Program Name	: **Diploma in Computer Hardware & Maintenance, Diploma in Artificial Intelligence and Machine Learning, Diploma in Cloud Computing and Big Data, Diploma in Electronics and Computer Engineering**
Program Code	: **DE/EJ/IE/IS/CO/CM/CW/IF/ET/EN/EX/HA/AN/BD/TE**
Semester	: **Second**
Course Title	: **Elements of Electrical Engineering**
Course Code	: **22215**

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			Credit (L+T+P)	Examination Scheme												
				Paper Hrs.	Theory						Practical					
L	T	P			ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
4	-	2	6	3	70	28	30*	00	100	40	25#	10	25	10	50	20

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

5.   COURSE MAP (with sample COs, PrOs, UOs, ADOs 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.
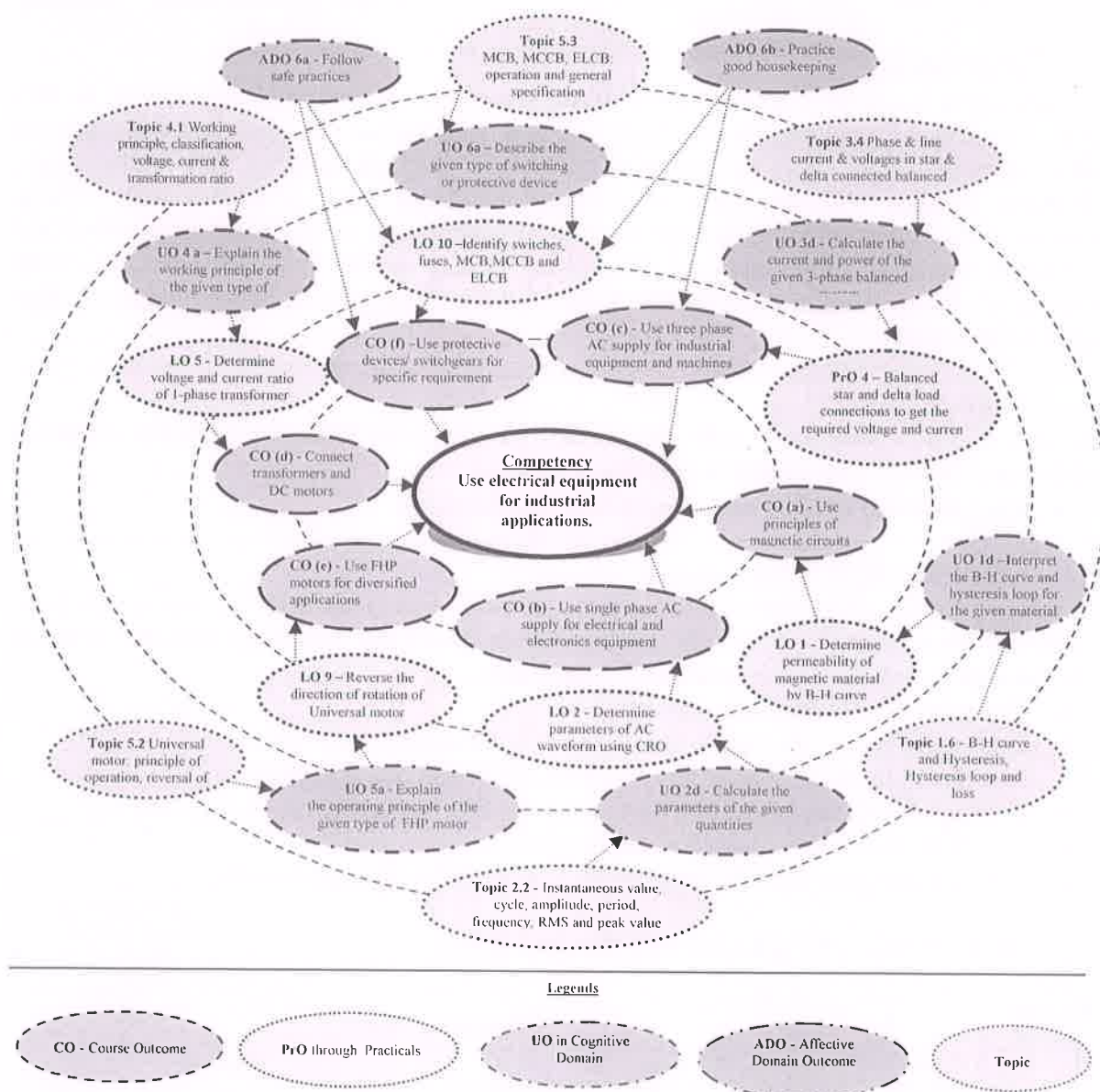

Figure 1 - Course Map

## 6.   SUGGESTED PRACTICALS/ EXERCISES

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

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1	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**

<u>**Note**</u>

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

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

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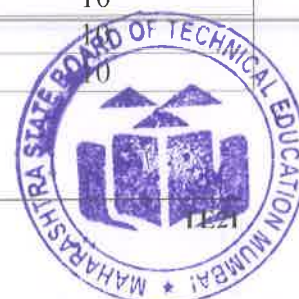
S.No.	Performance Indicators	Weightage in %
6	Interpretation of result and Conclusion	20
7	Answer to sample questions	10
8	Submission of report in time	10
	Total	**100**

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

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

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

- 'Valuing Level' in 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	
11	DC and AC Ammeters: 0-5-10 Amp	
12	DC and AC Voltmeters: 0-150-300 V	Comm
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 is to be taught and assessed in order to develop UOs for achieving the COs to attain the identified competency:

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit – I **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** **Fundamen** **tals**	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	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

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
	of the given type(s) of star (or delta) connections with sketches. 3d. Calculate the current and power of the given three phase balanced system.	3.5 Current, power, power factor in a 3 phase balanced system 3.6 Star and delta connections
Unit-IV Transformer and DC Motors	4a. Explain the working principle of the given type of transformer. 4b. Distinguish the construction of the given type of transformer. 4c. Describe the construction and working of the given type of DC motor. 4d. Select relevant type of DC motor for the given application with justification.	4.1 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 4.4 DC motor -Principle of operation 4.5 Types of D.C. motors, schematic diagram, applications of dc shunt, series and compound motors
Unit –V Fractional Horse Power (FHP) Motors	5a. Explain the working principle of the given type of FHP motor. 5b. Select relevant FHP motor for the given application with justification. 5c. Describe the procedure to connect the given type of FHP motor for the given application with sketches. 5d. Describe the procedure to connect stepper motor for the given application with sketches.	5.1 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 UOs need to be undertaken to achieve the 'Application Level' and above 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 UOs. 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 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 PrOs, UOs and ADOs. The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than *16 (sixteen) student engagement hours* during the course.

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

a. **Magnetic circuits:** Each batch will collect B-H curves and hysteresis loops for various types magnetic and 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.

Program Name	: Diploma in Electronics and Computer Engineering
Program Code	: DE/EJ/ET/EN/EX/IE/IS/IC/TE
Semester	: Second
Course Title	: Basic Electronics
Course Code	: 22216

1.   RATIONALE

Diploma engineers have to deal with the various electronic components while maintaining various electronics equipment. The study of basic operating principles and handling of various electronics devices will help them to troubleshoot electronics equipment. This course is developed in such a way that, students will be able to apply the knowledge to solve broad electronic engineering application problems.

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 electronic circuits comprising of discrete electronic components.**

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 relevant diode in different electronics circuits.
- b. Maintain rectifiers comprising of diodes.
- c. Use BJT in electronics circuits.
- d. Use FET in electronics circuits.
- e. Maintain DC regulated power supply.

4.   TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme												
					Theory						Practical					
L	T	P		Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
4	-	4	8	3	70	28	30*	00	100	40	50#	20	50	20	100	40

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

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

5. COURSE MAP (with sample COs, PrOs, UOs, ADOs 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.
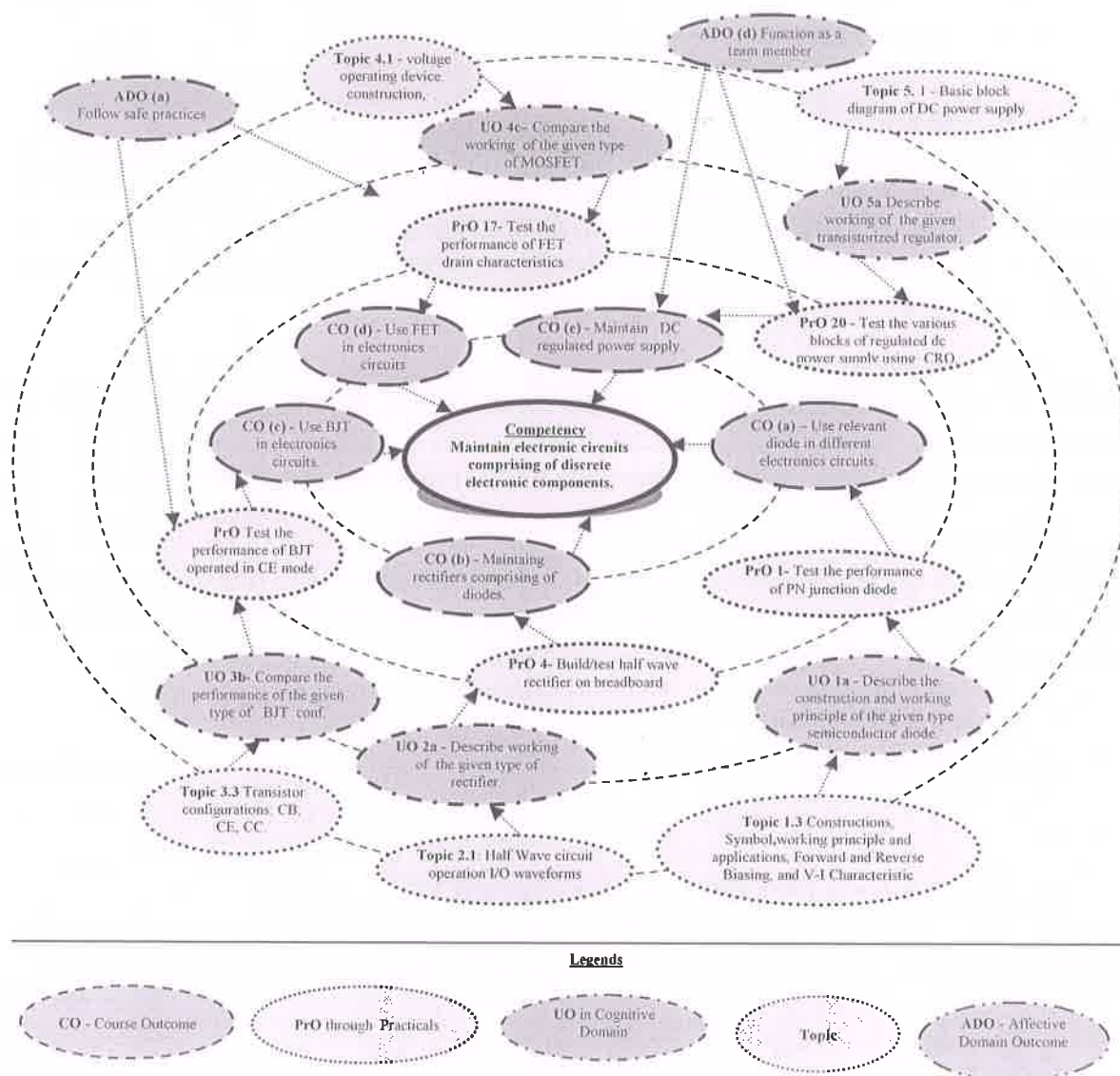

Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

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

S. No.	Practical Outcomes(PrOs)	Unit No.	Approx. Hrs. Required
1	Test the performance of PN junction diode .	I	2*
2	Test the performance of zener diode.	I	2
3	Test the performance of photo diode by varying the light intensity as well as distance of the light source.	I	

S. No.	Practical Outcomes(PrOs)	Unit No.	Approx. Hrs. Required
4	Build/test half wave rectifier on breadboard	II	2
5	Build/test half wave rectifier on breadboard with filter- Part I	II	2*
6	Build/test half wave rectifier on breadboard with filter- Part II	II	2
7	Build/ test full wave rectifier on breadboard using two diodes.	II	2*
8	Build/ test full wave rectifier on breadboard using two diodes.	II	2
9	Build/ test full wave bridge rectifier on breadboard .	II	2
10	Use LC filter with fullwave rectifier to measure ripple factor.	II	2
11	Use π filter with bridge rectifier to measure ripple factor.	II	2
12	Assemble positive clipper circuit on breadboard and test the performancs.	II	2
13	Assemble Negative clipper circuit on breadboard and and test the performancs.	II	2
14	Build the combinational Clipper on breadboard and test the performance. - Part I	II	2*
15	Build the combinational Clipper on breadboard and test the performance. - Part II	II	2
16	Build positive clamper on breadboard and test the performance. - Part I	II	2
17	Build positive clamper on breadboard and test the performance. - Part II	II	2
18	Build Negative clamper on breadboard test the performance.	II	2
19	Identify the terminals of the PNP and NPN transistor using different methods . - Part I	III	2*
20	Identify the terminals of the PNP and NPN transistor using different methods . - Part II	III	2
21	Find specifications of a given transistor using data sheets.	III	2
22	Test the performance of BJT working in CE mode .	III	2
23	Test the performance of BJT working in CB mode .	III	2
24	Test the assembled BJT voltage divider bias circuit for given input. - Part I	III	2
25	Test the assembled BJT voltage divider bias circuit for given input. - Part II	III	2
26	Test the performance of FET drain characteristics , transfer characteristics and calculate trans-conductance. - Part I	IV	2*
27	Test the performance of FET drain characteristics , transfer characteristics and calculate trans-conductance. - Part II	IV	2
28	Build / test zener voltage regulator for the given voltage.	V	2
29	Test the performance of transistorized series voltage regulator for the given load regulation.	V	2
30	Test the performance of transistorized shunt voltage regulator for the given load regulation	V	2
31	Test the various blocks of regulated dc power supply .	V	2
32	Find out faults at different stages of regulated dc power supply.	V	2
33	Trouble shoot given DC regulated power supply. - Part I	V	2*
34	Trouble shoot given DC regulated power supply. - Part II	V	
	Total		**68**

Note

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

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

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

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

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

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

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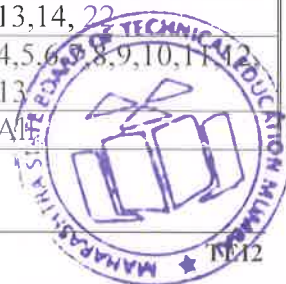
S. No.	Equipment Name with Broad Specifications	Exp. S. No.
	multimeter measures: V_{ac}, V_{dc} (1000V max) , A_{dc}, A_{ac} (10 amp max), Resistance (0 - 100 MΩ) , Capacitance and Temperature measurement	
5	Lux meter 3000 Lumen, Battery operated hand held type	3
6	Electronic Work Bench : Bread Board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

8. UNDERPINNING THEORY COMPONENTS

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

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit – I Semiconductor Diode	1a. Describe the construction and working principle of the given type semiconductor diode. 1b. Differentiate between the given type of insulator, conductor and semiconductor based on energy band theory. 1c. Describe working principle, characteristics, and application of the given type of diode. 1d. Describe effect of temperature on the given type of diode.	1.1 Different types of Semiconductor Diodes and their materials 1.2 Energy band theory and effect of temperature 1.3 Construction, Symbol , working principle , applications, Forward and Reverse Biasing and V-I Characteristic of following diodes: PN junction, Zener, LED, Photo diode
Unit– II Applications of diodes	2a. Describe working of the given type of rectifier. 2b. Describe the need and working of the given type of rectifier filter circuit. 2c. Select clipper or clamper for obtaining the given waveform. 2d. Calculate ripple factor, PIV and efficiency of the given type of rectifier.	2.1 Types of Rectifiers: Half Wave, Full Wave Rectifier (bridge and center tapped): circuit operation I/O waveforms for voltage and current 2.2 Parameters of rectifier: Average DC value of current and voltage ripple factor ripple frequency PIV of diode, TUF, efficiency of rectifier 2.3 Types of Filters: Shunt capacitor, Series inductor, LC and π filter, bledder resistor 2.4 Clipper and Clamper circuits
Unit– III Bipolar Junction Transistor	3a. Describe the working principle of the given type of transistor. 3b. Compare the performance of the given type of transistor configurations. 3c. Justify the biasing method for the given circuit.	3.1 Current operating device 3.2 Different types of transistors: PNP, NPN 3.3 Transistor configurations: CB, CE, CC. Transistor characteristics (input, output,) in different transistor configurations

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
	3d. Describe the procedure to minimize the thermal runaway effect for the given type of transistor baising circuit.	3.4 BJT biasing: DC load line, operating point, stabilization, thermal runaway, types of biasing, fixed biasing, base bias with emitter feedback, voltage divider
Unit– IV Field Effect Transistor	4a. Explain the working of FET for the given application. 4b. Explain the given type of FET biasing method. 4c. Compare the working of the given type of MOSFET. 4d. Differentiate the working principle of FET and MOSFET on the basis of the given transfer characteristic curve.	4.1 Voltage operating device Construction of JFET (N-channel and P- channel), symbol, working principle and characteristics (Drain and Transfer characteristics) 4.2 FET Biasing: Source self bias, drain to source bias 4.3 Applications of FET 4.4 MOSFET: Construction, working principle and characteristics of Enhancement and depletion MOSFET, MOSFET handling
Unit– V Regulators and power supply	5a. Describe working of the given transistorized regulator. 5b. Describe the working of the given block of the DC regulated power supply in the block diagram. 5c. Calculate output voltage of the given zener voltage regulator circuit. 5d. Calculate load and line regulation of the given transistorized regulator.	5.1 Basic block diagram of DC regulated power supply 5.2 Load and Line regulation 5.3 Zener diode voltage regulator 5.4 Transistorized series and shunt regulator - circuit diagram and working

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

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	Semiconductor Diode	12	3	4	7	14
II	Applications of diodes	14	3	6	7	16
III	Bipolar Junction Transistor	16	3	7	8	18
IV	Field Effect Transistor	12	3	4	5	12
V	Regulators and power supply	10	2	3	5	10
Total		**64**	**14**	**24**	**32**	**70**

Legends: *R=Remember, U=Understand, A=Apply and above (Bloom's Revised taxonomy)*

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

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

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 COs through classroom presentations (see implementation guideline for details).
d.   With respect to item No.10, teachers need to ensure to create opportunities and provisions for *co-curricular activities*.
e.   Guide student(s) in undertaking micro-projects.
f.   Use PPTs to explain the construction and working of rectifier.
g.   Use PPTs to explain the construction and working of wave shaping circuits.
h.   Guide students for using data manuals.

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 PrOs, UOs and ADOs. The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than *16 (sixteen) student engagement hours* during the course.

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

a.   **Diode:** Build a circuit on general purpose PCB to clip a positive half cycle at 1..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.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Electronic Devices and Circuit: An Introduction	Mottershead, Allen	PHI Learning, New Delhi, ISBN : 9788120301245
2	Electronic Devices and Circuit Theory	Boylestead Robert, Louis Neshelsky	Pearson Education,10th edition, New Delhi,2009, ISBN: 978-8131727003
3	The Art of Electronics	Paul Horowitz Winfield Hill	Cambridge University Press, New Delhi 2015 ISBN: 9780521689175
4	Electronics Principles	Malvino, Albert Paul, David	McGraw Hill Eduction, New Delhi, ISBN: 978-0070634244
5	Principles of Electronics	Mehta, V.K. Mehta, Rohit	S. Chand and Company, Ram Nagar, New Delhi-110 055, 2014, ISBN: 9788121924504
6	Basic Electronic Engineering	Baru V., Kaduskar R.,Gaikwad S.T.	Dreamtech Press, New Delhi, 2015 ISBN: 9789350040126
7	Fundamentals of Electronic Devices and Circuits	Bell, David	Oxford University Press, International edition, USA, 2015, ISBN : 9780195425239
8	A text book of Applied Electronics	Sedha, R.S.	S.Chand ,New Delhi, 2008, ISBN: 978-8121927833

14. SOFTWARE/LEARNING WEBSITES

a. www.nptel.iitm.ac.in
b. www.datasheetcafe.com
c. www.williamson-labs.com
d. www.futurlec.com
e. www.bis.org.in
f. www.learnerstv.com
g. www.cadsoft.io
h. www.khanacademy.com

Program Name	: Diploma in Computer Hardware & Maintenance, Diploma in Artificial Intelligence and Machine Learning, Diploma in Cloud Computing and Big Data, Diploma in Electronics and Computer Engineering
Program Code	: CO/CM/IF/CW/HA/AN/BD/TE
Semester	: Second
Course Title	: Applied Mathematics
Course Code	: 22224

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			Credit (L+T+P)	Examination Scheme												
					Theory						Practical					
L	T	P		Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
4	2	--	6	3	70	28	30*	00	100	40	--	--	--	--	--	--

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

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

5.   COURSE MAP (with sample COs, PrOs, UOs, ADOs 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.
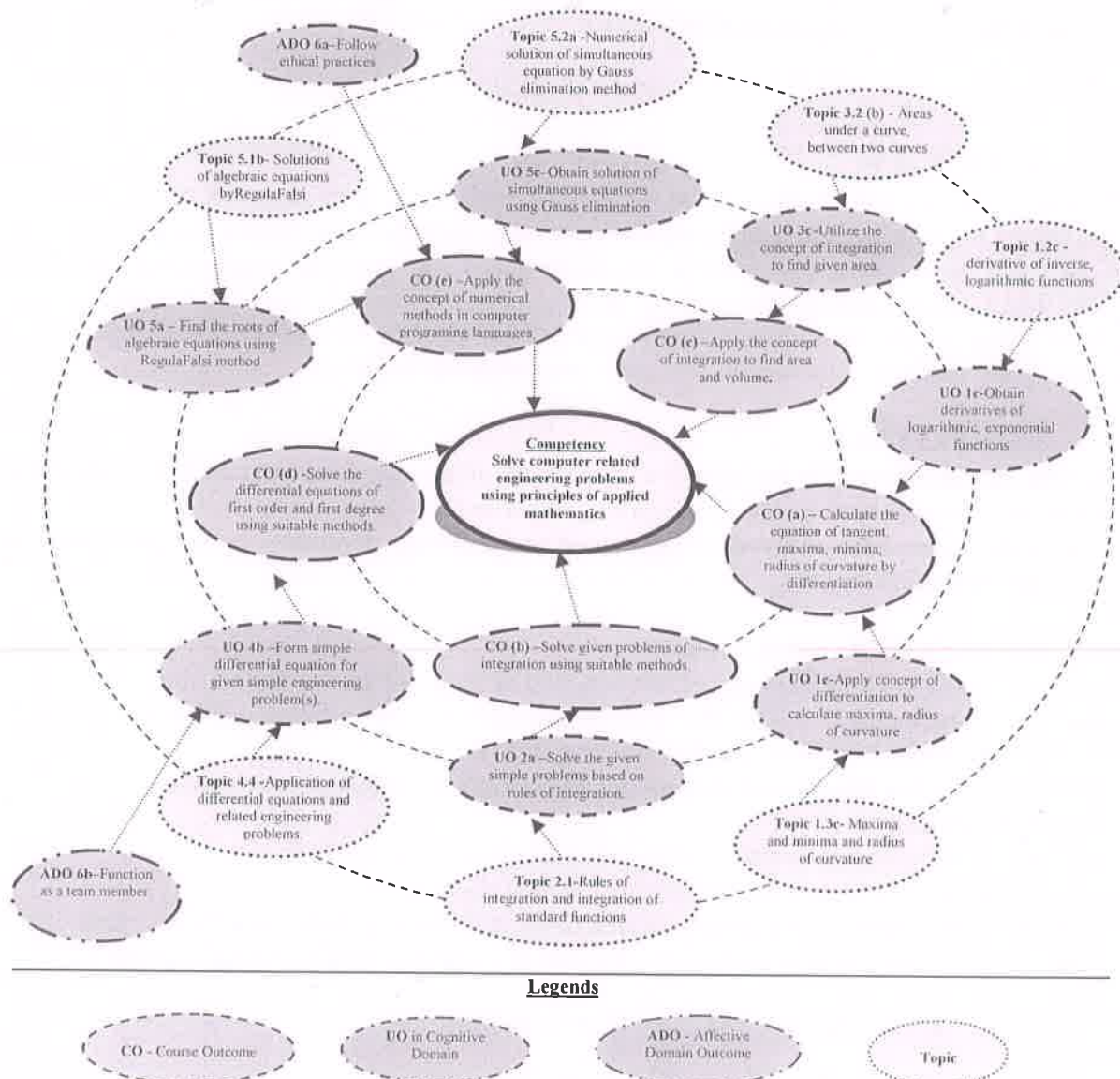

Figure 1 - Course Map

6.   SUGGESTED PRACTICALS/ EXERCISES

The tutorials in this section are 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	I	2

S. No.	Tutorials	Unit No.	Approx. Hrs. Required
	different points.		
2	Solve problems to find derivatives of implicit function and parametric function	I	2
3	Solve problems to find derivative of logarithmic and exponential functions.	I	2
4	Solve problems based on finding equation of tangent and normal.	I	2
5	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:**
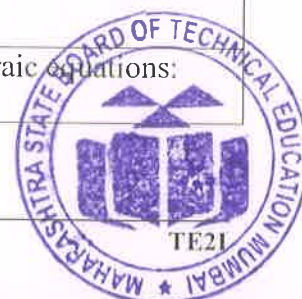   - Not applicable -

8.   **UNDERPINNING THEORY COMPONENTS**
The following topics/subtopics is to be taught and assessed in order to develop UOs for achieving the COs to attain the identified competency.

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit – I Differenti al Calculus	1a. Solve the given simple problems based on functions.	1.1 Functions and Limits: a) Concept of function and simple examples
	1b. Solve the given simple problems based on rules of differentiation.	b) Concept of limits without examples

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
	1c. Obtain derivatives of given logarithmic, exponential functions. 1d. Apply the concept of 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.	1.2 Derivatives : a) Rules of derivatives such as sum, product, quotient of functions. 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 Applicati ons of Definite Integrati on	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 Differenti al Equation s	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 Numerica	5a. Find the roots of given algebraic equations using Bisection method	5.1 Solutions of algebraic equations: a. Bisection Method.

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
l methods	and Regula falsi method. 5b. Determine the roots of given nonlinear equation(s) using 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.	b. Regula falsi Method. c. Newton Raphson Method. 5.2 Numerical solutions of simultaneous equations: a. Gauss elimination method b. Jacobi's Method. c. Gauss Seidal Method.

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

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 UOs. 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 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 PrOs, UOs and ADOs. The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than *16 (sixteen) student engagement hours* during the course.

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

- a. Prepare 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	Grewal, B.S.	Khanna publications, New Delhi 20
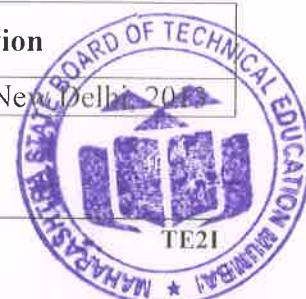
S. No.	Title of Book	Author	Publication
	Mathematics		ISBN:8174091955
2	Advanced Engineering Mathematics	Krezig, Ervin	Wiley Publications, New Delhi, 2016 ISBN:978-81-265-5423-2,
3	Advanced Engineering Mathematics	Das, H.K.	S. Chand Publications, New Delhi, 2008, ISBN-9788121903455
4	Engineering Mathematics, 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.

Program Name	: Diploma in Computer Hardware & Maintenance, Diploma in Artificial Intelligence and Machine Learning, Diploma in Cloud Computing and Big Data, Diploma in Electronics and Computer Engineering
Program Code	: CO/CM/IF/CW/IF/HA/AN/BD/TE
Semester	: Second
Course Title	: Programming in 'C'
Course Code	: 22226

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			Credit (L+T+P)	Examination Scheme											
				Paper Hrs.	Theory						Practical					
L	T	P			ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
3	2	2	7	3	70	28	30*	00	100	40	25@	10	25	10	50	20

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

5.   COURSE MAP (with sample COs, PrOs, UOs, ADOs 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.
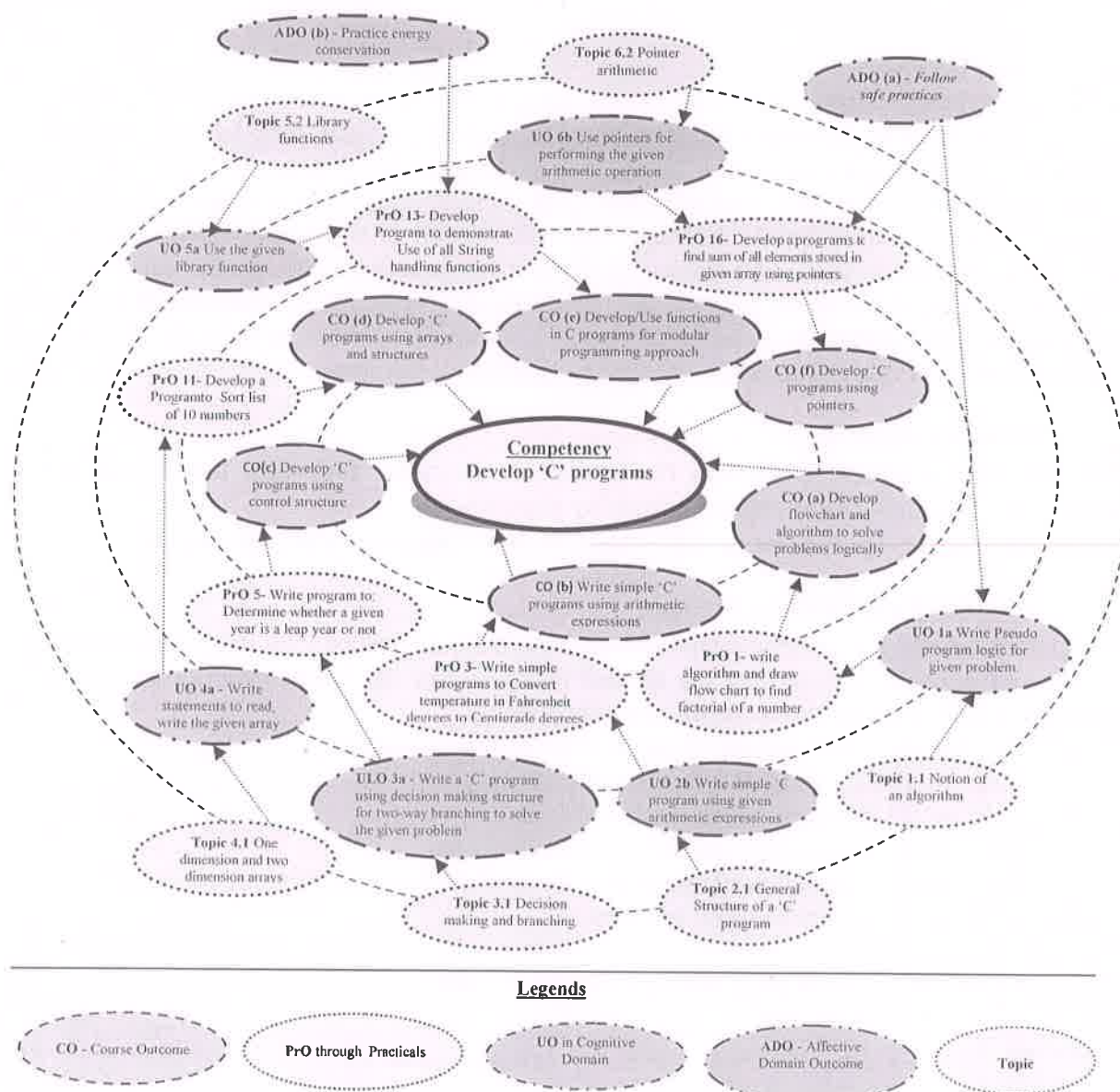

Figure 1 - Course Map

6.   SUGGESTED PRACTICALS/ EXERCISES

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

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1	**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
14	**User Defined Functions:** Develop a Program to:		02

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
	(i) Create a function to find GCD of given number. Call this function in a program. (ii) Find Factorial of given number using recursion.		
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 PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. All the above listed practical need to be performed compulsorily, so that the student reaches the 'Applying Level' of Blooms's 'Cognitive Domain Taxonomy' as generally required by the industry.*

ii. *The 'Process' and 'Product' related skills associated with each PrO 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**

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

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

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

- 'Valuing Level' in 1st year
- '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 is to be taught and assessed in order to develop UOs for achieving the COs to attain the identified competency:

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit – I 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. 3b. Write a 'C' program using	3.1 **Decision making and branching:** Relational and logical operators, if statement, if-else statement, nested if else, if-else ladder' The switch statement

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
	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.	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 UOs 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 UOs. 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 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 PrOs, UOs and ADOs. The micro-project could be industry application

based, internet-based, workshop-based, laboratory-based or field-based. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than *16 (sixteen) student engagement hours* during the course.

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

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/

Program Name: Diploma in Computer Hardware & Maintenance, Diploma in Artificial Intelligence and Machine Learning, Diploma in Cloud Computing and Big Data, Diploma in Electronics and Computer Engineering, Diploma in Agricultural Engineering, Diploma in Polymer Technology

Program Code: CE/CR/CS/CH/PS/CM/CO/IF/CW/DE/EJ/EN/EQ/ET/EX/IE/MU/EE/ EP/EU/IS/IC/AE /FG/ME/PG/PT/DC/TX/TC/HA/AN/BD/TE/AL/PO

Semester : Second

Course Title : Business Communication Using Computers

Course Code : 22009

1.   RATIONALE

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

2.   COMPETENCY

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

- **Communicate effectively and skillfully at workplace.**

3.   COURSE OUTCOMES (COs)

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

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

4.   TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme												
				Paper Hrs.	Theory						Practical					
L	T	P			ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
		2	2	--	--	--	--	--	--	--	35@^	14	15~	06	50	20

($\sim^1$): For only practical courses, the PA (15 marks) has two components under practical marks i.e. the assessment of practical has a weightage of 60% (i.e.09 marks) and micro-project assessment has a weightage of 40% (i.e.06 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, PrOs, UOs, ADOs 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.
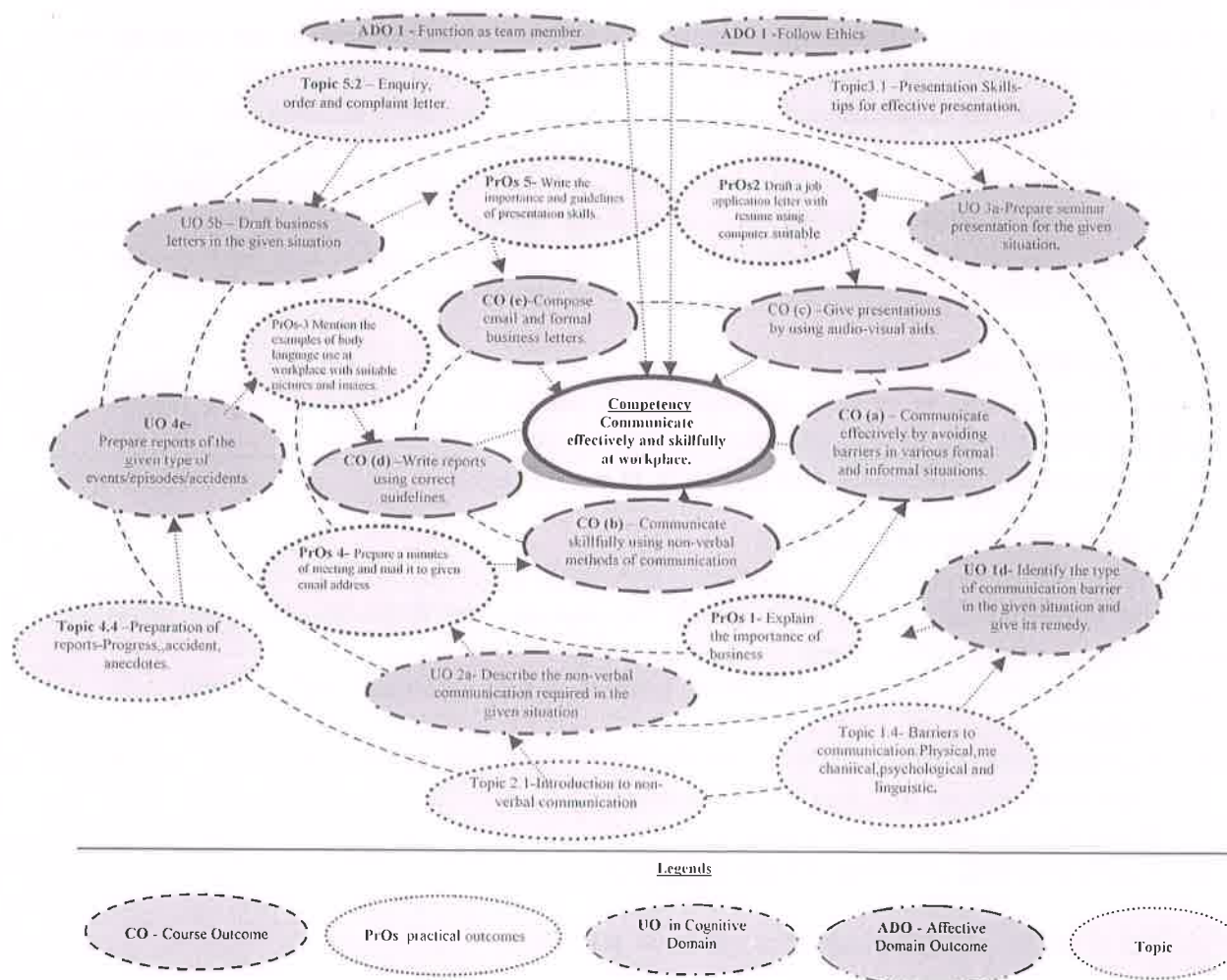

Figure 1 - Course Map

6.   SUGGESTED PRACTICALS ACTIVITIES / EXERCISES (Integrate the theory in the laboratory when conducting practical)

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

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	Explain the importance of business communication for an organization using case study	I	2*
2	Draft a job application letter with resume using computer.	V	2*
3	Mention the examples of body language use at workplace with suitable pictures and images.	II	2*
4	Prepare a minutes of meeting and mail it to given email address	VI	2
5	Write the importance and guidelines of presentation skills.	III	2*
6	Draft a detailed Progress Report.	IV	2*
7	Organize a debate on types of communication.	I & III	2
8	Summarize an industry report using techniques of summarizing.	IV	2
9	Draft a complaint letter on given topic.	V	2
10	Design PowerPoint presentation on any technical topic.	III	2*
11	Explain the eight principles of effective communication.	I	2*
12	Explain various non-verbal codes with examples.	II	2
13	Explain the importance of personal appearance stating tips of grooming for a professional.	II	2*
14	Draft a memo on given topic.	V	2
15	Present any Two barriers to communication using case study.	I	2*
16	Present a technical paper using IEEE format.	III	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. The size of batch for the practical should not exceed more than 21 students strictly for the maximum attainment of COs and PrOs.*

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:

7. MAJOR EQUIPMENTS / 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.
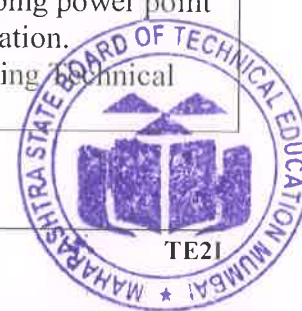
S. No.	Equipment Name with Broad Specifications	Exp. S.No.
1	LCD Projector	All
2	Smart Board with networking	All
3	Language lab with internet	All
4	Printer	

8.   UNDERPINNING THEORY COMPONENTS

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

Unit	Unit Outcomes (UOs) (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 Introduction to Communication- Elements, Importance, Functions. 1.2 Types (meaning and importance) –Verbal (Oral-Written), Formal, Informal, Vertical, Horizontal and Diagonal communication. 1.3 Principles of effective communication. 1.4 Barriers to communication - Physical, mechanical, psychological and linguistic. 1.5 Business communication: Meaning, characteristics and importance.
Unit– II Non-Verbal Communication	2a. Describe the non-verbal communication required in the given situation. 2b. Describe personal appearance required in the given communication situation. 2c. Describe the given facial expressions.	2d. Use relevant facial expressions in the given situation. 2e. Answer questions after listening to presentations.	2.1 Introduction to Non-Verbal communication (Meaning and importance) 2.2 Body Language: Aspects of body language: gestures, eye contact, posture, facial expressions, personal appearance (dressing and grooming) vocalics. 2.3 Body language - positive and negative body language.
Unit– III Presentation skills	3a. Prepare seminar presentation for the given situation. 3b. Prepare debate points 'for' and 'against' the given topic. 3c. Prepare the points for computer presentation	3d. Make seminar presentation 3e. Participate in debate speaking 'for' or 'against' the given topic. 3f. Make effective	3.1 Presentation skills- tips for effective presentation. 3.2 Guidelines for developing power point presentation. 3.3 Presenting technical papers.

Unit	Unit Outcomes (UOs) (in cognitive domain)		Topics and Sub-topics
	Writing Skills	Speaking Skills	
	for the given topic.	computer presentations	
Unit– IV Office Drafting	4a. Draft the given notice using the relevant format. 4b. Draft the given memorandum using the relevant format. 4c. Prepare agenda for the given type of meetings. 4d. Prepare minutes of the given type of meetings. 4e. Prepare reports of the given type of events/episodes/ accidents	4f. Read the agenda of the given meeting. 4g. Read the report of the given event. 4h. Initiate telephone calls for given situation. 4i. Answer official phone calls for given situation.	4.1. Office drafting: Formats and Guidelines. 4.2. Formulating notices and memoranda. 4.3. Preparation of agenda and writing minutes of meetings. 4.4. Preparation of reports- progress reports, Accident reports, case study. 4.5. Summarizing techniques.
Unit-V Business Correspondence	5a. Respond to given job advertisements by writing your CV/ Resume. 5b. Draft business letters in the given situations. 5c. Draft complaint letters for the given situations. 5d. Compose E- mails with relevant for the given situation.		5.1 Business correspondence. 5.2 Enquiry, order and complaint letters. 5.3 E-mails- netiquettes. 5.4 Difference –Curriculum Vitae, Bio-data and Resume. 5.5 Job application and resume writing

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

9. SUGGESTED SPECIFICATION TABLE FOR INTERNAL END SEMISTER EXAMINATION

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

Legends: R=Remember, U=Understand, A=Apply and above (Bloom's Revised taxonomy)
Note: This specification table provides general guidelines to assist student for their learning and to teachers to teach and assess students with respect to attainment of PrOs and UOs. 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 GUIDELINES FOR ASSESSMENT TOOL TO CONDUCT INTERNAL END SEMETER EXAM (ESE) .

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

SUGGESTED STUDENT ACTIVITIES

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

 a. Collect good articles from newspapers and magazines and read them with correct intonation.
 b. Listen to Business news on TV and radio.
 c. Watch videos of effective presentations on television and open learning sources for presentation skills and body language.
 d. Undertake micro-projects.

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.

b. **'L' in item No. 4** does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.

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

d. With respect to item No.10, teachers need to ensure to create opportunities and provisions for **co-curricular activities**.

a. Arrange various communication activities using functional grammar.

b. Show video/animation films to develop listening skills and enhance vocabulary.

c. Use real life situations for explanation.

d. Prepare and give oral presentations.

e. Guide micro-projects in groups as well as individually.

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 CrAs, UOs and ADOs. The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than **16 (sixteen) student engagement** hours during the course.

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

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

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

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

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

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

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

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

h. Report on various formal/business activities.

i. Study of oral presentation of famous business leader.

j. Detailed study of business etiquettes observed in organization.

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

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Effective Communication Skills	M Ashraf Rizvi	Tata McGraw-Hill

S. No.	Title of Book	Author	Publication
2	Communication Skills	Sanjay Kumar and Pushp Lata	Oxford University Press
3	Personality Development and Soft Skills	Barun K. Mitra	Oxford University Press

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

Program Name   : Diploma in Computer Hardware & Maintenance, Diploma in Artificial Intelligence and Machine Learning, Diploma in Electronics and Computer Engineering

Program Code   : CO/CM/IF/CW/HA/AN/TE

Semester   : Second

Course Title   : Web Page Designing With HTML

Course Code   : 22014

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			Credit (L+T+P)	Examination Scheme												
					Theory						Practical					
L	T	P		Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
2	-	2	4	--	--	--	--	--	--	--	50@	20	50~	20	100	40

(~): For the **practical only courses,** the PA has two components under practical marks. 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, PrOs, UOs, ADOs 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.
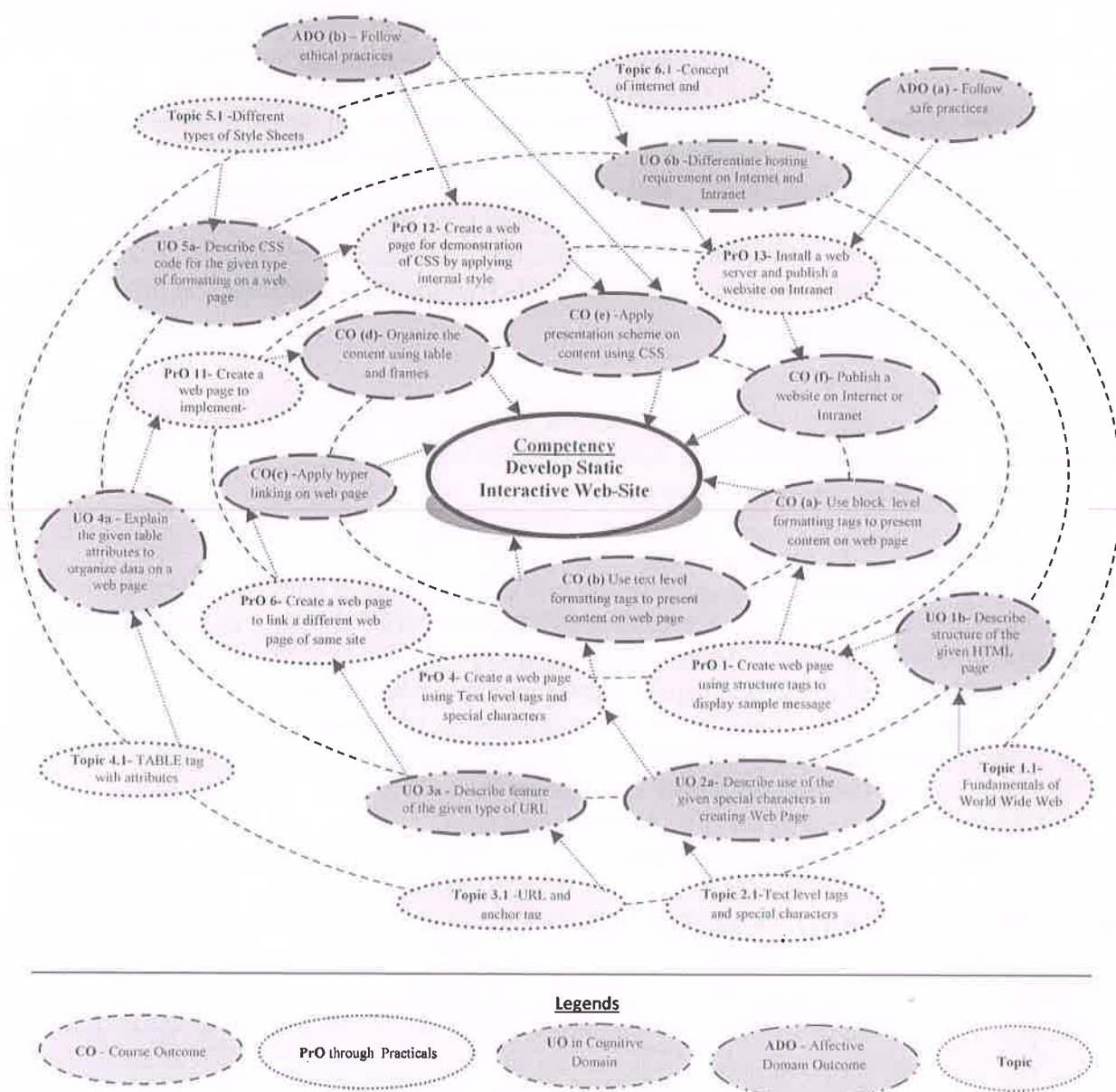

Figure 1 - Course Map

6.   SUGGESTED PRACTICALS/ EXERCISES

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

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1	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 style.	V	02*
13	Create a web page for demonstration of CSS by applying External style.	V	02
14	Create a web page for demonstration of CSS by applying Inline style.	V	02
15	Install a web server and publish a website on Intranet.	VI	02
16	Publish a website on Internet by acquiring space on free hosting site.	VI	02*
	Total		**32**

Note

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

ii. *The 'Process' and 'Product' related skills associated with each PrO 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)	
c.	Complete the practical in stipulated time	10

d.	Answer to sample questions	20
e.	Submit report in time	10
	Total	**100**

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

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

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

- 'Valuing Level' in 1st year
- '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 are to be taught and assessed in order to develop UOs for achieving the COs to attain the identified competency:

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit – I 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, Address, HR tag.

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
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. 2d. Describe the procedure of using the given text level tags in creating a Web Page.	**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– 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

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
		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 intranet 6c. Describe the procedure for hosting the given website. 6d. Explain process of uploading the given files on a website.	**6.1 Website Hosting:** Concept of Internet and Intranet. Publishing website on Intranet, Installing and configuring web server, uploading files on intranet site, access intranet based website; Publishing website site on Internet, hiring Web space, uploading files using FTP, Virtual Hosting, access internet based website

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

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 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 PrOs, UOs and ADOs. The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than *16 (sixteen) student engagement hours* during the course.

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