklets
Unit-V Business Correspondence	5a. Respond to the 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 emogies for the given situation.		5.1 Purpose and structure of business communication. 5.2 Writing job application, CVs, resume. 5.3 Enquiry, order and complaint letter. 5.4 Writing e-mails, use of emogies.

***Note**: To attain the COs and competency, above listed Learning Outcomes (LOs) need to be undertaken to achieve the 'Application Level' of Blooms's 'Cognitive Domain Taxonomy'*

9. 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 Business Communication	04	02	02	01	05
II	Non-verbal Communication and Body Language	08	02	02	01	05
III	Presentation Skills	04	02	01	02	05
IV	Office Communication and report writing	08	02	04	04	10
V	Business Correspondence	08	02	04	04	10
Total		**32**	**10**	**13**	**12**	**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 teachers to teach and assess students with respect to attainment of LOs. The actual*

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

10. 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. Compile/collect the different formats [traditional and modern] of business letters.
b. Collect good articles from newspapers and magazines and read them with correct intonation.
c. Listen to Business news on TV and radio.
d. Watch different personalities on you- tube, television and Google for presentation skills and body language.
e. Undertake micro-projects.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (1if 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 LOs/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.

12. SUGGESTED TITLES 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 which are in fact, an integration of practicals, cognitive domain and affective domain LOs. 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. Report on various formal events.

b. Identify a good business leader and study his Presentations.
c. Collect speeches of good business leaders from various sources.
d. Compose Emails for given situations.
e. Prepare Minutes of the meeting for a given situation.
f. Prepare different types of assignments using multimedia:
   i. Prepare a presentation on positive body language during seminar.
   ii. Prepare a presentation using PPT on any given topic.
   iii. Prepare poster for Inter Polytechnic Paper Presentation competition
   iv. Prepare a leaflet(three fold) giving information about your Institute
   v. Prepare a leaflet about the admission process of Polytechnic
g. Prepare Presentations for the following:
   i. Important Meeting in the Organization.
   ii. An Environmental issue
   iii. A Successful Business man [Biographical information]
h. Prepare a questionnaire and conduct the interview of Principal/Head of Department/ Senior Faculty Members/ Senior Students/ Industry Personnel
i. Summarise views of two businessmen from English newspapers/magazines and other sources.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Communication Skills	MSBTE	MSBTE, Mumbai
2	Effective Communication Skills	M Ashraf Rizvi	Tata McGraw-Hill, New Delhi, 2014
3	Communication Skills	Sanjay Kumar and Pushp Lata	Oxford University Press, New Delhi, 2014
4	Business Communication	K.K.Sinha	Tata McGraw Hill, New Delhi, 2014
5	Essentials of Business Communication	Rajendra Pal , J.S.Korlahalli	Sultan Chand And Sons, New Delhi, 2014

14. SOFTWARE/LEARNING WEBSITES

a. https://www.britishcouncil.in/english/learn-online
b. http://learnenglish.britishcouncil.org/en/content
c. http://www.talkenglish.com/
d. languagelabsystem.com
e. www.wordsworthelt.com
f. www.notesdesk.com
g. http://www.tutorialspoint.com
h. www.studylecturenotes.com
i. totalcommunicator.com
j. www.speaking-tips.com