

II Semester Scheme of Studies - Diploma in Civil Engineering [C-20]

Sl. No	Course Category / Teaching Department	Course Code	Course Title	Hours per week			Total contact hrs/week	Credits	CIE Marks		SEE Marks		Total Marks	Min Marks for Passing (including CIE)	Assigned Grade	Grade Point	SGPA and CGPA	
				L	T	P			Max	Min	Max	Min						
THEORY COURSES																		
1	BS/SC	20SC01T	Engineering Mathematics	4	0	0	4	4	50	20	50	20	100	40			SGPA & CGPA of 2 nd Semester	
2	SC/CE	20PM01T	Project Management Skills	6	0	0	6	4	50	20	50	20	100	40				
PRACTICAL COURSES																		
3	ES/CE	20CE21P	Civil Engineering Graphics	2	0	4	6	4	60	24	40	16	100	40				
4	ES/CE	20CE22P	Basic Surveying	2	0	4	6	4	60	24	40	16	100	40				
5	ES/EE	20EE01P	Fundamentals of Electrical & Electronics Engineering	2	0	4	6	4	60	24	40	16	100	40				
AUDIT COURSES																		
6	AU/KA	20KA21T	Kannada-I/ಸಾಹಿತ್ಯ ಸಿಂಚನ - I /ಬಳಕೆ ಕನ್ನಡ - I	2	0	0	2	2	50	20	-	-	50	20				
Total				18	0	12	30	22	330	132	220	88	550	220				

T:- Theory P:- Practical D:- Drawing E:- Elective BS- Basic Science:: ES-Engineering Science:: HS-Humanities & Social Science:: AU-Audit Course:: EG: English ::SC: Science

Note:

1. Assigned Grade, Grade Point, SGPA and CGPA to be recorded in the Grade/Marks card.
2. Theory course Semester End Examination (SEE) is conducted for 100 marks (3 Hours duration)
3. Practical course CIE and SEE is conducted for 100 marks (3 Hours duration)

Government of Karnataka
Department of Collegiate and Technical Education
Board of Technical Examinations, Bangalore

Course Code	20CE11T	Semester	I
Course Title	CONSTRUCTION MATERIALS	Course Group	Core
No. of Credits	4	Type of Course	Lecturing & Assignments
Course Category	Program Core Course	Total Contact Hours	4Hrs Per Week
			52Hrs Per Semester
Prerequisites	High school level science	Teaching Scheme	(L:T:P)= 4:0:0
CIE Marks	50	SEE Marks	50

RATIONAL

Materials for engineering play an important role as the vital tool for solving the problems of material selection and application in the civil Engineering construction field. Therefore, an engineering diploma student must be conversant with the properties, composition and behavior of materials from ***the point of view of reliability, sustainability and performance in civil engineering construction.*** The study of basic concepts of materials will help the students understanding civil engineering subjects where the emphasis is laid on the application of these materials.

1. COURSE SKILL SET

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

- 1) To learn about various construction materials, and understand their relevant characteristics.
- 2) To be able to identify suitability of various materials for different construction purposes.
- 3) To know about natural, artificial, and processed materials available for various purposes of construction activities.

2. COURSE OUT COMES

On successful completion of the course, the students will be able to demonstrate industry oriented Cos associated with the above mentioned competency:

CO1	Identify relevant natural construction materials.
CO2	Select relevant artificial construction materials
CO3	Identify and use of processed construction materials.
CO4	Select relevant special type of construction materials.

3. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS

CO	Course Outcome	PO Mapped	Cognitive Level R/U/A	Theory Sessions In Hrs	Allotted marks for SEE on cognitive levels		TOTAL
					R	U	
CO1	Identify relevant natural construction materials.	1,4,7	R,U	15	30	30	60
CO2	Select relevant artificial construction materials.	1,4,7	R,U	21	40	40	80
CO3	Identify and use of processed construction materials.	1,4,7	R,U	10	20	20	40
CO4	Select relevant special type of construction materials.	1,4,7	R,U	06	10	10	20
		Total Hours of instruction		52	Total marks		200

4. DETAILS OF COURSE CONTENT

The following topics/sub topics is to be taught and assessed in order to develop Unit Skill sets for achieving CO to attain identified skill sets

UNIT NO	Unit skill set (In cognitive domain)	Topics/Sub topics		Hours L-T-P
UNIT-1 Natural Constructi on Materials CO1	1. Identify rocks based on geology of its origin 2. Explain the requirements and characteristics of stones 3. Explain the methods of Quarrying of stones 4. Explain the methods of deterioration of stones 5. Explain the methods of preservation of stones 6. Mention the properties of sand and its uses 7. Explain the classification of Coarse aggregate according to size 8. Explain the structure and properties of timber 9. apply the use of Bamboo in construction	1.1	Geological classification of Rocks	15-0-0
		1.2	Requirements of good building stone	
		1.3	General characteristics of stone	
		1.4	Quarrying of stones by wedging	
		1.5	Quarrying of stones by blasting	
		1.6	Deterioration of stones	
		1.7	Preservation of stones	
		1.8	Properties of sand and uses	
		1.9	Classification of coarse aggregate according to size	
		1.10	Structure of timber	
		1.11	General properties and uses of good timber	
		1.12	Different methods of seasoning for preservation of timber.	
		1.13	List various Defects in timber	
		1.14	Use of bamboo in construction	
		1.15	Asphalt-properties and uses	

	10. Mention the properties and uses of Asphalt.			
UNIT-II Artificial Constructi on Materials C02	1.Explain the constituents and characteristics of Bricks 2. Perform Field tests on Bricks 3. With a neat diagram able to explain manufacturing process of bricks 4. Write the properties of Aerated Concrete Blocks 5. Identify different varieties of Floor tiles and wall tiles, Glazed tiles and vitrified tiles 6. With a neat diagram able to explain manufacturing process of cement. 7. Identify different types of cement and mention their uses. 8. Explain properties and uses of Precast hollow and solid concrete blocks and pavement blocks. 9. Explain and identify Plywood Particle board, veneers and laminated boards 10 Identify and explain uses of different types of glasses. 11. Explain the properties and uses of Ferrous, Non- ferrous and alloys.	2.1	Constituents of Good brick earth	21:0:0
		2.2	Modular and Standard bricks	
		2.3	Special bricks -fly ash bricks	
		2.4	Characteristics of good brick	
		2.5	Field tests on Bricks	
		2.6	Manufacturing process of burnt clay brick	
		2.7	Clamp burning of Bricks	
		2.8	Hoffmann's kiln	
		2.9	Aerated concrete blocks-Properties and uses	
		2.10	Flooring and wall tiles - Clay tiles,	
		2.11	Glazed tiles and vitrified tiles	
		2.12	Manufacturing process of Cement-only dry process	
		2.13	Types of cement and its uses.	
		2.14	Properties and uses of Pre-cast hollow and solid concrete blocks	
2.15	Properties and uses of pavement blocks			
2.16	Artificial or Industrial Timber -Plywood, Particle board, Veneers			
2.17	Laminated board and their uses.			
2.18	Types of glass: Soda lime glass, Lead glass and Borosilicate glass and their uses.			
2.19	Ferrous Metals- Cast Iron and Steel- List Properties and Uses			
2.20	Non-ferrous metals- Aluminium, Copper, Zinc, - Properties and uses			
2.21	Alloys- Aluminium Alloys and Steel Alloys- Composition, and uses			
UNIT-III Processed Constructi on Materials C03	1.Explain the constituents and Uses of POP 2.Explain properties and uses of Fiber reinforced plastics 3. Explain properties and uses of Paints, Distempers, oil paints and varnishes and able to apply for different types of surfaces, 4. Know the manufacturing process and uses of Manufactured Sand. 5. Identify different Cladding materials.	3.1	Constituents and uses of POP (Plaster of Paris),	10-0-0
		3.2	Plastics- Properties and uses of plastics	
		3.3	Fiber reinforced plastic (FRP) its properties and applications	
		3.4	Paints and Distempers, Ingredients and their uses. Properties of good paint.	
		3.5	Oil Paints and Varnishes with their uses. (Situations where used).	
		3.6	Varnishes with their uses. (Situations where used).	
		3.7	Special processed construction materials; Geo synthetic, Ferro Crete.	
		3.8	Manufactured sand (m sand): its manufacturing and their uses.	
		3.9	Cladding materials-Terracotta,	
		3.10	High Pressure Laminates (HPL) Aluminium Composite panels (ACP), Glass Reinforced Concrete (GRC), Pre painted Galvanized Iron sheets.	

UNIT-IV Special Constructi on Materials CO4	1.Explain the types of water proofing materials, Termite proofing materials, and sound insulating materials and suitability of its different types in construction	4.1 Water proofing material- Types and its suitability in construction
	2.Explain the properties and applications of Geopolymer cement	4.2 Termite proofing- Types and its suitability in construction
	3. Explain the applications of Epoxy Resins, Non-Shrink Grouts	4.3 Sound insulating materials- Types and its suitability in construction,
		4.4 Epoxy Resins ,Non-Shrink Grouts Shotcrete- Applications
		4.5 Gypsum and its products :Types and its suitability in construction
		4.6 Properties and uses of Geo polymer cement

MAPPING OF CO WITH PO

CO	Course Outcome	PO Mapped	UNIT Linked	Cognitive Level R/U/A	Tutorial & Practical Sessions in Hrs
CO1	Identify relevant natural construction materials.	PO1,PO4, PO7	1-4	U/A	15
CO2	Select relevant artificial construction materials.	PO1,PO4 PO7	1-4	U/A	21
CO3	Identify and use of processed construction materials.	PO1,PO4 PO7	1-4	U/A	10
CO4	Select relevant special type of construction materials.	PO1,PO4 PO7	1-4	U/A	06
					52

Level of Mapping PO's with CO's

Course	CO's	Programme Outcomes (PO's)							Programme Specific outcome (PSO's)	
		1	2	3	4	5	6	7	1	2
Construction Matsals		3	-	-	1	-	-	1	3	2
	CO2	3	-	-	1	-	-	1	3	2
	CO3	3	-	-	1	-	-	1	2	2
	CO4	3	-	-	1	-	-	1	2	2
	Average	3		-	1	-	-	1	2.3	2

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

Method is to relate the level of PO with the number of hours devoted to the CO's which maps the given PO.
 If ≥50% of classroom sessions related to the CO are addressing a particular PO, it is considered that PO is mapped at Level 3
 If 30 to 50% of classroom sessions related to the CO are addressing a particular PO, it is considered that PO is mapped at Level 2
 If 5 to 30% of classroom sessions related to the CO are addressing a particular PO, it is considered that PO is mapped at Level 1
 If < 5% of classroom sessions related to the CO are addressing a particular PO, it is considered that PO is considered not-mapped i.e.; Level 0

5. INSTRUCTIONAL STRATEGY

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes

1. Massive Open on line courses (MOOCS) may be used to teach various topics/sub topics.
2. Lecturer method(L) does not mean only traditional lecture method, but different type of teaching method and media that are employed to develop the outcomes
3. About 15 to 20% of the topics/sub topics which is relative simpler or descriptive in nature is to be given to the students for self directed learning
4. Arrange visits to nearby Construction sites/ Manufacturing Industries/ Academic institution having research centre facility /Research labs for various understanding of tests on Building Materials
5. Show Video/animation films to explain functioning of various application of materials in Civil Engineering domain
6. Use different instructional strategies in class room teaching

6. SUGGESTED LEARNING RESOURCES:

A. List of Books

S. No	Author	Title of Books	Publication/Year
1	Ghose, D. N.	Construction Materials	Tata McGraw Hill
2	S.K. Sharma	Civil Engineering Construction Materials	Khanna Publishing House
3	Varghese.P.C	Building Materials	PHI learning, NewDelhi.
4	Rangwala, S.C.,	Engineering Materials	Charatorpublisher,Ahemdabad.
6	Somayaji, Shan	Civil Engineering Materials	Pearson education, NewDelhi
7	Rajput,R.K	Engineering Materials	S. Chand and Co. New Delhi.
8	Sood H.,	Laboratory Manual on Testing of Engineering Materials	New Age Publishers New Delhi.
9	Sharma C. P	Engineering Materials	PHI Learning, NewDelhi
10	Duggal, S. K	Building Materials	New International, NewDelhi.
11	S.S.Bhavikatti	Building Materials	Vikas Publishing House Pvt.Ltd.

B. List of Materials required**MATERIAL LIST**

The following are the specification of the specimens required for demonstration during the lecture hours of “constructions materials” and number of specimens required

SN	Name of the MATERIALS	Specification	Required Number
STONES			
1	Granite	Size of 10×6×4 cm	2NOS EACH
	Trap	Size of 10×6×4 cm	2NOS EACH
	Basalt	Size of 10×6×4 cm	2NOS EACH
	Sandstone	Size of 10×6×4 cm	2NOS EACH
	Limestone	Size of 10×6×4 cm	2NOS EACH
	Gneiss	Size of 10×6×4 cm	2NOS EACH
	Laterite	Size of 10×6×4 cm	2NOS EACH
	Marble	Size of 10×6×4 cm	2NOS EACH
	Quartzite	Size of 10×6×4 cm	2NOS EACH
	Slate	Size of 10×6×4 cm	2NOS EACH
BRICKS & BLOCKS			
2	Bricks Ground moulded		2NOS EACH
	Table moulded		2NOS EACH
	Machine moulded (Wire cut)		2NOS EACH
	Soil stabilized blocks		2NOS EACH
	Concrete blocks (solid-hallow)		2NOS EACH
	Fly ash brick		2NOS EACH
	Fire bricks		2NOS EACH
	Autoclave aerated concrete blocks		2NOS EACH
BINDING MATERIALS			
3	Cement	50 kg bag	Consumable
	White cement	1 kg bag	1NOS EACH
	Lime	5 kg bag	Consumable
	Clay	1 kg bag	1NOS EACH
	Fly ash	50 kg bag	1NOS EACH
	Plaster of Paris	1 kg bag	1NOS EACH
	Lime putty	1 kg bag	1NOS EACH
	White cement based putty	1 kg bag	2NOS EACH
TIMBER			
	Teak	Size of 15×10×6 cm	2NOS EACH
	Honne	Size of 15×10×6 cm	2NOS EACH
	Sal	Size of 15×10×6 cm	2NOS EACH
	Casuarina	Size of 15×10×6 cm	2NOS EACH
	Deodar	Size of 15×10×6 cm	2NOS EACH
	Jackfruit	Size of 15×10×6 cm	2NOS EACH
	Mahogan	Size of 15×10×6 cm	2NOS EACH
	Mango	Size of 15×10×6 cm	2NOS EACH
	Neem	Size of 15×10×6 cm	2NOS EACH
	Silver oak	Size of 15×10×6 cm	2NOS EACH

	Bamboo.	20 cm length	2NOS EACH
	Industrial timber- Veneers	6×4 feet	
	Plywood (diff thickness)		
	Fibre board		
	Hardboard		
	Block board		
	laminated sheets		
FLOORING			
	Vitrified	2 × 2 feet	2NOS EACH
	Marble	1 × 1 feet	2NOS EACH
	Granite,	1 × 1 feet	2NOS EACH
	Pressed Clay tile	1 × 1 feet	2NOS EACH
	Interlocking pavers	60mm, 80mm thick	2NOS EACH
	Wooden flooring		2NOS EACH
GLASS			
	Plain	6 × 4 inch	3NOS EACH
	Dark cool	6 × 4 inch	3NOS EACH
	Brown cool	6 × 4 inch	3NOS EACH
	printed	6 × 4 inch	3NOS EACH
	Mesh glass	6 × 4 inch	3NOS EACH
	Wired glass	6 × 4 inch	3NOS EACH
	Glass bricks	6 × 4 inch	3NOS EACH
	Structural glass	6 × 4 inch	3NOS EACH
	Ribbed glass	6 × 4 inch	3NOS EACH
	Perforated glass	6 × 4 inch	3NOS EACH
	Foam glass	6 × 4 inch	3NOS EACH
	Fibre glass	6 × 4 inch	3NOS EACH
	Float glass	6 × 4 inch	3NOS EACH
	Toughened glass	6 × 4 inch	3NOS EACH
PAINTS			
6	Water based primer	1 litre	2NOS EACH
	Metal-wood & wall primer	1 litre	2NOS EACH
	Emulsion paint	1 litre	2NOS EACH
	Enamel paint	1 litre	2NOS EACH
	Cement paint (Snowcem)	1 litre	2NOS EACH
	Texture paints	1 litre	2NOS EACH
	French polish	1 litre	2NOS EACH
	Metallic paint	1 litre	2NOS EACH
	Distemper- Water based & weather proof exterior emulsion	1 litre	2NOS EACH
ROOFING MATERIALS			
9	Mangalore tiles		2NOS EACH
	Country tiles		2NOS EACH
	A C sheet		2NOS EACH
	Plastic sheets		2NOS EACH
	Non asbestos Hi tech roofing sheet		2NOS EACH
	Meta colour sheets		2NOS EACH
	Alpha sheet		2NOS EACH

	Corrugated aluminium sheets		2NOS EACH
	Puff sandwiched roofing sheets.		2NOS EACH
	Steel bars ϕ5,6,8,10,12,16,20,22,25mm	Each bar 1m length	2NOS EACH
	Binding wire	1 bundle	1KG
DECORATIVE MATERIAL			
	Acoustic ceiling board		
	Gypsum ceiling board		
	Fibre board		
	Pulp board		
	Straw board		
	Polystyrene		
	Thermocol		
	Hair felt		
CHEMICAL CONSTRUCTION MATERIALS			
	Epoxy resin (base and hardener)	1 kg	2NOS EACH
	Plasticizer	5 litre	2NOS EACH
	Super plasticizer	5 litre	2NOS EACH
	Carboxylic admixtures	5 litre	2NOS EACH
	Silicon paste	1 kg	2NOS EACH
	Water proofing compound	1 litre	2NOS EACH
	Cement Grouts	25 kg	2NOS EACH
	Epoxy grouts	1 kg	2NOS EACH
	Adhesives	1 kg	2NOS EACH
	Sealants	250gms	2NOS EACH
	Asphalt	1 kg	2NOS EACH
	Geogrids	6 × 4 feet	2NOS EACH

SUGESTED ACTIVITY

1. Identify various layers and types of soil in foundation pit by visiting at least 3 construction sites in different locations of city and prepare report consisting photographs and samples.
2. Identify various layers and types of soil in foundation pit by visiting at least 3 construction sites in different locations of city and prepare report consisting photographs and samples.

SUGGESTED LIST OF PROPOSED STUDENT ACTIVITYS

Note: The following activities should be accompanied by at least 2 staff members from the department with prior approval from the industry. The visit should be recorded in the form of a hand written report and photo graphs. Each student should also submit the proof of their visit. A group of minimum 6 students should be assigned each activity. (Each group should select minimum one activity from each unit)

UNIT-I	
1	Visit to Geological Survey of India and study Rocks and Mineral samples available in the Museum
2	Visit to any nearby stone processing industry or Showroom
3	Visit to nearby timber depot and study different types of timber, Conversion of timber, Measurements, seasoning and storing pattern and various defects, quality of good timber.
UNIT-II	
4	Visit to nearby Brick manufacturing site and study size of bricks, mould and manufacturing

	process. Clamps and Kiln burning process of Bricks
5	Visit to nearby Hollow or solid concrete Block manufacturing site
6	Visit to nearby cement manufacturing plant and study manufacturing process
7	Visit to Plywood Retail Store and collect samples of Industrial timbers
8	Collect Market forms of Ferrous and Non ferrous metals
9	Collect different types of glass available in the market and explain its uses
10	Visit to nearby Tiles manufacturing industry or Visit to nearby Tiles show room and study different types of tiles available in the market its suitability and sizes and rates should be documented while visit.
UNIT-III	
10	Visit to nearby paint showroom or stores and study different types of paints available in the market.
11	Visit to nearby M sand manufacturing plant
12	Visit to nearby roofing and cladding materials sales showroom and study its different types and market rates and suitability of their use in construction
UNIT-IV	
14	Visit to a construction site where water proofing is under progress and study methodology adopted in water proofing.
15	Visit to a construction site where termite proofing and sound insulating is under progress and study methodology adopted in water proofing.

COURSE ASSESSMENT:

Sl. No	Assessment	Duration	Max marks	Conversion
1.	CIE Assessment 1 (Written Test -1) - At the end of 3 ^d week	80 minutes	30	Average of three written tests 30marks
2.	CIE Assessment 2 (Written Test -2) - At the end of 7 week	80 minutes		
3.	CIE Assessment 3 (Written Test -3) - At the end of 13 week	80 minutes		
4	CIE Assessment 4 (MCQ/Quiz) - At the end of 5 week	60 minutes	20	Average of three 20marks
5	CIE Assessment 5 (Open book Test) - At the end of 9 week	60 minutes		
6	CIE Assessment 6 (Student activity/Assignment)- At the end of 11 week	60 minutes		
7.	Total Continuous Internal Evaluation (CIE) Assessment			50marks
8.	Semester End Examination(SEE) Assessment (Written Test)	3 hrs	100	50marks
Total Marks				100marks

COURSE ASSESSMENT AND EVALUATION CHART

Assessment Method	Type of Assessment		Target	Assessment methods		Max Marks	Type of record	CO's for assessment
Direct Assessment	CIE Continuous Internal Evaluation	I A Testes	STUDENT	Three Tests (Average of Three Tests will be Computed)		30	Blue Books	CO1
								CO2, CO3
					CO4			
		Assignment & Student activity		MCQ/QUIZ	20	20 (Average)	Log of record	Specified CO by the course coordinator
	Open Book Test			20				
	Student activity			20				
	Total CIE Marks			50				
	SEE Semester End Exam	End of the Course		50	Answer Scripts by BTE	All CO's		
Total		100						
Indirect Assessment	Student feedback		STUDENT	Middle of the course		-NA-	Feedback forms	CO's which are covered
	End of Course survey			End of course			Questionnaire	All CO's Effectiveness of delivery of instructions and assessment methods

RUBRICS FOR ACTIVITY (Example Only)

Dimension	Unsatisfactory	Developing	Satisfactory	Good	Exemplary	Student Score
	4	8	12	16	20	
Collection of data	Does not collect any information relating to the topic	Collects very limited information; some relate to the topic	Collect much information; but very limited relate to the topic	Collects some basic information; most refer to the topic	Collects a great deal of information; all refer to the topic	16
Fulfil team's roles & duties	Does not perform any duties assigned to the team role	Performs very little duties but unreliable.	Performs very little duties	Performs nearly all duties	Performs all duties of assigned team roles	12

Shares work equally	Always relies on others to do the work	Rarely does the assigned work; often needs reminding	Usually does the assigned work; rarely needs reminding	Normally does the assigned work	Always does the assigned work without having to be reminded.	16
Listen to other Team mates	Is always talking; never allows anyone else to speak	Usually does most of the talking; rarely allows others to speak	Talks good; but never show interest in listening others	Listens, but sometimes talk too much	Listens and speaks a fair amount	16
Average / Total Marks: (16+12+16+16)/4						15 marks

Note: Concerned faculty (Course coordinator) must devise appropriate rubrics/criteria for assessing Student activity.

Note: Dimension should be chosen related to activity and evaluated by the course faculty

Model Question Paper I A Test (CIE)

Programme :		Semester: I			
Course :		Max Marks : 30			
Course Code :		Duration : 1 Hr 20 minutes			
Name of the course coordinator:		Test : I/II/III			
Note: Answer one full question from each section. One full question carries 10 marks.					
Qn.No	Question	CL	CO	PO	Marks
Section-1					
1.a)					
b)					
c)					
2.a)					
b)					
c)					
Section-2					
3.a)					
b)					
c)					
4.a)					
b)					
c)					
Section-3					
5.a)					

b)					
c)					
6.a)					
b)					
c)					

**Model Question Paper
Semester End Examination**

Programme:	Semester: I
Course :	Max Marks: 100
Course Code:	Duration: 3 Hrs

Instruction to the Candidate:

Answer one full question from each section. One full question carries 20 marks.

Qn.No	Question	CL	CO	Marks
Section-1				
1.a)				
b)				
2.a)				
b)				
Section-2				
3.a)				
b)				
4.a)				
b)				
Section-3				
5.a)				
b)				
6.a)				
b)				
Section-4				
7.a)				
b)				
8.a)				
b)				
Section-5				
9.a)				
b)				
10.a)				
b)				

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Course Code	20EG01P	Semester	I/II
Course Title	COMMUNICATION SKILLS	Course Group	Core
No. of Credits	4	Type of Course	Tutorial + Practice
Course Category	Workplace Skills / Humanities & Social Sciences	Total Contact Hours	6Hrs Per Week
			78Hrs Per Semester
Prerequisites	Nil	Teaching Scheme	(L:T:P)= 0:1:2
CIE Marks	60	SEE Marks	40

Preamble

Today, Communication is a very important skill for the success of every millennial student. Millennials affinity to use digital media for communication, changing career and working landscapes, and greater competition in colleges and workplaces makes enhancing student communication skills beyond language a must. Rote learning a few tips or tricks the night before an interview or performance review won't do the job if students are trying to make an impression in highly collaborative workplaces of the future. Expectations from students aspiring to be part of such future workplaces are that they have not just good verbal and non-verbal communication skills but also a good understanding of how to use modern tools for effective communication.

Scope

To enable students to communicate clearly and effectively, by improving their verbal and non-verbal communication skills, as well as enhancing interpersonal skills and knowledge of appropriate tools for specific communication strategies.

Course Objectives

The objectives of communication skills course are:

- Build better communication skills: oral and written expressions and body language
- Enable critical thinking
- Empower with active listening skills
- Enable team work/collaboration

Instructional Strategy

To achieve course objectives, it is important to provide the blended mode of instruction for each of the concepts. This blended mode of instruction enables and empowers students with:

- **Understanding of Concept (Theory):**
 - Through definitions, discussions, explanation, conclusions.
 - Through demonstrations: Show films or other workplace clips that model various conversation skills. This provides greater clarity of the concept by
 - Enabling observation skills

- Helping in expression of gesture
 - building confidence
- **Application of Concept (Learning by doing):** It is imperative that to become a good communicator, the skills have to be built by applying the concept in the hypothetically created real life situations. Students are encouraged to participate in each of these activities during lab session to help build the effective communication skills.
 - Use of technology tools like audio books, apps like voice thread or paper telephone, etc.
 - To help in workplace conversions.
 - To increase active listening, pronunciation
 - To help in voice modulation
 - Group discussion
 - Reinforce active listening
 - Enable group debate to imbibe healthy communication strategies
 - Sharpen the skills of “Asking clarifying questions”
 - Sharpen Feedback / Response skills
 - Time management skills
 - Group presentations/peer reviews
 - Enable team work
 - Assess concept understanding
 - Sharpen both oral and written communication skills
 - Group activities:
 - foster critical thinking
 - enable reflective learning
 - Tools usage:
 - Understand the difference between a Dictionary and a Thesaurus
 - Understand “When” and “How” to use these tools for communication

Course Outcomes

After completion of this course, the student shall be able to;

- Communicate
 - Identify audience (colleagues, management, customers/vendors) and use the right methodologies for communication using the right terminology, names, grades and other nomenclature pertaining to the trade, tools and specific equipment.
- Write
 - in at least one language correctly
 - basic level notes and observations
 - job cards, work sheets, basic report writing and responding to emails, simple presentations, job applications, resume
- Read
 - Technical manuals, task sheets/job orders, policies and regulations pertinent to the job, including OEM guidelines.
 - all instructions given in memos, manuals, documents or those put up as posters across the premises
 - safety precautions mentioned in equipment manuals and panels to understand the potential risks associated
- Question
 - Ask right questions
 - Use different ways of asking questions
 - Clarifying/Open ended (What, Why, When, Who, Where, How)
 - Close ended

- Present
 - With right Posture & Gesture
 - With greater concept/content clarity
 - With high confidence
 - With voice modulation to capture the attention of audience

- Use technology tools
 - Office productivity
 - Word : Report writing
 - PowerPoint : Creating effective presentations
 - Excel : Data handling/Charts

Course Content

The following are the various units to be taught and assessed in order to ensure the student is able to demonstrate the Course Outcomes mentioned in the **Course Outcome** section.

Pre-assessment:

Teachers are required to administer pre-assessment before starting the actual instruction. This helps in gathering information about students' like their attitude, beliefs, interests, and learning abilities.

Pre assessment expectations:

- To assess current language skill (Pronunciation, usage, sentence formation)
- To assess their ability to comprehend and respond to the instruction
- To assess their interest towards accepting ideas and learning
- To assess their current communication skills: asking questions, listening, communicating with confidence

	<p>Barriers to communication</p>	<p><i>How communication happens?</i></p> <ul style="list-style-type: none"> • Pictorial representation of communication framework • Elements of communication: sender, receiver, message • Refer to activity in Unit activity section. <p><i>Language</i></p> <ul style="list-style-type: none"> • Lack of linguistic ability • Grammar <p><i>Context</i></p> <ul style="list-style-type: none"> • Psychology • Physiology <p><i>Systematic</i></p> <ul style="list-style-type: none"> • inefficient or inappropriate information systems • Lack of communication channel • lack of understanding of the roles and responsibilities <p><i>Attitude</i></p> <ul style="list-style-type: none"> • Perceptions • Preconceived notions 	<p>0:2:2 (video clip play, content tutorial, role play)</p>
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<p>Building blocks of communication</p>	<p>People Message Context Listening</p>	<p>People:</p> <ul style="list-style-type: none"> • Empathising with sender’s or receiver’s perception • Intent & Impact on the sender/receiver • Think – Feel – Do model <p>Message:</p> <p>Message channels:</p> <ul style="list-style-type: none"> ○ Inperson, email, memo, report <p>Be aware of Mental Filters</p> <ul style="list-style-type: none"> ○ Level of understanding/knowledge ○ Personal concerns ○ Pre conceived notions <p>Organize message:</p> <ul style="list-style-type: none"> ○ Critical thinking: organize your thoughts? <p>Use following strategy:</p> <ul style="list-style-type: none"> ▪ Who ▪ What ▪ When ▪ Why ▪ How <ul style="list-style-type: none"> ○ Bundle Primary and Secondary information ○ Mindful about non-verbal message ○ Tone of voice <p>Examples of Types of messages:</p> <ul style="list-style-type: none"> ○ Inform ○ Persuade ○ Cyclical <p>Avoiding Miscommunication:</p> <ul style="list-style-type: none"> • Evaluate (Checking for) understanding of the intent of the message with the receiver – by asking clarifying questions? <p>Context:</p> <p>Define context</p> <p>Importance of context</p> <p>Tune into context</p> <ul style="list-style-type: none"> • Timing • Location • Relationship 	<p>0:4:4</p>
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		<p>Listening:</p> <p>Importance of listening</p> <p>Barrier to listening:</p> <ul style="list-style-type: none"> • Mental filters • Multitasking • Information overload <p>Strategies for listening:</p> <ul style="list-style-type: none"> • Recall • Acknowledge • Summarize • Listen with eyes for connecting to non-verbal connection • Empathize • Pay attention • Ask clarifying questions <p>Effective Listening Behaviors:</p> <ul style="list-style-type: none"> • Maintaining relaxed body posture • Leaning slightly forward if sitting • Facing person squarely at eye level • Maintaining an open posture • Maintaining appropriate distance • Offering simple acknowledgements • Reflecting meaning (paraphrase) • Reflecting emotions • Using eye contact • Providing non-distracting environment <p>Behaviors that hinder effective listening</p> <ul style="list-style-type: none"> • Acting distracted • Autobiographical (Telling your own story without acknowledging theirs first) • No response • Invalidating response, put downs • Interrupting • Criticizing • Judging • Giving advice/solutions • Changing the subject • Reassuring without acknowledgment 	

UNIT 3: Verbal Communication

Lesson outcome:

At the end of this session, Students should be able to:

- Understand and define the communication framework structure for each of the verbal communication(in person/telephonic/video conference).
- Understand and apply the verbal communication techniques.
- Use technical jargons in communication.
- Use right body language during verbal communication
- Understand and practice the Active Listening techniques
- Confidently articulate or present the content

<p>Different types of verbal communication:</p>	<p><i>In person</i></p> <p><i>Telephonic</i></p> <p><i>Video conference</i></p>	<p>Use ABC's : Accuracy, Brevity, Clarity</p> <ul style="list-style-type: none"> ○ Introduction ○ Main body of the content ○ Summary <ul style="list-style-type: none"> ● Use voice/tone effectively ● Reinforcement of Listening skills: Active and Empathetic listening skills ● Body language <ul style="list-style-type: none"> ○ Eye contact ○ Body posture ○ Gesture ○ Facial expression ○ Space 	<p>0:2:4</p>
<p>Listening Skills</p>	<p><i>Effective Listening behaviors</i></p> <p><i>Behaviours that hinder effective listening</i></p>	<p>Effective Listening Behaviours:</p> <ul style="list-style-type: none"> ● Maintaining relaxed body posture ● Leaning slightly forward if sitting ● Facing person squarely at eye level ● Maintaining an open posture ● Maintaining appropriate distance ● Offering simple acknowledgements ● Reflecting meaning (paraphrase) ● Reflecting emotions ● Using eye contact ● Providing non-distracting environment <p>Behaviours that hinder effective listening</p> <ul style="list-style-type: none"> ● Acting distracted ● Autobiographical (Telling your own story without acknowledging theirs first) ● No response ● Invalidating response, put downs ● Interrupting ● Criticizing ● Judging ● Giving advice/solutions ● Changing the subject ● Reassuring without acknowledgment 	
<p>Using technical Jargons:</p>	<p><i>Assignment based project encouraging pupil to use the</i></p>		

	<p><i>technical terms in the written and verbal communication.</i></p> <p>This requires understanding of the core concepts (from subject teacher) and integrating the concept with communication concepts to gain the real time application knowledge.</p>		
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UNIT4: Non-Verbal Communication:

Lesson outcome:

At the end of this unit, students should be able to:

- Understand the importance of Body language and its impact.
- Use the strategies for effective body language.
- Understand the relevance of different elements of emails and how to use them.
- Develop the confidence in presenting written content in logical and organized manner with a definitive email framework.
- Write different email formats confidently: Job application, Request email, apology email, email responses/feedback.
- Confidently write Resume/Curriculum-vitae, Reports, Formal letters and portfolio.
- Confidently communicate using technical jargons and with increased vocabulary.

<p>Body Language</p>	<p><i>Strategies</i></p>	<p>Body language tips:</p> <ul style="list-style-type: none"> • Keep appropriate distance • Take care of your appearance • Maintain eye contact • Smile genuinely <p>Do's and Don'ts:</p> <p>dos:</p> <ul style="list-style-type: none"> • smile • stand up confident and straight • use appropriate hand gestures • Make eye contact with audience • Hold neat note cards while presenting content <p>Don'ts</p> <ul style="list-style-type: none"> • point at anyone • rock backwards and forwards • pace across front of room • read off slides <p>read off notes</p>	<p>0:3:4</p>
<p>Art of Professional writing:</p>	<p><i>Written communication</i></p> <p><i>Emails:</i></p> <ul style="list-style-type: none"> • Structured framework for writing formal emails to emphasize on professional communication in English 	<p>Different types of emails: Job application, request letter, letter writing and quick notes</p> <p>Structure of email text:</p> <ul style="list-style-type: none"> • Introduction – Beginning of the letter and this plays crucial role as it provides first impression to the reader. <ul style="list-style-type: none"> ○ Who: author (name + position and organisation) ○ what: purpose - controlling idea (what author does or feels) • Development: Expand on the Controlling Idea/purpose of the email by answering relevant WH questions <ul style="list-style-type: none"> ○ what, when, where, who, whom, which, whose, why, and how • Conclusion: Positive words <ul style="list-style-type: none"> ○ Verb: thank, appreciate, hope, wish 	<p>0:2:4</p>

		<ul style="list-style-type: none"> ○ Phrases: be glad about, look forward to <p>Email writing samples and practice content in the activity section.</p> <p>Additional essential writing skills – Framework will be provided and assignments will be advised:</p> <ul style="list-style-type: none"> • Resume writing /CurriculumVitae • Report Writing • Portfolio writing • Formal letters 	
<p>UNIT5: English - Reading Skills, Grammar & Vocabulary</p> <p>Lesson Outcome:</p> <p>At the end of the session, student should be able to:</p> <ul style="list-style-type: none"> • Read sentences with punctuation. • Understand the techniques of reading complex words. • Understand and apply the reading techniques for efficient reading. • Understand the usage of communication tools like Thesaurus and Dictionary that aids in improving vocabulary and reading. • Understand and apply the functional grammar aspects in day today communication. 			
	<p><i>Comprehension activities</i></p> <p><i>Techniques for smart reading</i></p> <p><i>List of Commonly confused words and how to use/avoid them</i></p> <p><i>Sentences:</i></p> <ul style="list-style-type: none"> ○ Declarative sentence 	<p>Passage comprehension Conversation comprehension</p> <p>Strategies for smart reading:</p> <ul style="list-style-type: none"> • Skimming and scanning through the text, inferring the meaning • Questioning, summarizing <p>Set of words to accelerate the English language learning and usage. Strategies to use these words effectively</p> <p>Techniques of categorizing sentences, understanding how to build with punctuation and effectively use in the</p>	<p>0:2: 2</p> <p>0:1: 2</p> <p>0:1: 2</p>

<p>Reading skills</p>	<ul style="list-style-type: none"> ○ Imperative sentence ○ Interrogative sentence ○ Exclamatory sentence 	<p>verbal and non-verbal communication. This involves more of hands on activities.</p>	
<p>Functional Grammar</p>	<p><i>Punctuation, Content organization and Comprehension</i></p>	<p>Comprehension remains as a main activity to accelerate the learning of spoken and written English language</p>	<p>0:1: 2</p>
<p>Vocabulary</p>	<p><i>Techniques:</i></p> <ul style="list-style-type: none"> • Learning new words from comprehension by way of repetition and usage of these words in communication • Listing technical jargons and repeatedly using in the communication with peers and teachers • Chunking and reading words <p><i>Tools</i></p> <ul style="list-style-type: none"> • Understand the difference between a Dictionary and a Thesaurus • Understand “When” and “How” to use these tools for communication 	<p>Increases vocabulary, builds confidence and helps in becoming a good communicator.</p> <p>Activities are done, tips are provided to efficiently implement these strategies.</p>	<p>0:1:0</p>

Unit 6 - Communication Tools			
Lesson Outcome:			
At the end of the session, student should be able to:			
<ul style="list-style-type: none"> • Use Email technology efficiently for communication • Present content in the PPT format efficiently • Understand different platforms available for web conferencing and efficiently work with them. • Create reports and data management. 			
Introduction	Evolution of communication tools	Traditional vs. modern communication tools Advantages and Disadvantages	1:0:0
One-to-One	<i>Email using Gmail</i>	How to use the tools effectively? Formatting, layout Including attachment Working with “To, CC, BCC” and Subject fields effectively Using signature	0:1:1
One-to-Many	<i>Presentation using PowerPoint</i>	Creating, Editing, Saving slides Using Animation Formatting options	0:1:2
	<i>Webinar / Web Presentation (zoom, Google meet, Skype)</i>	Hosting online meeting using online meeting tools Inviting people Sharing screen	0:1:1
Other	<i>Reports using MS Word</i>	Open, close, Edit and Save usage with documents Layout and strategies for creating report Sample report creation demo with follow on assignment Core subject project report submission assignment	0:1: 2
	<i>Data & Graphs using MS Excel</i>	Open, close, save and edit the excel document Creating data Using basic maths operation in Excel for working with data Creating simple graphs Assignment: For example, creating statistics of subject wise activities completed for 6 months in the credit course	0:1: 2
			4:34:40

Course Class Activity List (Unit-wise)

The following are the various activities that faculty could conduct for each unit are presented below;

Unit No.	Unit Title	Unit Activities
<p>UNIT 1: Activities:</p>	<p>English - Introduction</p>	<p>1. 42 sounds revision:</p> <ol style="list-style-type: none"> 1. s, a, t, i, p, n 2. c k, e, h, r, m, d 3. g, o, u, l, f, b 4. ai, j, oa, ie, ee, or 5. z, w, ng, v, oo, oo 6. y, x, ch, sh, th, th 7. qu, ou, oi, ue, er, ar <ul style="list-style-type: none"> • This helps in reducing the native language impact • Helps in understanding Short and Long vowel words • Helps in spelling • Helps in pronunciation <p>2. Reading commonly used words loud from the list (list will be provided in the workbook):</p> <ul style="list-style-type: none"> • This helps in getting familiarity with the word pronunciation and helps in reading. <p>3. Blending words activity:</p> <ul style="list-style-type: none"> • Write simple three letter words (CVC/CVCC/CVCV) pattern words: Can, Cap, Snap, cape (list will be provided in the workbook) • Show how to blend with the sound. • Starting with 3 letter words and continuing to 6 to 8 letter words. <i>Note: Remember before going through big words, it is always important to assess and ensure the student is aware of all the 42 sounds and are comfortable making small words.</i> <p>Parts of Speech:</p> <p>building sentence using parts of speech: Demonstration by teacher: (Will be explained in the book as an example)</p> <p>Jumbled parts of speech: Student should pick the right order to build meaningful sentence:</p> <p>(More samples will be provided in the workbook)</p> <ul style="list-style-type: none"> • College go to youeveryday. • Makes spider web the a

		<p>Gender, Singular and Plurals:</p> <ul style="list-style-type: none"> • Match the following activity for singular and plural • Fill in the blanks activity for genders <p>Reading & Comprehension: Conversation</p> <ul style="list-style-type: none"> • Conversation at the bank (provided in the workbook along with few more conversation samples) • Questions based on this conversation will be provided in the workbook
<p>Unit 2</p>	<p>Communication</p>	<p>Oral:</p> <ul style="list-style-type: none"> • Introduce yourself? <p>Visual:</p> <ul style="list-style-type: none"> • Video clip on communication etiquette • Pictures (in addendum section): do's and don'ts of communication <p>Group of students, one participant whispers in another participant's ear, and this message has to be passed on in a circle until it reaches back the sender. Making a note of process of message conveyed and how it was perceived.</p> <ul style="list-style-type: none"> ○ Identify the communication gap if any. ○ Discuss and conclude the communication framework importance ○ Discuss/reiterate how to make communication framework strong. <p>1. Role play to assess the understanding of building blocks of communication: (can be tapered to the core skills of diploma courses, following are just few of the examples)</p> <ol style="list-style-type: none"> a. Announcing the result of students in the class or b. Announcing the job placement of students (people, context, message, form of message) c. Discussing the guidelines of examination (listening skills) d. Listening to the weather forecast without seeing and making note of the listening

		<p>ability (play video of weather forecast) – Assess based on how much the student is able to recall.</p> <p>2. Run National geography/Discovery Video clip/subject related technical video clip on YouTube: Check:</p> <ul style="list-style-type: none"> ○ if the student has not understood what a speaker expressed ○ about work or safety related issues ○ seeking clarification or advice appropriately from colleague, customer, management or vendor
<p>Unit 3</p>	<p>Verbal communication</p>	<p>1. Voice/tone modulation: Showcase video Discussion: What was right? What was wrong? How it should have been better?</p> <p>2. Picture description activity (memory test): Class split into groups A, B C,D: (two or four groups of at least 5 people each): Teacher shows different picture to each group for three minutes. Now each group has to remember what was on the picture and discuss with each other, write down the elements on a piece of sheet and share it with the teacher. Group that remembers more will be the winner.</p> <p>Teacher to observe the body language of a student in the group, listening skills of a student, presentation skill, comprehension skill, content delivery skill, confidence level, team work. And reiterate the concepts, dos and don'ts, and discuss what could have been done better. (details of pictures will be given in the workbook)</p> <p>3. Telephonic conversation: Role play by a teacher: Call Airtel/Vodafone department and asking for the phone number portability process.</p>

		<p>After teacher demonstrates, teacher divides the class in to small groups of three people.</p> <ul style="list-style-type: none"> • Each group will be given a different telephone conversation assignment (samples will be provided in workbook). • Two people in the group pretend to converse over the phone, and the third person makes a note of right and wrong approaches during the communication.
<p>Unit 4:</p>	<p>Non-verbal communication</p>	<p>Body language</p> <p>Simon Says:</p> <p>Instructions and set up :</p> <ol style="list-style-type: none"> 1. Series of instructions to the group that are to be copied/reproduced. Start slowly and increase the pace 2. State the following actions as YOU do them: <ul style="list-style-type: none"> ○ Put your hand to your nose ○ Clap your hands ○ Stand up ○ Turn around ○ Touch your shoulder ○ Sit down ○ Stamp your foot ○ Cross your arms ○ Put your hand to your forehead – <u>BUT WHILE SAYING THIS PUT YOUR HAND TO YOUR NOSE</u> 3. Observe the number of group members who copy what you did rather than what you said. <p>Outcome of this activity:</p> <p>Discuss how body language can reinforce/influence verbal communication and drive the importance of body language and how to work on it</p> <ul style="list-style-type: none"> • Email communication & Using technical jargons: <p>Sample letter writing as assignment to students. (list will be provided in the text book – Request, apology,</p>

		<p>job application and relevant email formats that are useful for students post diploma course)</p> <ul style="list-style-type: none"> • There will be at least one assignment that utilizes technical jargons in email communication.
UNIT 5:	English - Reading Skills, Grammar & Vocabulary	<ul style="list-style-type: none"> • Reading passage (Provided in workbook) • Reading passage from the text book • Comprehension: Passage & Conversation (will be provided in workbook) • Chunking words and reading activities
Unit 6:	Communication tools	<ul style="list-style-type: none"> • Email writing activities: Writing emails using email provider. Theme based email writing • Report writing assignment <p>Writing about a machinery tool/interior designing plan? Related to the diploma stream.</p> <ul style="list-style-type: none"> • Resume writing assignment • Data handling: Collecting data about machines/number of students passed out of college for last three years and creating graph about it. • Presentation: <ul style="list-style-type: none"> ○ About learning in the communication class ○ Concept presentation

Course Assessment Strategies

Assessment Methodology

- Observation (role play activities, team activities, demonstration)
- Questions & Answer – Periodic Assessment

Assessment Grading RUBRICS

Language Basics	
Beginner	Doesn't know / understand
Intermediate	can read and identify commonly used words
Good	Confident , able to communicate well with known people
Advanced	Confident , able to communicate well with anyone using a English
Expert	Can read, understand; Also comprehend & can train others
Reading	
Beginner	Beginning to read, has native language impact
Intermediate	can read, identify words, build simple 3/4/5 letter words easily
Good	Can read, understand, build words, read simple sentences ; Also comprehend

Advanced	Can read, understand, build words, read simple sentences ; Also comprehend
Expert	Confident , read simple and complex sentences with punctuation, comprehend, spell also build words
Inter personal communication	
Beginner	is shy, doesn't talk/express
Intermediate	hesitates to communicate – due to lack of confidence / ability, can talk to known people
Good	can talk to unknown people, less confident, does not express, has hard time working as a team
Advanced	can talk to unknown people, confident, can't express, has hard time working as a team
Expert	confident, can talk to anyone, express well, works well in the team
Body language	
Beginner	Is shy, not open to communicate, has hard time making friends
Intermediate	Knows basics of Body language, practices sometimes
Good	Knows basics of Body language, practices most times, has less confidence in presenting content
Advanced	Knows and practices good body language all times, can present content
Expert	Knows and practices good body language all times, is an example, Leads the pack to get better
Listening Skills	
Beginner	Just hears, no attention
Intermediate	Listens, pays attention, does not ask any question
Good	Listens, pays attention, ask questions
Advanced	listens, pays attention, asks questions, cannot empathize
Expert	Listens, pays attention, asks clarifying questions, able to understand the message communicated
Acceptability to Learn	
Low	is not receiving to information
Average	receives information but resists to implement
Good , Above Average	receives information and implements per instructions
Strong	receives information and proactively implements and seeks feedback
Verbal Communication	
Beginner	Does not communicate, shy, low on confidence: has problem expressing in his/her native language or English language
Intermediate	Can communicate in native language, low confidence, shy, yet to try in English language
Good	Can communicate in native language, good confidence, tries to communicate in English language
Advanced	Can communicate in native language, express view points, good confidence, comfortable talking to people in the team, tries to communicate in English language aswell

Expert	Can communicate in native language, express view points, very good confidence, can communicate with anyone without any fear, asks clarifying questions, communicates well in English, or tries hard to communicate in English language as well
Non-Verbal Communication	
Beginner	Struggles to understand the non-verbal cues, has to work on body language, has hard time understanding the written communication aspects
Intermediate	Can understand the non-verbal cues, has to practice, tries to apply written communication aspects
Good	Can understand non-verbal cues, practices well, works hard to get hold on written communication skills, exhibits confidence in whatever task is given
Advanced	Can understand non-verbal cues, can work on written communication aspects, exhibits confidence, practices well, help others to identify non-verbal cues
Expert	Can understand non-verbal cues, train others, confident, exhibits good non-verbal cues at all times, can train the pack, has good hold on written communication as well.
Comprehension	
Beginner	Tries to read the passage, has hard time to comprehend
Intermediate	Can read the conversation passage, has hard time understanding the regular passage
Good	Can read the conversation passage, regular passage, but stutters in answering questions if there are technical jargons
Advanced	Can read the conversation passage, comprehend but regular passage comprehension is good
Expert	Can read the conversation passage, comprehend but regular passage comprehension is good, explain better to others, help others, lead the pack
Writing Communication	
Beginner	Has trouble forming right sentences for written communication
Intermediate	Can form sentences, has problem with the layout, gets confused between layout for different form of written communication
Good	Can form sentences, has fair understanding of the layout to be used for particular type of written communication, but stutters for words and expression
Advanced	Can form sentences, has good understanding of the layout to be used for particular type of written communication, confident, can express thoughts well
Expert	Can form sentences, has good understanding of the layout to be used for particular type of written communication, confident, can express thoughts well and train others and lead the pack

Recommended Learning Resources

<https://www.englishclub.com/grammar/parts-of-speech.htm>

Watch Amy Cuddy's TED Talk: [Your Body Language Shapes Who You Are](#)

Additional Reading: http://money.cnn.com/2000/05/03/career/q_body_language/

Pre-assessment:

Activity 1:

Make a group, read random words from the list, build sentence for few words from the list.

Create a group of 3 or 5 students. Randomly pick 5 words from the word list write down on the board/show them as a chart if you have created a word chart/make chit of words and ask them to pick one chit and READ the word.

Main idea: Testing the pronunciation ability, language ability, confidence in speaking, ability to understand and accept the instruction

Activity 2:

Simple reading test – Reading passages (Simple passage from the current course book)

Show the reading passage, let each one of them read 2 lines, after first student is done with reading two lines, then the next student must pick up from there and read next two lines. This process has to be followed until the entire class is done with reading or at least ten students are done with reading.

Main idea: Testing listening skills, attentiveness, language ability, pronunciation ability

Activity 3:

Students getting to know each other. Create a group of 3 or 5 students. Each student gets chance to talk to another student, introduce him/herself to the student, ask question, make a note of the answer against the name of the student who is answering the question on a sheet of paper.

Main idea: To assess current communication level, body language when students talk with each other, and confidence.

Commonly Used Word List

When	Today	For	Off	Yes	To	Girl	This		
Give	Stop	There	Often	On	Am	A	Could		
Again	Little	Than	Myself	Been	Where	You	Now		
Do	Large	At	Over	Of	Way	Be	Fun		
From	Both	Like	Along	He	Which	Were	Only		
Him	Name	Said	Why	It	Write	Or	Much		
Can	Few	They	Has	More	Goes	One	Tell		
Go	Home	Look	Bring	My	Great	All	Out		
But	Big	Know	Part	Any	Number		That	Fast	
Old	Should	Done	By	Their	First	Cat	Is		
Not	Once	High	As	We	Find	His	Small		
Her	Thought		So	She	Me	Have	Dog		
Time	Better	Them	Away	Did	In	How	See		
Long	Many	Does	No	Went	Before	Water	Here		
Had	Get	Always	Other	Full	Saw	And	People		
Word	Please	These	With	Some	Never	Use	School		
Very	Ask	Last	An	Then	Boy	Take	Two		
Your	Say	Got	What	If	Right	The	Call		
Make	Ten	Next	Come	Night	After	Will	Might		
Day	I	Those	Would	Made	About	Was	May		
Each	Show	Play	Who	Up	Far	Are	Walk		

To assess current communication skill: Activity based

Activity 3:

Making a group of students and getting to know each other with a predefined expectation for example:

Name:

I have performed on stage:

I'm good at sports:

I can speak more than 3 languages:

I'm always cheerful:

I like my mother tongue:

Course Assessment and Evaluation**Continuous Internal Evaluation (CIE)**

Sl.No	Assessment	Schedule	Duration	Max. Test marks
1	Skill Test 1	At the end of 3 rd week of the sem	2 Hrs	20
2	Skill Test 2	At the end of 7 th week of the sem	2 Hrs	20
3	Skill Test 3	At the end of 13 th week of the sem	2 Hrs	20
Total				60

Scheme of Valuation for CIE

Serial no	Assessment	Marks
1	Portfolio Evaluation of activities / exercises conducted upto the schedule of Skill Test. (Work Book Based)	10
2	Assessment of any one through qualitative assessment (Rubrics)	10
TOTAL		20

**RUBRICS FOR ASSESSMENT OF ACTIVITY (10marks)
(Qualitative Assessment)**

Dimension	Beginner	Intermediate	Good	Advanced	Expert	Student Score
	2	4	6	8	10	
	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	
	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	
	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	
	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	
Average / Total Marks:						

Example Only						
RUBRICS FOR ASSESSMENT OF ACTIVITY (10marks)						
Faculty need to develop appropriate rubrics as per the assigned activity for assessment						
Dimension	Beginner	Intermediate	Good	Advanced	Expert	Student Score
	2	4	6	8	10	
Language Basics	Doesn't know / understand	Can read and identify commonly used words	Confident , able to communicate well with known people	Confident , able to communicate well with anyone using a English	Can read, understand; Also comprehend & can train others	8
Reading	Beginning to read, has native language impact	Can read, identify words, build simple 3/4/5 letter words easily	Can read, understand, build words, read simple sentences ; Also comprehend	Can read, understand, build words, read simple sentences ; Also comprehend	Confident , read simple and complex sentences with punctuation, comprehend, spell also build words	6
Inter personal communication	Is shy, doesn't talk/express	Hesitates to communicate – due to lack of confidence / ability, can talk to known people	Can talk to unknown people, less confident, does not express, has hard time working as a team	Can talk to unknown people, confident, can't express, has hard time working as a team	Confident, can talk to anyone, express well, works well in the team	8
Body language	Is shy, not open to communicate, has hard time making friends	Knows basics of Body language, practices sometimes	Knows basics of Body language, practices most times, has less confidence in presenting content	Knows and practices good body language all times, can present content	Knows and practices good body language all times, is an example, Leads the pack to get better	8
Average / Total Marks: (8+6+8+8)/4						7.5 = 8 marks

Scheme of Valuation for Semester End Examination (SEE)

Serial no	Assessment	Evidence	Marks	Conversion
1	Portfolio Evaluation- UNIT 1: English - Introduction	Work Book	15	40 Marks
2	Portfolio Evaluation- UNIT 2: Communication	Work Book	15	
3	Portfolio Evaluation- UNIT 3: Verbal Communication	Work Book	15	
4	Portfolio Evaluation- UNIT-4: Non-Verbal Communication:	Work Book	15	
5	Portfolio Evaluation- UNIT-5: English - Reading Skills, Grammar & Vocabulary	Work Book	15	
6	Any one activity through communication tools- By qualitative assessment (Rubrics).	BTE Answer scripts	25	
		TOTAL	100	

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Course Code	20SC02P	Semester	I/II
Course Title	STATISTICS AND ANALYTICS	Course Group	Core
No. of Credits	4	Type of Course	Lecture and practice
Course Category	Practice	Total Contact Hours	6 Hrs. Per Week
			78 Hrs. Per Semester
Prerequisites	10 TH LEVEL MATHEMATICS	Teaching Scheme	(L: T:P)-1:0:2
CIE Marks	60	SEE Marks	40

RATIONALE

Statistics and analytics help the learner to use the proper methods to collect the data, employ the correct analyses, effectively present the results and conduct research, to be able to read and evaluate journal articles, to further develop critical thinking and analytic skills, to act as an informed consumer and to know when you need to hire outside statistical help. The python language is one of the most accessible programming languages available because it has simplified syntax and not complicated, which gives more emphasis on natural language.

COURSE OUT COMES

At the end of the course, student will be able to

CO1	Understand the tools of data collection, classification and cleaning of data.
CO2	Able to summarize the given statistical data
CO3	Understand the measure of location and dispersion of data.
CO4	Learn the basics of Python programming.

DETAILS OF COURSE CONTENT

The following topics/subtopics is to be taught and assessed in order to develop Unit Skill Sets for achieving CO to attain identified skill sets.

UNIT NO	Unit skill set (In cognitive domain)	Topics/Subtopics	Hours L-T-P
<p align="center">UNIT-1 STATISTICAL DATA COLLECTION AND TYPES</p>	<ul style="list-style-type: none"> ➤ Able to collect statistical data. ➤ Able to distinguish the data types. ➤ Understands the usage of data collection tools ➤ Able to specify problem statement for data collection ➤ Able to collect data pointing the root cause of the problem statement. 	<p>a Definition of data and classification (qualitative quantitative discrete and continuous data).</p> <p>b Data collection tools</p> <ul style="list-style-type: none"> i) Questionnaires. ii) Survey. iii) Interviews. iv) Focus group discussion. <p>1.3 Data cleaning.</p>	<p align="center">4-0-8</p>
<p align="center">UNIT-2 SUMMARIZATION OF DATA</p>	<ul style="list-style-type: none"> ➤ Sketches bar, pie and histograms on Microsoft Excel spread sheet. ➤ Sketches frequency curve and frequency polygon for the data set on Microsoft Excel spread sheet. ➤ Sketches bar, pie and histograms on Microsoft Excel spread 	<p>a Descriptive statistics</p> <ul style="list-style-type: none"> v) Datatabulation(frequency table vi) Relative frequency table. <p>b Grouped data</p> <ul style="list-style-type: none"> vii) Bar graph viii) Pie chart ix) Line graph x) Frequency polygon xi) Frequency curve xii) Relative frequency polygon xiii) Histograms xiv) Box plot xv) Leaf-stem plot <p>To be done in Microsoft excel.</p>	<p align="center">8-0-16</p>

	<p>sheet.</p> <ul style="list-style-type: none"> ➤ Sketches frequency curve and frequency polygon for the data set on Microsoft Excel spread sheet. 		
<p>UNIT-3 MEASURE OF LOCATION AND DISPERSION</p>	<ul style="list-style-type: none"> ➤ Able to determine the descriptive statistical variables using Microsoft Excel. ➤ Able to determine the absolute measures of dispersion of the given data set. ➤ Explain the symmetry and asymmetry of the distributed data. 	<ul style="list-style-type: none"> a Determination of central tendencies Range, Mean, Mode and Median for the data in Microsoft excel. b Determination of absolute measures of dispersion for data like range quartile deviation, mean deviation, standard deviation and variance in Microsoft Excel. c Skewness and kurtosis graphs in Microsoft excel and interpretations of results. 	<p>6-0-12</p>
<p>UNIT-4 INTRODUCTION TO PYTHON PROGRAMMING</p>	<ul style="list-style-type: none"> ➤ Able Install and run the Python interpreter. Create and execute Python programs. ➤ Understand the concepts of file I/O. ➤ Able to read data from a text file using Python. ➤ Learn variable declarations in Python. ➤ Learn control structures. ➤ Learn loop constructs. 	<ul style="list-style-type: none"> 4.1 Introduction to PYTHON. 4.2 Syntax of PYTHON. 4.3 Comments of PYTHON. 4.4 Data types of PYTHON. 4.5 Variables of PYTHON. 4.6 If-else in PYTHON. 4.6 Loops in PYTHON. 4.7 Arrays and functions in PYTHON. 	<p>8-0-16</p>

SL NO	Practical outcomes/Practical exercises	Unit no	PO	CO	L:T:P
1	Prepare a questionnaire (closed end) containing 25 questions for a specified problem statement: for example experience of an individual in a restaurant.	1	1,2,4,5,7	1	0:0:2
2	Prepare a Google form for a specified problem statement to collect the dataset. (for example questionnaire to conduct online quiz)	1	1,2,4,5,7	1	0:0:2
3	Send out a survey on your problem statement to number of 50 (By Google forms) and collect the data.	1	1,2,4,5,7	1	0:0:2
4	Remove duplicate or irrelevant observations. Remove unwanted observations from the dataset provided, including duplicate observations or irrelevant observations.	1	1,2,4,5,7	1	0:0:2
5	In Microsoft Excel spread sheet draw the frequency distribution table for the given data (data set should contain minimum 50 data).	2	1,2,4,5,7	2	0:0:2
6	In Microsoft Excel spread sheet draw the relative frequency distribution table for the given data (data set should contain minimum 50 data).	2	1,2,4,5,7	2	0:0:2
7	Using Microsoft Excel spread sheet plot bar graph for the data collected from 100 people(for example, conduct a survey on the favorite fruit of a person in your locality(restricting to 5 to 6 fruits). Explain the bar graph with minimum 30 words.	2	1,2,4,5,7	2	0:0:2
8	Using Microsoft Excel spread sheet plot pie chart for the data collected from 50 people(for example, conduct a survey on the smokers with respect to their ages in your locality. Explain the pie chart with minimum 30 words.	2	1,2,4,5,7	2	0:0:2
9	Using Microsoft Excel spread sheet draw a line graph for the given dataset.	2	1,2,4,5,7	2	0:0:2
10	Using Microsoft Excel spread sheet draw frequency polygon and frequency curve for the data collected from 50 people. (For example, marks obtained by the students in your class in 5 subjects in previous examination). Explain your observations from the graph in minimum 30 words.	2	1,2,4,5,7	2	0:0:2
11	Using Microsoft Excel spread sheet construct a box plot for the given dataset. (For example dataset can be the number of passengers in a flat form at different time in a day).	2	1,2,4,5,7	2	0:0:2
12	Using Microsoft Excel spread sheet construct a leaf plot for the given dataset. Explain the graph with minimum 30 words.	2	1,2,4,5,7	2	0:0:2

13	Using Microsoft Excel spread sheet find the Mean, Mode and Median for the data (univariate data) given and also represent them in a Histogram.	3	1,2,4,5,7	2	0:0:2
14	Generate a 50 random data sample (even and odd number dataset) using Microsoft Excel spread sheet and determine the range and Quartiles.	3	1,2,4,5,7	2	0:0:2
15	Collect the current yield of a crop from 50 different persons (problem statement can be changed according to priorities of the tutor) in your locality and determine mean deviation and Quartile deviation in Microsoft excel spread sheet and brief your inference with less than 30 words.	3	1,2,4,5,7	3	0:0:2
16	Collect the data of any 2 livestock population from 50 different houses in your locality (problem statement can be changed according to priorities of the tutor) and determine standard deviation for both the two separately in Microsoft excel spread sheet and brief your inference with less than 30 words.	3	1,2,4,5,7	3	0:0:2
17	Collect the data of two wheeler (with a rider and a pillion) crossing a busy junction in your locality in the peak hours (problem statement can be changed according to priorities of the tutor) and determine the variance of the data in Microsoft excel spread sheet and brief your inference with less than 30 words.	3	1,2,4,5,7	3	0:0:2
18	Using Microsoft Excel spread sheet draw a Skewness graph and kurtosis graph for randomly generated dataset.	3	1,2,4,5,7	3	0:0:2
20	Write a python program to add 2 integers and 2 strings and print the result.	4	1,2,4,5,7	4	0:0:2
21	Write a python program to find the sum of first 10 natural numbers.	4	1,2,4,5,7	4	0:0:2
22	Write a python program to find whether the number is odd or even.	4	1,2,4,5,7	4	0:0:2
23	Write a python program to find the variance and standard deviation for the given data..	4	1,2,4,5,7	4	0:0:2
24	Write a python program to display student marks from the record.	4	1,2,4,5,7	4	0:0:2
25	Write a python program to create a labeled bar graph using matplotlib. pyplot.	4	1,2,4,5,7	4	0:0:2
26	Write a python program to create a labeled pie chart using matplotlib. pyplot.	4	1,2,4,5,7	4	0:0:2
Total Hours					0:0:52=52

MAPPING OF CO WITH PO

CO	Course Outcome	PO Mapped	Experiment Linked	Cognitive Level R/U/A	Tutorial & Practical Sessions in Hrs.	TOTAL
CO1	Understand the tools of data collection, classification and cleaning of data.	1,2,4,5,7	1-4	A	12	12
CO2	Able to summarize the given statistical data	1,2,4,5,7	5-12	A	33	33
CO3	Understand the measure of location and dispersion of data.	1,2,4,5,7	13-18	A	12	12
CO4	Learn the basics of Python programming.	1,2,4,5,7	19-26	A	21	21
					78	78

Course	CO's	Programme Outcomes (PO's)						
		1	2	3	4	5	6	7
Statistics & Analytics	CO1	3	3	0	3	3	0	3
	CO2	3	3	0	3	3	0	3
	CO3	3	3	0	3	3	0	3
	CO4	3	3	0	3	3	0	3

**Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped,
Level 0- Not Mapped**

SUGGESTED LEARNING RESOURCES:

1. Statistical Analysis with Excel For Dummies (For Dummies Series) Paperback – Import, 9 April 2013 by [Joseph Schmuller](#) (Author)
2. <https://www.brianheinold.net/python/A Practical Introduction to Python ProgrammingHeinold.pdf>
3. http://www.bikeprof.com/uploads/9/0/6/5/9065192/excel_stats_handout_npl.pdf
4. <https://adminfinance.umw.edu/tess/files/2013/06/Excel-Manual1.pdf>
5. <https://www.brianheinold.net/python/A Practical Introduction to Python ProgrammingHeinold.pdf>
6. Introduction to Python programming for beginners by Vivian Baily Kindle edition.
7. PYTHON PROGRAMMING: Python programming: the ultimate guide from a beginner to expert by Clive Campbell.
8. Open source for python: <https://hub.gke2.mybinder.org/user/jupyterlab-jupyterlab-demo-zfkdw4y/lab>

SUGGESTED LIST OF STUDENT ACTIVITY

Note: The following activities or similar activities for assessing CIE (IA) for 10 marks (Any one)

- | | |
|---|---|
| 1 | <p>Describe the data collection activity itself (interviews, surveys, library research, etc.) AND why this specific form of data collection was chosen. Be sure to explain why you think this kind of data will help you in your design process. Also be sure to provide details about the activity: how many interviews, how long they took, where they took place, how many questions asked in a survey, how many respondents, etc.</p> <p>Present the results of your data collection. You do not have to have completely analyzed all your data, but do make sure you present the results of your research. If you did a survey, please attach a copy of the survey as an appendix; if you did interviews, please attach a copy of the interview questions.</p> <p>Discuss any preliminary analysis of your data. What have you learned thus far from the data should be discussed from an analytical perspective (rather than a data dump). For example, if you surveyed people about their use of the local bus system, and 90% of your respondents said they take the bus when it is raining, and 60% of your respondents said they usually wait more than 10 minutes for a bus, think about what this teaches you rather than just the information itself. In this instance, you can see that people are generally waiting for several minutes in the rain for a bus, so a covered bus stop might be a good idea. Keep in mind that your findings from data should lead directly to the conclusions you make about your design recommendations. This is the time to begin thinking very specifically about your research in those terms. This is also an opportunity to think about your definition of “better” and how it applies to your design goals and your choice of research activities (for example, if you are choosing to make something better by making it cheaper, maybe you are interviewing people to see how much loss of functionality or decrease in features for a technology they are willing to tolerate).</p> |
|---|---|

2	https://ils.unc.edu/courses/2013_spring/inls541_001/Assignments.html#Assignment_9 DOWNLOAD a dataset from the above link and use data visualization tools to analyze it.
3	Acquire the dataset from https://www.kaggle.com/datasets (For example acquire the data of IPL ball by ball scores and find the standard deviation and variance of score of a batsmen)and clean the data for the root cause of the problem statement and summarize the date and explain the inference.

COURSE ASSESSMENT AND EVALUATION CHART

Method	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
DIRECT ASSESSMENT	CIE (Continuous Internal Evaluation)	Models	Students	Two IA Tests (Written)	20	Blue Book	1,2,3.
				Three Skill tests	20	Model	1,2,3
				Student Activity	20	Model/Report	
				TOTAL	60		
	SEE (Semester End Examination)	End Exam		End of the course	100	Models	1,2,3
INDIRECT ASSESSMENT	Student Feedback on course		Students	Middle of the course		Feedback forms	1,2,3, Delivery of course
	End of Course Survey			End of the course		Questionnaires	1,2,3 Effectiveness of Demonstrations & Assessment Methods

Sl.No	Assessment	Duration	Max marks	Conversion
1	CIE Assessment 1 (Written Test -1-theory) - At the end of 3rd week	60 minutes	20	Average of two written tests 20
2	CIE Assessment 2 (Written Test -2-theory) - At the end of 13th week	60 minutes	20	
3	CIE Assessment 3 (Skill test) - At the end of 5th week	3 Hrs	20	Average of three skill tests 20
4	CIE Assessment 4 (Skill test) - At the end of 7th week	3 Hrs	20	
5	CIE Assessment 5 (Skill test) - At the end of 9th week	3Hrs	20	
6	CIE Assessment 6 (Student activity) - At the end of 11th week	-	20	20
7	Total Continuous Internal Evaluation (CIE) Assessment			60
8	Semester End Examination (SEE) Assessment (Practical Test)	3Hrs	100	40
Total Marks				100

Note:

1. CIE written test is conducted for 20 marks (Two sections). Each section shall have two full questions of same CL, CO. Student shall answer one full question (10 marks) from each section.
2. CIE Skill test is conducted for 100 marks (3 Hours duration) as per scheme of evaluation and the obtained marks are scaled down to 20 marks.
3. SEE is conducted for 100 Marks (3 Hours duration) as per scheme of evaluation.

MODEL QUESTION PAPER**CIE, SKILL TEST AND SEMESTER END EXAMINATION**

Course & Programme: Common to all Engineering Programmes.	Semester: II
Subject: Statistics and Analytics Practice	Max Marks: 100
Course Code : 20SC21P	Duration : 3Hrs

Instruction to the Candidate: Answer both questions

Qn.No	Question	CL	CO	PO	Marks
1	For the given ungrouped data set plot the bar graph by grouping the data in Microsoft excel spread sheet and interpret the obtained results. (Dataset, bar graphs and interpretation have to be entered in the answer script). OR Generate a random data set in Microsoft excel spread sheet containing 50 data and find the mean mode and median in Microsoft excel spread sheet and interpret the obtained results. (Dataset, bar graphs and interpretation have to be entered in the answer script).	A	2,3	1,2,4,5,7	50
2	Write the python program to enter two integers and two strings and to print the sum two integers and two strings.	A	4	1,2,4,5,7	50

Questions are not framed from Unit 1 in the final SEE. Short questions can only be asked from that unit.

SCHEME OF EVALUATION FOR BOTH CIE AND SEE

Sl. No	Particulars	Marks
1	Short questions from Unit 1	10
2	Observation	30
3	Conduction	20

4	Output and Interpretation of result	20
5	Viva-voce	20
Total		100

EQUIPMENT LIST

FOR STATISTICS AND DATA ANALYTICS LAB

2 laboratories. Each containing 30 computers (Desktop) with the following system requirements.

SYSTEM REQUIREMENTS			
SL NO	REQUIREMENTS	MINIMUM	RECOMMENDED
1	RAM	4GB FOR FREE RAM	8GB OF TOTAL SYSTEM RAM
2	DISK SPACE	2.5 GB AND 1 GB FOR CACHES	SSD DRIVE WITH AT LEAST 5 GB OF FREE SPACE
3	MONITOR RESOLUTION	1024x768	1920×1080
4	OS(OPERATING SYSTEM)	OFFICIALLY RELEASED 64-BIT VERSIONS OF THE FOLLOWING: MICROSOFT WINDOWS 8 OR LATER	LATEST 64-BIT VERSION OF WINDOWS

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Department of Collegiate and Technical Education

Board of Technical Examinations, Bangalore

Course Code	20CS01P	Semester	I/II
Course Title	IT SKILLS	Course Group	ES/CS
No. of Credits	4	Type of Course	Lecture + Practice
Course Category	ES	Total Contact Hours	6Hrs Per Week
			78Hrs Per Semester
Prerequisites	Basic Computer Skills	Teaching Scheme	(L:T:P)= 1:0:2
CIE Marks	60	SEE Marks	40

1. RATIONALE

Information Technology is crucial to the majority of the business and has a great influence on innovation and engineering. Every branch of engineering and every organization opt for computers and IT skills for business automation, communication/connectivity, resource planning, work automation and securing information etc. All engineering diploma students must be conversant with the basic IT skills which empower them to learn new technologies, adapt to changes, business development, communication etc.

2. COURSE SKILL SET

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

Perform jobs related to web design and maintenance, business process automation tool management, cyber security and safety and program assistant.

3. COURSE OBJECTIVES

1. Demonstrate the basics of coding.
2. Design and develop web pages that include static and dynamic content.
3. Describe the basic concepts of Cloud and IoT.
4. Express the workflow and business automation
5. Recognize the best practices of Cyber Safety and security.

4. JOB ROLE

SL.NO	LEVEL	JOB ROLES
1	3	Junior software developer - web.
2	3	Junior Creative Designer/Digital Artist

5. PREREQUISITES

STUDENT	Basic Computer skills (Students without basic computer skills should be taught basic skills)
TEACHER	Computer science faculty with required knowledge of IT Skills.

6. COURSE OUT COMES

On successful completion of the course, the students will be able to demonstrate industry oriented Cos associated with the above mentioned competency:

COURSE OUTCOME		UNIT LINKED	CL	LINKED PO	TEACHING HOURS
CO1	Illustrate the basics of coding and develop simple applications for android phones.	1	U, A	1,4,7	15
CO2	Design and Develop websites.	2	U, A	1,4,7	30
CO3	Identify Cloud Services IoT applications	3	U	1,4,7	12
CO4	Apply workflow and use ERP for a simple project plan	4	U	1,4,7	09
CO5	Implement best practices of cyber safety and security in the workplace.	5	U, A	1,4,7	12
TOTAL					78

Legends: R = Remember; U = Understand; A = Apply and above levels CL = Cognitive Level (Bloom's revised taxonomy)

8. INSTRUCTIONAL STRATEGY

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

1. Lecturer method(L) does not mean only traditional lecture method, but different type of teaching method and media visual/graphical content that are employed to develop the outcomes
2. Massive Open on-line courses (MOOCS) can be used to teach various topics/sub topics.
3. Online coding platform wherever mentioned.
4. Hands on coding should be practiced.
5. About 15 to 20% of the topics/sub topics which are relatively simpler or descriptive in nature is to be given to the students for self-directed learning

9. DETAILS OF COURSE CONTENT

The following topics/sub topics is to be taught and assessed in order to develop Unit Skill sets for achieving CO to attain identified skill sets

UNIT NO	Topics/Sub topics	Unit skill set/Learning outcomes (In cognitive domain)	Hours L-T-P
1	UNIT 1 - INTRODUCTION TO BASICS OF CODING		05-0-10
	1.1 Introduction to computer programming 1.2 Algorithms –With sufficient examples 1.3 Flowcharts – With sufficient examples 1.4 Execute simple programs Note: Below listed or any other suitable online/offline coding platforms should be used to demonstrate and provide coding experience to students. a. https://scratch.mit.edu/	1. Understand computer programming 2. Create and write Algorithm for programmable problems. 3. Design Flowchart for programmable problems. 4. Develop simple Android application.	

	<p>b. https://studio.code.org/projects</p> <p>Suggested programs are listed in Table 1</p> <p>1.5 Introduction to Application development</p> <p>1.6 Simple android application development (No knowledge of programming language is required).</p> <p>Note:</p> <p><i>i. The purpose of application development is to ignite and promote programming skills.</i></p> <p><i>ii. Application development should be done using any App builder platforms such as</i></p> <p><i>iii. MITApp Inventor: https://appinventor.mit.edu/</i></p> <p><i>iv. Thinkable: https://thinkable.com/</i></p> <p><i>v. ibuildapp: https://ibuildapp.com/</i></p> <p><i>vi. The student should be introduced to the android application development environment for further research and learning https://developer.android.com/</i></p> <p>1.7 Activity: create a simple Android application (Unique for each student) publish on the learning management system.</p>		
2	UNIT 2 - DESIGN AND DEVELOP WEB PAGES		10-0-20
2	<p>2.1 Basic web technologies</p> <ul style="list-style-type: none"> ▪ Browser ▪ Web -Server ▪ Client-Server Model ▪ URL ▪ SEO techniques ▪ Domain names and domain name system. <p>2.2 Creating Web-pages with HTML5 - Static</p>	<ol style="list-style-type: none"> 1. Understand and examine basic web technologies 2. Creating static web pages 3. Formatting Webpages with cascading style sheets (CSS) 4. Creating Dynamic web pages with JavaScript 	

<p>web pages.</p> <ul style="list-style-type: none"> ▪ Introduction, Editors ▪ Tags, Attributes, Elements, Headings ▪ Links, Images, List, Tables, Forms ▪ Formatting, Layout, Iframes. <p>2.3 Formatting web pages with style sheets (CSS3).</p> <ul style="list-style-type: none"> ▪ Introduction to CSS ▪ Inline CSS, Internal CSS, Classes and IDs ▪ div, Color, Floating, Positioning ▪ Margins, Padding, Borders ▪ Fonts, Aligning Text, Styling Links <p>2.4 Creating a web page dynamic using JavaScript.</p> <ul style="list-style-type: none"> ▪ Dynamic web page and Introduction to JS ▪ Basic syntax ▪ Functions ▪ Events <p>Note: Refer https://www.w3schools.com</p> <p>2.6 Creating dashboards in websites.</p> <p>2.6 Activity: Personal website design and launch with a free platform or Create a Blogging website.</p> <ul style="list-style-type: none"> ▪ Online platforms (Learning and executing) ▪ https://www.w3schools.com/ ▪ https://studio.code.org ▪ https://www.khanacademy.org <p>Note:</p> <p>1) The student must be introduced to website development platforms - wordpress.com.</p> <p>2) The student must be made familiar</p>	<p>5. Creating and launching dashboard based personal website.</p>	
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	<p>with launching websites .</p> <p>Certification available:</p> <ul style="list-style-type: none"> • HTML - W3schools • CSS - W3schools • JavaScript - W3schools 		
3	UNIT 3 -BUSINESS PROCESS AUTOMATION/ERP		03:0:06
3	<p>3.1 Introduction to business process automation.</p> <p>3.2 Organization structure and functions composition-Properties and applications</p> <ul style="list-style-type: none"> ▪ Structure ▪ Types ▪ Functional Units <p>Note: Students should be made familiar with organization, types and components of a big enterprise to make him understand the working of organization keeping him as part of org.</p> <p>3.3 Workflows</p> <ul style="list-style-type: none"> ▪ Introduction ▪ Components ▪ Use and use cases <p>Note: Use free and open-source platform to demonstrate and create workflows.</p> <p>Example:</p> <p>https://airflow.apache.org/</p> <p>https://taverna.incubator.apache.org/</p> <p>https://trello.com/</p> <p>https://www.processmaker.com/</p> <p>3.4 Enterprise resource planning</p> <ul style="list-style-type: none"> ▪ History ▪ Evolution ▪ Uses of ERP ▪ ERP software tools. 	<ol style="list-style-type: none"> 1. Identify and examine the needs of business process automation. 2. Understand Organization structure and functions 3. Create and use workflows 4. Use Enterprise resource planning in workplace. 	

	<p>Note: The student should be introduced into Enterprise resource planning software tools to understand importance of ERP.</p> <p>Examples:</p> <ul style="list-style-type: none"> ▪ https://erpnext.com/ ▪ www.bitrix24.com ▪ https://www.odoo.com/ <p>3.5 Activity:</p> <ul style="list-style-type: none"> ▪ Project plan for summer internship - use open source ERP Software ▪ Identify different components of nearby organization with recourse plan and workflow design. ▪ Identify types of ERP software available with their market share. 		
4	UNIT 4 - INTRODUCTION TO CLOUD AND IOT CONCEPTS		04-0-8
	<p>4.1 Fundamentals of cloud</p> <p>4.2 Cloud service models</p> <ul style="list-style-type: none"> ▪ IaaS (Infrastructure-as-a-Service) ▪ PaaS (Platform-as-a-Service) ▪ SaaS (Software-as-a-Service) <p>4.3 Cloud deployment types</p> <ul style="list-style-type: none"> ▪ Public, ▪ Private, ▪ Hybrid ▪ Community Cloud <p>4.4 Cloud services:</p> <ul style="list-style-type: none"> ▪ Google Drive - file storage and synchronization service developed by Google; ▪ Google docs- bring your documents to life with smart editing and styling tools to help you easily format text and paragraphs; ▪ Google Co-lab (Usage of Jupyter Notebook): <i>Colab</i> notebooks allow you to combine 	<ol style="list-style-type: none"> 1. Understand Cloud concepts 2. Identify and use Cloud services 3. Understand IoT concepts 4. Identify IoT applications 	

	<p>executable code and rich text in a single document, along with images, HTML, LaTeX, and more.</p> <ul style="list-style-type: none"> ▪ Google App Engine: Google App Engine is a Platform as a Service and cloud computing platform for developing and hosting web applications in Google-managed data centers. Applications are sandboxed and run across multiple servers. <p>Note: Above cloud services are not compulsory for all branches; teacher can recommend other cloud service based on need of engineering branch.</p> <p>4.5 Working of IoT and IoT components (Only brief introduction and demonstration through videos)</p> <p>4.6 Explain concept of Internet of Things with examples</p> <ul style="list-style-type: none"> ▪ Smart home ▪ Smart city ▪ Smart farming <p>Note:</p> <p>a. Teacher can also select specific area of work where Things (autonomous computing devices) could be interconnected over TCP/IP to establish IoT.</p> <p>b. The students should be introduced to the IoT environment for further research and study.</p> <p>Example:</p> <ul style="list-style-type: none"> ▪ https://www.raspberrypi.org/ ▪ https://www.arduino.cc/ 		
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	<p>4.7 Activity: Create your cloud service account and demonstrate using cloud services. Identify cloud service provider with respect to service models and deployment types. Identify areas where Internet of Things could bring positive changes.</p>		
5	UNIT 5 - CYBERSECURITY AND SAFETY		4-0-8
	<p>5.1 Introduction to Cyber security and cyber safety.</p> <ul style="list-style-type: none"> ▪ Brief awareness on cyber safety measures ▪ Identification of basic security issues in mobile phones and personal computers ▪ Installation of Antivirus software ▪ Firewall concepts ▪ Browser settings ▪ Importance of privacy and Password policy (Best practices). <p>5.2 Common threats - Demonstration</p> <ul style="list-style-type: none"> ▪ Phishing ▪ DoS attack ▪ Man in the middle attack ▪ Eavesdropping ▪ Spamming <p>5.3 Activity</p> <ul style="list-style-type: none"> ▪ Identification of basic security issues in computers of your college and fixing the same. ▪ Visit nearby government organization. <ul style="list-style-type: none"> ▪ Identify basic cybersecurity issues and fixing the same ▪ Demonstrate the importance of cybersecurity, password policy, and cyber safety. 	<ol style="list-style-type: none"> 1. Identify need for Cyber security and cyber safety 2. Identify basic security issues in mobile phones and personal computers 3. Examine Importance of privacy, Password policy 4. Implement best practices of cyber safety and security in work place 	

10. SUGGESTED PRACTICAL SKILL EXERCISES**TABLE-I**

Sl. No.	Practical Out Comes/Practical exercises	Unit No.	PO	CO
1	Write an algorithm for programmable problems Example for Reference: <ul style="list-style-type: none"> • Add/subtract two numbers • Find the largest/smallest of 3 numbers • Calculate and print sum of 'N' numbers 	1	1,4,7	1
2	Design a flowchart for programmable problems Example for Reference: Add/subtract two numbers Find the largest/smallest of 3 numbers Calculate and print sum of 'N' numbers	1	1,4,7	1
3	Design and create simple game using MIT-scratch/Code.org	1	1,4,7	1
4	Design and create simple android application (MIT App Inventor)	1	1,4,7	1
5	Design and create webpage for displaying your poem (Title, header, paragraph, formatting tags)	2	1,4,7	2
6	Design and create webpage for your wish list (What you want to do). Also list challenges and opportunities along with images to present your dreams (List ordered and unordered, Image, table)	2	1,4,7	2
7	Design and create webpage using HTML and CSS about an awesome animal (Use necessary CSS tags)	2	1,4,7	2
8	Design and create web page for a travel book/recipe book with more than 3 pages, table to list places/recipes (iframe, hyperlink)	2	1,4,7	2
9	Design and create web page with JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient	2	1,4,7	2
10	Design and create a personal webpage with dashboard	2	1,4,7	2
11	Design and create web page about advantages of business process automation with respect to your branch of engineering	2,3	1,4,7	2,3

12	Create a workflow for education loan approval in bank/diploma admission process (Use any tool)	3	1,4,7	3
13	Demonstrate ERP with ERPNext Demo for manufacturing, retail and service sector (Use any other ERP tools)	3	1,4,7	3
14	Create user account and demonstrate use of Google drive, Google docs, Google Co-lab (Usage of Jupyter Notebook)	4	1,4,7	4
15	1.1 Demonstrate Internet of Things using with examples a. Smart home b. Smart city c. Smart farming Note: Teacher can also select specific area of work where Things (autonomous computing devices) could be interconnected over TCP/IP to establish IoT.	4	1,4,7	4
16	Installation of Antivirus software	5	1,4,7	5
17	Demonstration and hands on browser settings	5	1,4,7	5
18	Demonstration and hands on privacy settings and password policy	5	1,4,7	5
19	Demonstration of common security threats (using videos) a. Phishing b. DoS attack c. Man in the middle attack d. Spamming e. Virus	5	1,4,7	5

The suggested practical activities (TABLE-I) in this section are demonstrated for the attainment of the competency. These practical activities can also be used for the student assessment in portfolio mode for awarding CIE marks. **The lecturer can enhance the competency level of the students by sketching more practical exercises.**

NOTES:

1. It is compulsory to prepare log book/record of exercises. It is also required to get each exercise recorded in logbook, checked and duly dated signed by the teacher
2. Student activities are compulsory and are also required to be performed and noted in logbook.
3. Student activity is compulsory and part of skill assessment. The activity enable student to explore the course, help student to demonstrate creativity & critical thinking.
4. Student activity report is compulsory part to be submitted at the time of practical ESE
5. Term work report is compulsory part to be submitted at the time of practical ESE.

6. Student activity and student activity reports must be uploaded to Learning management system.
7. For CIE, students are to be assessed for Skills/competencies achieved.

11. MAPPING OF CO WITH PO

COURSE	CO'S	PROGRAMME OUTCOMES (PO'S)						
		1	2	3	4	5	6	7
IT SKILLS	CO1	3	0	0	3	0	0	3
	CO2	3	0	0	3	0	0	3
	CO3	3	0	0	3	0	0	0
	CO4	3	0	0	3	0	0	3
	CO5	3	0	0	3	0	0	0
Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped								

12 SUGGESTED LEARNING RESOURCES

BOOKS	
1	The Art of Programming Through Flowcharts & Algorithms, A. B. Chaudhuri, Firewall Media publication
2	HTML5 Black Book, by Publishing company Limited. Kogent Learning Solutions Inc.
3	“World Wide Web design with HTML”, Xavier, Tata McGraw-Hill
4	Internet of Things – A Hands on Approach, By ArshdeepBahga and Vijay Madiseti Universities Press, ISBN: 9788173719547
URL'S	
1	https://scratch.mit.edu
2	https://studio.code.org
3	http://ai2.appinventor.mit.edu
4	https://www.w3schools.com
5	https://www.tutorialspoint.com/javascript/index.htm
6	https://www.geeksforgeeks.org/html-tutorials/
7	Android https://developer.android.com
8	https://www.khanacademy.org
9	Tools for Web Development a. https://www.wix.com

b. https://atom.io/
c. https://www.openelement.com/
d. https://www.layoutit.com

13. SUGGESTED LIST OF PROPOSED STUDENTS ACTIVITY

Note: Refer activities mentioned in DETAILS OF COURSE CONTENT table

14. COURSE ASSESSMENT AND EVALUATION CHART

SL.N O	ASSESSMENT	DURATIO N (in minutes)	MAX MARKS	CONVERSION
1	CIE Assessment 1 (Written Test -1 TH) - At the end of 3 ^d week	60	20	Average of two written tests 20
2	CIE Assessment 2 (Written Test -2 TH) - At the end of 13 week	60	20	
3	CIE Assessment 3 (Skill Test) - At the end of 5 week	3 hrs	20	Average of three skill test 20
4	CIE Assessment 4 (Skill Test) - At the end of 7 week	3 hrs	20	
5	CIE Assessment 5 (Skill Test) - At the end of 9 week	3 hrs	20	
6	CIE Assessment 6 (Student activity)- At the end of 11 week	-	20	20
7	Total Continuous Internal Evaluation (CIE) Assessment			60
8	Semester End Examination(SEE) Assessment (Practical Test)	3 hrs	100	40
TOAL MARKS				100
Note: CIE written test is conducted for 20 marks (Two sections). Each section shall have two full questions of same CL, CO. Student shall answer one full question from each section.				

15. RUBRICS FOR ACTIVITY

RUBRICS FOR ACTIVITY (Example Only)						
Appropriate rubrics shall be developed by the concerned faculty						
Dimension	Poor	Below Average	Average	Good	Exemplary	Student Score
	4	8	12	16	20	
Concept	Does not collect any information relating to the concept	Collects very limited information; some relate to the concept	Collect much information; but very limited relate to the concept	Collects some basic information; most refer to the concept	Collects a great deal of information; all refer to the concept	8
Design	Design is not acceptable/very poorly structured	Design is poor and not well structured.	Design Followed layout samples and well structured	Design & convey both content and context	Design considered all aspect of concept, concept and presentation (UI)	6
Creativity	Very little creativity in design/implementation	Creativity in concept or design or implementation	Creativity in concept /design/implementation	Creativity in concept /design/implementation which complements each other	Creative concept, content, presentation and implementation	8
Implementation	Poorly implemented	Partially implemented	Implemented on time with results (content)	Product convey both content and context	Product is creative with easy-to-use UI, structure	8
Average / Total Marks: (8+6+8+8)/4						7.5 = 8

16. RUBRICS for Skill Test Evaluation (Both for CIE & SEE)

Sl No	Parameter to be Observed	Marks Allotted
1	Design-Written Skill Test 1: Algorithm / Flowchart/Visual Design Skill Test 2: Web site visual design Skill Test 3: Work flow or Project plan or cyber security plan or Cloud service Concept	30
2	Implementation Skill Test 1: Android application Skill Test 2: Web site / Web pages Skill Test 3: Create or use cloud service account or Cyber safety and security- Antivirus Installation or browser settings	50
3	Appeal and Presentation	20
Total		100

17. SYSTEM REQUIREMENTS:

Sl. No.	Specification	Quantity
1.	Computers with HD Graphics Card	20
2.	Software: GIMP, KRETA, BLENDER, PHOTOSHOP or any other relevant open-source software.	-
3.	Internet Connectivity	-

Note: Above specification is for a batch of 20 students

Government of Karnataka
Department of Collegiate and Technical Education
Board of Technical Examinations, Bangalore

Course Code	20AU01T	Semester	I
Course Title	ENVIRONMENTAL SUSTAINABILITY	Course Group	Audit
No. of Credits	2	Type of Course	Lecture
Course Category	AU	Total Contact Hours	2Hrs Per Week
			26Hrs Per Semester
Prerequisites	Basic Environmental Science	Teaching Scheme	(L:T:P)= 2:0:0
CIE Marks	50	SEE Marks	No

COURSE OBJECTIVES:

Technicians working in industries or elsewhere essentially require the knowledge of environmental science so as to enable them to work and produce most efficient, economical and eco-friendly finished products.

1. Solve various engineering problems applying ecosystem to produce eco - friendly products.
2. Use relevant air and noise control methods to solve domestic and industrial problems.
3. Use relevant water and soil control methods to solve domestic and industrial problems.
4. To recognize relevant energy sources required for domestic and industrial applications.
5. Solve local solid and e-waste problems.

COURSE OUTCOMES:

At the end of the course student will be able to know :

C01	Importance of ecosystem and terminology.
C02	The extent of air pollution, effects, control measures and acts.
C03	The extent of noise pollution, effects, control measures and acts.
C04	The water and soil pollution, effects, control measures and acts
C05	Different renewable energy resources and efficient process of harvesting.
C06	Solid Waste Management and Environmental acts.

COURSE CONTENT:

Marks: 15	Unit-1 Ecosystem	Allotted Hrs: 03
Structure of ecosystem, Biotic & Abiotic components, Aquatic (Lentic and Lotic) and terrestrial ecosystem. Global warming - Causes, effects, Green House Effect, Ozone depletion.		
Marks: 20	Unit-2 Air Pollution	Allotted Hrs: 03
Air pollution, Natural and manmade sources of air pollution, Effects of air pollution. Air Pollutants and Types. Control of air pollutants by Cyclone separator and Electrostatic Precipitator, Air (prevention and control of pollution) act 1981		
Marks: 10	Unit-3 Noise Pollution:	Allotted Hrs: 02
Noise pollution: sources of pollution, measurement of pollution level, Effects and Control of Noise pollution, Noise pollution (Regulation and Control) Rules, 2000		
Marks: 20	Unit-4 Water and Soil Pollution:	Allotted Hrs: 06
Water pollution and Sources of water pollution, Types of water pollutants, Characteristics of water pollutants, control measures of water pollution. Definition and list unit operations in water and WasteWater Treatment process, Water (prevention and control of pollution) act 1974, Water conservation - Importance of Rain Water Harvesting. Soil pollution, Causes, Effects and Preventive measures of Soil Pollution due to Excessive use of Fertilizers, Pesticides and Insecticides		
Marks: 20	Unit-5 Renewable sources of Energy	Allotted Hrs: 07
Solar Energy: Basics of Solar energy. Definition and advantages of advanced solar collectors. Solar water heater and Solar stills and their uses. Biomass: Overview of biomass as energy source. Thermal characteristics of biomass as fuel. Wind energy: Current status and future prospects of wind energy. Wind energy in India. Need of new Energy sources, Different type's new energy sources. Environmental benefits of New Energy Sources-Hydrogen energy, Ocean energy resources, Tidal energy conversion.		
Marks: 15	Unit-6 Solid Waste Management and Environmental Acts	Allotted Hrs: 05
Solid waste generation, Sources and characteristics of Municipal solid waste, Solid Waste Management rules 2016- 3R in SWM. E- Waste generation, Sources and characteristics, E waste management rules 2016 Plastic Waste generation, Sources and characteristics, Recycled plastic rules 2016 Importance of Environment (protection) act 1986 Occupational health and safety measures.		

Unit No & Name	Detailed Course Content	CO	PO	Contact Hrs
1. Ecosystem	Structure of ecosystem, Biotic & Abiotic components, Aquatic (Lentic and Lotic) and terrestrial ecosystem.	CO1	1,5,7	1
	Global warming - Causes, effects.	CO1	1,5,7	2
	Green House Effect, Ozone depletion - Causes, effects	CO1	1,5,7	3
2. Air and Pollution	Air pollution, Natural sources of air pollution, Man Made sources of air pollution	CO2	1,5,7	4
	Air pollutants and Types, Effects of Particulate Pollutants and control by Cyclone separator	CO2	1,5,7	5
	Effects of Particulate Pollutants and control by Electrostatic Precipitator, Air (prevention and control of pollution) act 1981.	CO2	1,5,7	6
3. Water and Soil Pollution	Noise pollution: sources of pollution, Measurement of Noise pollution level.	CO3	1,5,7	7
	Effects and Control of Noise pollution. Noise pollution (Regulation and Control) Rules, 2000	CO3	1,5,7	8

4. Water and Soil Pollution:	Sources of water pollution. Types of water pollutants, Characteristics of water pollutants.	C04	1,5,7	9
	Control measures of water pollution.	C04	1,5,7	10
	Definition and list unit operations in water and WasteWater Treatment process, Water (prevention and control of pollution) act 1974.	C04	1,5,7	11
	Water conservation – Importance of Rain Water Harvesting	C04	1,5,7	12
	Soil pollution, Causes and Effects due to Fertilizers, Pesticides and Insecticides	C04	1,5,7	13
	Preventive measures of Soil Pollution due to Excessive use of Fertilizers, Pesticides and Insecticides.	C04	1,5,7	14
5. Renewable sources of Energy	Solar Energy: Basics of Solar energy. Solar collectors and advantages of Advanced solar collectors.	C05	1,5,7	15
	Solar water heater, Solar stills and their uses.	C05	1,5,7	16
	Biomass: Overview of biomass as energy source. Thermal characteristics of biomass as fuel.			17
	Wind energy: Current status and future prospects of wind energy. Wind energy in India.	C05	1,5,7	18
	Need of new Energy sources, Different type's new energy sources. Environmental benefits of New Energy Sources-Hydrogen energy	C05	1,5,7	19
	Environmental benefits of New Energy Sources- Ocean energy resources	C05	1,5,7	20
	Environmental benefits of New Energy Sources-Tidal energy conversion.	C05	1,5,7	21
6. Solid Waste Management And Environmental Acts	Solid waste generation, Sources, Characteristics of solid waste Solid Waste Management rules 2016	C06	1,5,7	22
	E- Waste generation Sources and characteristics, E waste management rules 2016	C06	1,5,7	23
	Plastic Waste generation Sources and characteristics, Plastic Waste Sources and characteristics	C06	1,5,7	24
	Recycled plastic rules 2016,Importance of Environment (protection) act 1986,	C06	1,5,7	25
	Occupational health and safety measures.	C06	1,5,7	26
			Total	26

References:

(a) Suggested Learning Resources:

Books:

1. S.C. Sharma & M.P. Poonia, Environmental Studies, Khanna Publishing House, New Delhi
2. C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011.
3. Arceivala, Soli Asolekar, Shyam, Waste Water Treatment for Pollution Control and Reuse, Mc-Graw Hill Education India Pvt. Ltd., New York, 2007, ISBN:978-07-062099.
4. Nazaroff, William, Cohen, Lisa, Environmental Engineering Science, Willy, New York, 2000, ISBN 10: 0471144940.
5. O.P. Gupta, Elements of Environmental Pollution Control, Khanna Publishing House, New Delhi

6. Rao, C. S., Environmental Pollution Control and Engineering, New Age International Publication, 2007, ISBN: 81-224-1835-X.
1. Rao, M. N.Rao, H.V.N, Air Pollution, Tata Mc-Graw Hill Publication, New delhi, 1988, ISBN: 0-07- 451871-8.
2. Frank Kreith, Jan F Kreider, Principles of Solar Engineering, McGraw-Hill, New York ; 1978, ISBN: 9780070354760.
7. Aldo Vieira, Da Rosa, Fundamentals of renewable energy processes, Academic Press Oxford, UK; 2013. ISBN: 9780123978257.
3. Patvardhan, A.D, Industrial Solid Waste, Teri Press, New Delhi, 2013, ISBN:978-81-7993-502-6
4. Metcalf & Eddy, Waste Water Engineering, Mc-Graw Hill, New York, 2013, ISBN: 077441206.
5. Keshav Kant, Air Pollution & Control, Khanna Publishing House, New Delhi (Edition 2018)

(b) Open source software and website address:

- 1) www.eco-prayer.org
- 2) www.teriin.org
- 3) www.cpcp.nic.in
- 4) www.cpcp.gov.in
- 5) www.indiaenvironmentportal.org.in
- 6) www.whatis.techtarget.com
- 7) www.sustainabledevelopment.un.org
- 8) www.conserve-energy-future.com

Teachers should use the following strategies to achieve the various outcomes of the course.

- Different methods of teaching and media to be used to attain classroom attention.
- Massive open online courses (MOOCs) may be used to teach various topics/subtopics.
- 15-20% of the topics which are relatively simpler or descriptive in nature should be given to the students for self-learning and assess the development of competency through classroom presentations.
- Micro-projects may be given to group of students for hand-on experiences
- Encouraging students to visit sites such as Railway station and research establishment around the institution.

Mapping of Course Outcomes with Programme Outcomes

CO	Course Outcome	PO Mapped	Cognitive Level R/U/A	Theory Sessions In Hrs	Allotted marks for CIE on cognitive levels		TOTAL
					R	U	
CO1	Importance Of ecosystem and terminology	1,5,7	R,U	03	02	02	04
CO2	The extent of air pollution, effects, control measures and acts.	1,5,7	R,U	03	03	02	05
CO3	The extent of noise pollution, effects, control measures and acts.	1,5,7	R,U	02	03	02	05
CO4	The water and soil pollution, effects, control measures and acts	1,5,7	R,U	06	03	02	05