

CURRICULUM STRUCTURE

I Semester Scheme of Studies - Diploma in Computer Science & Engineering [C-20]

S. N	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			Only SGPA for 1 st Semester	
2	ES/CS	20CS11T	Fundamentals of Computer	4	0	0	4	4	50	20	50	20	100	40				
PRACTICAL COURSES																		
3	ES/EE/EC	20EC01P	Fundamentals of Electrical & Electronics Engineering	2	0	4	6	4	60	24	40	16	100	40				
4	ES/CS	20CS01P	IT Skills	2	0	4	6	4	60	24	40	16	100	40				
AUDIT COURSES																		
5	AU/SC	20AU01T	Environment Sustainability	2	0	0	2	2	50	20	-	-	50	20				
6	AU Physical Activity		Sports/NCC/NSS/Youth Red Cross/Yoga/ Technical club.	Student shall enrol in any one of these activities in 1 st semester and shall participate actively. The student shall obtain ‘Participation Certificate’ in the activity to get eligible for the award of Diploma.														
Total				14	0	8	22	18	270	108	180	72	450	180				

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:

- Assigned Grade, Grade Point, SGPA and CGPA to be recorded in the Grade/Marks card.
- AU- Physical Activity- Student participation in the selected physical activity shall be monitored and the participation record shall be maintained by the respective Programme Coordinator (Head of Section).
- Theory course Semester End Examination (SEE) is conducted for 100 marks (3 Hours duration)
- 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	20SC01T	Semester	I/II
Course Title	ENGINEERING MATHEMATICS	Course Group	Core
No. of Credits	4	Type of Course	Lecture
Course Category	Theory	Total Contact Hours	4Hrs Per Week
			52Hrs Per Semester
Prerequisites	10 Level Mathematics	Teaching Scheme	(L:T:P) = 4:0:0
CIE Marks	50	SEE Marks	50

RATIONALE

Engineering Mathematics specification provides students with access to important mathematical ideas to develop the mathematical knowledge and skills that they will draw on in their personal and work lives. The course enable students to develop mathematical conceptualization, inquiry, reasoning, and communication skills and the ability to use mathematics to formulate and solve problems in everyday life, as well as in mathematical contexts. At this level, the mathematics curriculum further integrates the three content areas taught in the higher grades into three main learning areas: Algebra; Measurement of angles and Trigonometry and Calculus.

1. COURSE SKILL SET

Student will be able to:

1. Solve system of linear equations arise in different engineering fields
2. Incorporate the knowledge of calculus to support their concurrent and subsequent engineering studies
3. Adept at solving quantitative problems
4. Ability to understand both concrete and abstract problems
5. Proficient in communicating mathematical ideas
6. Detail-oriented

2. COURSE OUT COMES

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

CO1	Determine the inverse of a square matrix using matrix algebra. Apply the concepts of matrices and determinants to solve system of linear equations and find eigen values associated with the square matrix.
CO2	Find the equation of straight line in different forms. Determine the parallelism and perpendicularity of lines.
CO3	Calculate trigonometric ratios of allied angles and compound angles. Transform sum or difference of trigonometric ratios into product and vice versa.

CO4	Differentiate various continuous functions and apply the concept in real life situations.
CO5	Integrate various continuous functions and apply the concept in evaluating the area and volume through definite integrals.

3. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS

UNIT NO	UNIT TITLE	TEACHING HOURS	DISTRIBUTION (THEORY)			
			R LEVEL	U LEVEL	A LEVEL	TOTAL
1	Matrices and Determinants	10	8	20	12	40
2	Straight lines	10	8	20	12	40
3	Trigonometry	10	8	20	12	40
4	Differential Calculus and applications	11	8	20	12	40
5	Integral Calculus and applications	11	8	20	12	40
	Total	52	40	100	60	200

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

4. 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
UNIT-1 MATRICES AND DETERMINANTS	➤ Use algebraic skills which are essential for the study of systems of linear equations, matrix algebra and eigen values	1.1 Matrix and types 1.2 Algebra of Matrices (addition, subtraction, scalar multiplication and multiplication) 1.3 Evaluation of determinants of a square matrix of order 2 and 3. Singular matrices 1.4 Cramer's rule for solving system of linear equations involving 2 and 3 variables 1.5 Adjoint and Inverse of the non-singular matrices of order 2 and 3 1.6 Characteristic equation and Eigen values of a square matrix of order 2	10-0-0

UNIT-2 STRAIGHT LINES	➤ Able to find the equation of a straight line in different forms ➤ Determine whether the lines are parallel or perpendicular	2.1 Slope of a straight line 2.2 Intercepts of a straight line 2.3 Intercept form of a straight line 2.4 Slope-intercept form of a straight line 2.5 Slope-point form of a straight line 2.6 Two-point form of a straight line 2.7 General form of a straight line 2.8 Angle between two lines and conditions for lines to be parallel and perpendicular 2.9 Equation of a straight line parallel to the given line 2.10 Equation of a straight line perpendicular to the given line	10-0-0
UNIT-3 TRIGONOMETRY	➤ Use basic trigonometric skills in finding the trigonometric ratios of allied and compound angles ➤ Able to find all the measurable dimensions of a triangle	3.1 Concept of angles, their measurement, Radian measure and related conversions. 3.2 Signs of trigonometric ratios in different quadrants (ASTC rule) 3.3 Trigonometric ratios of allied angles (definition and the table of trigonometric ratios of standard allied angles say $90^\circ \pm \theta$, $180^\circ \pm \theta$, $270^\circ \pm \theta$ and $360^\circ \pm \theta$) 3.4 Trigonometric ratios of compound angles (without proof) 3.5 Trigonometric ratios of multiple angles 3.6 Transformation formulae	10-0-0
UNIT-4 DIFFERENTIAL CALCULUS AND APPLICATIONS	➤ Able to differentiate algebraic, exponential, trigonometric, logarithmic and composite functions ➤ Able to find higher order derivatives ➤ Understand and work with derivatives as rates of change in mathematical models ➤ Find local maxima and minima of a function	4.1 Derivatives of continuous functions in an interval (List of formulae) 4.2 Rules of differentiation 4.3 Successive differentiation (up to second order) 4.4 Applications of differentiation	11-0-0
UNIT-5 INTEGRAL CALCULUS AND APPLICATIONS	➤ Understand the basic rules of integration and Evaluate integrals with basic integrands. ➤ Identify the methods to evaluate integrands ➤ Apply the skills to evaluate integrals representing areas and volumes	5.1 List of standard integrals and Basic rules of integration 5.2 Evaluation of integrals of simple function and their combination 5.3 Methods of integration 5.4 Concept of definite integrals 5.5 Applications of definite integrals	11-0-0

5. MAPPING OF CO WITH PO

CO	Course Outcome	PO Mapped	UNIT Linked	CL R/U/A	Theory in Hrs	TOT AL
C01	Determine the inverse of a square matrix using matrix algebra. Apply the concepts of matrices and determinants to solve system of linear equations and find eigen values associated with the square matrix.	1, 7	1	R/U/A	10	40
C02	Find the equation of straight line in different forms. Determine the parallelism and perpendicularity of lines.	1, 7	2	R/U/A	10	40
C03	Calculate trigonometric ratios of allied angles and compound angles. Transform sum (difference) of trigonometric ratios into product and vice versa.	1, 7	3	R/U/A	10	40
C04	Differentiate various continuous functions and apply the concept in real life situations.	1, 3, 7	4	R/U/A	11	40
C05	Integrate various continuous functions and apply the concept in evaluating the area and volume through definite integrals.	1, 3, 7	5	R/U/A	11	40
					52	200

Course	CO's	Programme Outcomes (PO's)						
		1	2	3	4	5	6	7
ENGINEERING MATHEMATICS	C01	3	1	0	0	0	0	3
	C02	3	1	0	0	0	0	3
	C03	3	1	0	0	0	0	3
	C04	3	1	3	0	0	0	3
	C05	3	1	3	0	0	0	3
Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped								

7. INSTRUCTIONAL STRATEGY

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

1. Explicit instruction will be provided in intervention classes or by using different differentiation strategies in the main classroom.
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. Observing the way their more proficient peers use prior knowledge to solve current challenges and persevere in problem solving will help struggling students to improve their approach to engaging with rich contextual problems.
4. Ten minutes a day in homeroom, at the end of class, or as a station in a series of math activities will help students build speed and confidence.
5. Topics will be introduced in a multiple representation.
6. The teacher is able to show different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
7. In a perfect world, teacher would always be able to demonstrate how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding. When a concept cannot be applied in that manner, we can still share how it might be applied within mathematics.

8. SUGGESTED LEARNING RESOURCES:

Sl. No.	Author	Title of Books	Publication/Year
1	B.S. Grewal	Higher Engineering Mathematics	Khanna Publishers, New Delhi, 40th Edition, 2007
2	G. B. Thomas, R. L. Finney	Calculus and Analytic Geometry	Addison Wesley, 9th Edition, 1995
3	S.S. Sabharwal, Sunita Jain, Eagle Parkashan	Applied Mathematics, Vol. I & II	Jalandhar.
4	Comprehensive Mathematics	Comprehensive Mathematics Vol. I & II	Laxmi Publications, Delhi
5	Reena Garg & Chandrika Prasad	Advanced Engineering Mathematics	Khanna Publishing House, New Delhi

9. COURSE ASSESSMENT AND EVALUATION CHART

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

Note:

1. SEE (Semester End Examination) is conducted for 100 Marks theory courses for a time duration of 3 Hours.
2. Three CIE (written test), each of 30 marks for a time duration of 80 minutes shall be conducted. Also, three CIE (MCQ or Quiz/Open book test/student activity or assignment) each of 20 marks for the time duration of 60 minutes shall be conducted. Any fraction at any stage during evaluation will be rounded off to the next higher digit
3. Assessment of assignment and student activity is evaluated through appropriate rubrics by the respective course coordinator. The secured mark in each case is rounded off to the next higher digit.

10 DETAILED COURSE CONTENT

UNIT NO AND NAME	DETAILED COURSE CONTENT	CO	PO	CONTACT HRS	TOTAL
1 MATRICES AND DETERMINANTS	Definition and types of matrices	1	1,7	1	10
	Algebra of Matrices (addition, subtraction and scalar multiplication) problems	1	1,7	1	
	Multiplication of Matrices(problems)	1	1,7	1	
	Evaluation of 2x2 ,3x3 determinants and Singular matrices and problems in finding unknown variable	1	1,7	1	
	Cramer's rule to solve system of linear equation with 2 and 3 variables	1	1,7	1	
	Cramer's rule to solve system of linear equation with 2 and 3 variables.problems	1	1,7	1	
	Minors, Cofactors of elements of square matrices of order 2 and 3	1	1,7	1	
	Adjoint of a square matrix(2x2 and 3x3),Inverse of a non singular square matrix	1	1,7	1	
	Adjoint of a square matrix(2x2 and 3x3),Inverse of a non singular square matrix and problems	1	1,7	1	
	Characteristic equation and eigen values of a 2x2 matrix and problems	1	1,7	1	
2 STRAIGHT LINES	Slope of the straight line(provided with inclination and two points on the line as well) and problems	2	1,7	1	10
	Intercepts of a straight line and problems	2	1,7	1	
	Intercept form of a straight line and problems	2	1,7	1	
	Slope-intercept form of a straight line and problems	2	1,7	1	
	Slope-point form of the straight line and problems	2	1,7	1	
	Two-point form of a straight line and problems	2	1,7	1	
	General form of a straight line.problems on finding slope and intercepts.	2	1,7	1	
	Angle between two straight lines and conditions for the lines to be parallel and perpendicular and problems	2	1,7	1	
	Equation of a line parallel to the given line and problems	2	1,7	1	
	Equation of a line perpendicular to the given line.problems	2	1,7	1	

3	TRIGONOMETRY	Concept of angles and their measurement. Radian measures and related conversions (degree to radian and vice-versa) and problems	3	1,7	1	10
		Signs of trigonometric ratios in different quadrants (ASTC rule)	3	1,7	1	
		Trigonometric ratios of allied angles (definition and the table of trigonometric ratios of standard allied angles say $90^\circ \pm \theta$, $180^\circ \pm \theta$, $270^\circ \pm \theta$ and $360^\circ \pm \theta$)	3	1,7	1	
		Problems on allied angles. (proving identities)	3	1,7	1	
		Problems on allied angles. (Finding values of x in an identity)	3	1,7	1	
		Trigonometric ratios of compound angles (without proof)	3	1,7	1	
		Trigonometric ratios of multiple angles ($\sin 2A$, $\cos 2A$, $\tan 2A$, $\sin 3A$, $\cos 3A$ and $\tan 3A$)	3	1,7	1	
		Problems on multiple angles $\sin 2A$, $\cos 2A$, $\tan 2A$, $\sin 3A$, $\cos 3A$ and $\tan 3A$	3	1,7	1	
		Transformation formulae (without proof) as sum to product. (Simple problems)	3	1,7	1	
		Transformation formulae (without proof) as product to sum. (Simple problems)	3	1,7	1	
4	DIFFERENTIAL CALCULUS AND APPLICATIONS	Definition of a derivative of a function. Listing the derivatives of standard functions. (Algebraic, trigonometric, exponential, logarithmic and inverse trigonometric functions)	4	1,3,7	1	11
		Addition and subtraction rule of differentiation and problems	4	1,3,7	1	
		Product rule and quotient rule of differentiation and problems	4	1,3,7	1	
		Product rule and quotient rule of differentiation and problems	4	1,3,7	1	
		Composite functions and their derivatives. (CHAIN RULE)	4	1,3,7	1	
		Composite functions and their derivatives. (CHAIN RULE). Problems	4	1,3,7	1	
		Successive differentiation up to second order	4	1,3,7	1	
		Slope of the tangent and normal to the given curve and their equations and problems	4	1,3,7	1	

	Rate measure: velocity and acceleration at a point of time and problems	4	1,3,7	1	
	Local Maxima and Minima of a function	4	1,3,7	1	
	Local Maxima and Minima of a function. Problems	4	1,3,7	1	
5 INTEGRAL CALCULUS AND APPLICATIONS	Definition of an indefinite integral. Listing the Integrals of standard functions. (Algebraic, trigonometric, exponential, logarithmic and inverse trigonometric functions)	5	1,3,7	1	11
	Rules of Integration. Evaluation of integrals with simple integrands and their combinations	5	1,3,7	1	
	Rules of Integration. Evaluation of integrals with simple integrands and their combinations. Problems	5	1,3,7	1	
	Evaluation of integrals with simple integrands and their combinations. Problems	5	1,3,7	1	
	Evaluation of integrals by Substitution method	5	1,3,7	1	
	Evaluation of integrals by Integration by parts	5	1,3,7	1	
	Evaluation of integrals by Integration by parts. Problems	5	1,3,7	1	
	Definition of definite integrals and their evaluation	5	1,3,7	1	
	Evaluation of Definite integrals. Problems	5	1,3,7	1	
	Area enclosed by the curves by integral method	5	1,3,7	1	
	Volume generated by the curve rotated about an axis by integral method	5	1,3,7	1	

First Semester Examination, Model Question Paper – 2020

Engineering Mathematics

Duration: 3Hours]

Subject Code: 20SC01T

[Max. Marks:100

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

SECTION – 1

- 1**
- a** If the matrix $\begin{bmatrix} 2 & 4 & 6 \\ 2 & x & 2 \\ 6 & 8 & 14 \end{bmatrix}$ is singular then find x . **4**
- b** Find the A^2 for the matrix $\begin{bmatrix} 1 & 3 & 4 \\ -1 & 2 & 1 \\ 0 & 3 & 3 \end{bmatrix}$. **5**
- c** Solve $2x - y = 3$ and $x + 2y = 4$ by using determinant method. **5**
- d** Find the inverse of the matrix $\begin{bmatrix} 2 & 3 & 1 \\ -1 & 2 & 1 \\ 5 & 4 & 3 \end{bmatrix}$. **6**
- 2**
- a** If $A = \begin{bmatrix} 2 & -1 \\ 4 & 0 \\ 1 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -3 & 4 \\ -1 & -1 & 1 \\ 0 & 4 & 2 \end{bmatrix}$ then find $(AB)^T$. **4**
- b** Verify whether $AB=BA$ for the matrices $A = \begin{bmatrix} 1 & 0 & 5 \\ -1 & 2 & 1 \\ 5 & 4 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & -1 & 4 \\ 0 & -1 & 1 \\ 2 & 4 & -2 \end{bmatrix}$. **5**
- c** Find the Adjoint of the matrix $A = \begin{bmatrix} 1 & 3 & 4 \\ -1 & 2 & 1 \\ 0 & 3 & 3 \end{bmatrix}$. **5**
- d** Find the characteristic equation and eigen values for the matrix $\begin{bmatrix} 1 & 2 \\ 3 & 1 \end{bmatrix}$. **6**

SECTION – 2

- 3**
- a** If the straight line is passing through the points (1, 2) and (3, 5) then find the slope of the line. **4**
- b** Write the standard intercept form of the straight line and hence find the equation of the straight line whose x and y intercepts are 2 and 3 respectively. **5**
- c** Write the standard slope-intercept form of a straight line. Find the equation of the straight line passing through the point (3, 5) and slope 4 units. **5**
- d** Find the equation of the straight line parallel to the line passing through the points (1, 3) and (4, 6). **6**
- 4**
- a** i) If a line inclined at 45° with x-axis find its slope. ii) Write the x and y intercept of the line $2x+3y=10$. **2+2**
- b** Find the equation of the straight line whose angle of inclination is 45° and passing through the origin. **5**
- c** Find the equation of the straight line perpendicular to the line $2x+6y=3$ and with the y intercept 2 units. **5**
- d** Find the acute angle between the lines $7x-4y=0$ and $3x-11y+5=0$. **6**

SECTION – 3

- 5**
- a** Express 75° in radian measure and $3\pi/2$ in degree. **4**
- b** Prove that $\cos(A+B)\cos(A-B) = \cos^2 A - \sin^2 B$. **5**
- c** Show that $\cos 2\theta = 2\cos^2 \theta - 1$. **5**

- d** Find the value of $\sin 120^\circ \cdot \cos 330^\circ - \sin 240^\circ \cdot \cos 390^\circ$ without using calculator. **6**
- 6 a** Find the value of $\sin 15^\circ$. **4**
- b** Simplify $\frac{\cos(360^\circ - A) \tan(360^\circ + A)}{\cot(270^\circ - A) \sin(90^\circ + A)}$. **5**
- c** Prove that $\sin 3\theta = 3\sin \theta - 4\sin^3 \theta$. **5**
- d** Prove that $\sin 20^\circ \cdot \sin 40^\circ \cdot \sin 80^\circ = \frac{\sqrt{3}}{8}$. **6**

SECTION – 4

- 7 a** Find the derivative of $y = x^2 + e^{2x} + \cos 2x - 2 \log x$ with respect to x . **4**
- b** Find dy/dx of $y = \frac{\sec x + \tan x}{\sec x - \tan x}$. **5**
- c** Find dy/dx of $y = \tan^{-1} \left(\frac{1+x}{1-x} \right)$. **5**
- d** If the $s = 2x^3 + 3x + 4$ represents the displacement of the particle in motion at time x , then find the velocity of the particle at $x = 2$ secs and acceleration at $x = 3$ secs. **6**
- 8 a** Find $\frac{dy}{dx}$ of $y = 3x^4 + 4 \log x + 2e^{3x} + \tan^{-1} x$. **4**
- b** If $y = e^{2x} \sin 3x$ then find $\frac{dy}{dx}$. **5**
- c** Find $\frac{d^2y}{dx^2}$ if $y = 3 \sin x + 4 \cos x$ at $x = 1$. **5**
- d** Find the equation of tangent and normal to the curve $y = x^2$ at the point $(1, 1)$. **6**

SECTION – 5

- 9 a** Evaluate $\int (x-1)(x+1)dx$. **4**
- b** Evaluate $\int_0^{p/2} \sin^2 x \, dx$ **5**
- c** Evaluate $\int x \sin x \, dx$. **5**
- d** Find the area bounded by the curve $y = 4x - x^2 - 3$, x-axis and ordinates $x = 1$ and $x = 3$. **6**
- 10 a** Evaluate $\int_0^2 e^x \, dx$. **4**
- b** Evaluate $\int \frac{4 \cos(\log x)}{x} \, dx$. **5**
- c** Evaluate $\int x e^x \, dx$. **5**
- d** Find the volume of the solid generated by revolving the curve $y = \sqrt{x^2 + 5x}$ between $x = 1$ and $x = 2$. **6**

Government of Karnataka
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Course Code	20CS11T	Semester	I
Course Title	FUNDAMENTALS OF COMPUTER	Course Group	Core
No. of Credits	4	Type of Course	Lecture
Course Category	PC	Total Contact Hours	4Hrs Per Week
			52Hrs Per Semester
Prerequisites	Nil	Teaching Scheme	(L: T:P) = 4:0:0
CIE Marks	50	SEE Marks	50

1. COURSE RATIONALE

Fundamentals of Computer is the foundational course that sets the base for computer science engineering. Core knowledge of number system, conversion, Boolean algebra, logic circuits are fundamental and even sets the basis for further study of computer organization & architecture, system software and computer network. Understanding the functional units, peripherals and components of a computer is vital.

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

1. Identify computer hardware and software
2. Understand the data representation in computers
3. Basic knowledge of computer system and its working
4. Basic knowledge of logical thinking and problem solving

3. COURSE OBJECTIVES

1. Introduction to number system, conversion and data representation
2. Introduction to logic design
3. Understand functional units and components of computer
4. Develop logical thinking and problem-solving skills

4. JOB ROLE

SL.NO	LEVEL	JOB ROLES
1	3	Computer Operator & Program Assistant
2	3	Front Desk Operator
3	3	Office Assistant

5. PREREQUISITES

STUDENT	NIL
TEACHER	Various pedagogical techniques

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		CL	LINKED PO	TEACHING HOURS
CO1	Apply the knowledge of number system and Boolean algebra in computer system	U, A	1,4,7	12
CO2	Apply the knowledge of logic circuits for practical application	U, A	1,4,7	14
CO3	Recognize the various hardware and software associated with computer	U	1,7	8
CO4	Comprehend the functional units of a computer	U	1,7	10
CO5	Represent simple problems in terms of algorithm and flowchart	U, A	1,7	8

7. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

COURSE OUTCOME		Unit Linked	LINKED PO	TEACHING HOURS	DISTRIBUTION OF THEORY MARKS			
					R	U	A	TOTAL
CO1	Apply the knowledge of number system and Boolean algebra in computer system	1	1,4,7	12	10	30	10	50
CO2	Apply the knowledge of logic circuits for practical application	2	1,4,7	14	10	30	10	50
CO3	Recognize the various hardware and software associated with computer	3	1,7	8	5	20	5	30
CO4	Comprehend the functional units of a computer	4	1,7	10	10	20	10	40
CO5	Represent simple problems in terms of algorithm and flowchart	5	1,7	8	5	20	5	30
TOTAL				52	40	120	40	200

Legends: R = Remember; U = Understand; A = Apply and above levels (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. Massive Open online courses (MOOCS) can be used to teach various topics/subtopics.
2. Lecture method(L) does not mean only traditional lecture method, but different type of teaching methods and media can be employed to develop the outcomes.
3. About 15 to 20% of the topics/subtopics which are relatively simpler or descriptive in nature are to be given to the students for self-directed learning.
4. Arrange visits to nearby Offices/Industries/ Academic institution having network facility to understand types of network and types of computers being used.
5. Use different instructional strategies in classroom teaching
6. Use of virtual labs wherever mentioned

5. 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	TOPICS/SUBTOPICS	LEARNING OUTCOME (IN COGNITIVE DOMAIN)	HOURS L-T-P
1	BASICS OF LOGIC DESIGN		12
	1.1 Introduction to number system. • Binary • Octal • Decimal • Hexadecimal (characteristics of each number system)	1. Understand various number representation 2. Perform conversion and arithmetic operations using different number system 3. Apply the knowledge of codes to represent data 4. Explain the working of logic gates 5. Apply Boolean rules and laws to solve the Boolean expression	
	1.2 Conversion from one number system to other		
	1.3 Complements of number systems and arithmetic operations		
	1.4 Computer codes (BCD, EBCDIC, ASCII		

	Code, Gray code, Excess-3 code and Unicode) 1.5 Logic gates 1.6 Boolean algebra (rules, laws, De-Morgan Theorem, Boolean expressions and simplifications)		
	Note: 1. Use visual/graphic content for demonstration 2. Demonstrate data representation inside the computer using virtual labs 3. Demonstrate logic gates using virtual labs 4. Explain with block diagram, circuit diagram and truth table		
2	LOGIC CIRCUITS		14
	2.1 Combinational Circuits ▪ Characteristics ▪ Logic circuit design ▪ Block diagram, features & Applications of ▪ adders, subtractors and comparators ▪ multiplexers, demultiplexers ▪ encoders, decoders and code converters (7 segment) 2.2 Sequential Circuits ▪ Characteristics ▪ Types ▪ Asynchronous ▪ Synchronous (clocked, unclocked) ▪ Flip flops ○ Types, circuit analysis and truth table ▪ Applications of sequential circuits ○ Shift registers (types and	1. Identify logic circuits 2. Describe the working of logic circuits 3. Compare combinational and sequential circuits 4. List the applications of logic circuits	

	application) ○ Counters (classification and application)		
	Note: 1. Demonstrate logic circuits and their application using virtual labs		
3	INTRODUCTION TO COMPUTER CONCEPTS		8
	3.1 Introduction to computers ▪ Evolution of computer (abstract only) ▪ Generation of computers ▪ Classification of computer ▪ Applications 3.2 Components of computers ▪ Hardware (different types of hardware components) ▪ Software (System Software, Application Software, E-accessibility Software) (Open source, freeware and proprietary software) ▪ Peripherals (working of keyboard and laser printer) 3.3 Computer Network (Concept Only) ▪ Basics ▪ Categories ▪ Protocols (Application layer) ▪ Advantages. 3.4 Methods of data processing (concepts only) ▪ Single user programming ▪ Multi programming ▪ Real-time processing ▪ On-line processing	1. Describe the characteristics of computer of various generations 2. Identify the functional units and peripherals of a computer 3. Identify components of a computer system 4. Explain computer network concepts such as types, protocols 5. Identify and distinguish threats and viruses	

	- Time sharing processing - Distributed processing 3.5 Computer Security - Types of threats and source of threats		
	Note 1. Demonstrate computer and computer software's using videos and other visual/graphical method		
4	INTRODUCTION TO COMPUTER ORGANIZATION & OPERATING SYSTEM		10
	4.1 Introduction - Overview of functional units of a computer - Stored Program Concept - Flynn's Classification of Computers 4.2 Memory Hierarchy - Main memory - Auxiliary memory - Cache memory 4.3 Introduction to BIOS and UEFI 4.4 OS Concepts - Overview - Types (Batch Operating System, Multitasking/Time Sharing OS, Multiprocessing OS, Real Time OS, Distributed OS, Network OS, Mobile OS) - Services	1.Examine the working of each functional unit 2. Explain memory hierarchy 3.Explain BIOS and UEFI 4.Describe type and functions of OS	
	Note: 1. Demonstrate using videos and other visual/graphical method		
5	INTRODUCTION TO COMPUTER PROGRAMMING		8
	5.1 Basics of programming - Algorithms and Flowcharts - Basics - Decision making	1.Writing algorithms for mathematical concepts 2.Representation with flowchart 3. Identify the naming rules for	

	▪ Iterative (With sufficient examples) 5.2 Programming Languages ▪ Generation of languages ▪ General concepts of variables and constants	variables	
	Note: 1. Demonstrate using videos and other visual/graphical method 2. Use of online tools for flowchart design. ex: https://app.diagrams.net/		

10. MAPPING OF CO WITH PO

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

11. SUGGESTED LEARNING RESOURCES

BOOKS	
1	Digital fundamentals – Thomas L. Floyd, PEARSON EDUCATION publication, Eleventh edition – Global Edition, ISBN 10: 1-292-07598-8, ISBN 13: 978-1-292-07598-3
2	Digital Electronics –principles and integrated circuits. Anil K. Maini. Wiley publications, first edition. ISBN: 978-81-265-1466-3
3	Digital Electronics –principles and integrated circuits. Anil K. Maini. Wiley publications, first edition. ISBN: 978-81-265-1466-3
4	Digital principles and applications. Donald P Leach, Albert Paul Malvino, GoutamSaha, McGraw Hill Publisher, 7th edition, ISBN (13 digit): 978-0-07-014170-4 ISBN (10 digit): 0-07-014170-3
5	Digital Computer Fundamentals, - Thomas C Bartee, McGraw-Hill Publisher, 4th edition. ISBN 0-07-003892-9
6	Digital Logic and Computer Design M. Morris Mano

7	Introduction to Computer Science, ITL Education Solutions Pvt. Ltd., Pearson Education
8	"Computer Fundamentals" by Goel
URL'S	
1	https://www.tutorialspoint.com/basics of computer science
2	https://www.guru99.com/operating-system-tutorial.html
3	https://www.javatpoint.com/computer-organization-and-architecture-tutorial

12. SUGGESTED LIST OF PROPOSED STUDENT ACTIVITIES

Note: the following activities or similar activities for assessing CIE (IA)

SL. NO	ACTIVITY
1	Prepare a report on programming languages and their features
2	Prepare a report on open source and proprietary, system and application software
3	Prepare a report on recent viruses(computer)
4	Identify the logic circuits used in construction of memory and prepare a report
5	Identify the utilities of OS and prepare a report

13. COURSE ASSESSMENT AND EVALUATION CHART

SL.N O	ASSESSMENT	DURATION (in minutes)	MAX MARKS	CONVERSION
1	CIE Assessment 1 (Written Test -1) - At the end of 3 ^d week	80	30	Average of three written tests 30
2	CIE Assessment 2 (Written Test -2) - At the end of 7 th week	80	30	
3	CIE Assessment 3 (Written Test -3) - At the end of 13 th week	80	30	
4	CIE Assessment 4 (MCQ/Quiz)- At the end of 5 th week	60	20	Average of three 20
5	CIE Assessment 5 (Open book Test) - At the end of 9 th week	60	20	
6	CIE Assessment 6 (Student activity/ Assignment)- At the end of 11 th week	60	20	
7	Total Continuous Internal Evaluation (CIE) Assessment			50

8	Semester End Examination (SEE) Assessment (Written Test)	3 hrs	100	50
TOTAL MARKS				100

14. RUBRICS FOR ACTIVITY

RUBRICS FOR ACTIVITY (Example Only)						
Dimension	Poor	Below average	Average	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	8
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	6
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.	8
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	8
Average / Total Marks: (8+6+8+8)/4						7.5 = 8 marks

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)				

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

Course Code	20EC01P	Semester	I/II
Course Title	FUNDAMENTALS OF ELECTRICAL & ELECTRONICS ENGINEERING	Course Group	Core
No. of Credits	4	Type of Course	Lecture & Practice
Course Category	PC	Total Contact Hours	6Hrs Per Week
			78Hrs Per Semester
Prerequisites	Basic Science	Teaching Scheme	(L: T:P) =1:0:2
CIE Marks	60	SEE Marks	40

1. RATIONALE

Fundamentals of Electrical and Electronics Engineering is essential for all streams of diploma engineering to work in any industry as it covers basic electrical safety, troubleshooting and repairing of simple electrical systems. Basic knowledge of electrical wiring circuits, protective devices, electrical machines and basic electronics devices is required to work in any engineering field.

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

1. Perform and test domestic wiring
2. Can operate electrical machine
3. Test different electronics devices

3. INSTRUCTIONAL STRATEGY

1. Expose to different learning tools used in respective labs, Operational safety and Procedure to be followed in the laboratory.
2. Instructor should give examples from daily routine as well as, engineering/technology applications on various concepts and principles in each topic so that students are able to understand and grasp these concepts and principles. In all contents, SI units should be followed.
3. Activity- Theory - Demonstrate/practice approach may be followed throughout the course so that learning may be skill and employability based.

4. COURSE OUT COMES

On successful completion of the course, the students will be able to

C01	Comply with the safety procedures
C02	Apply the fundamentals of electricity.
C03	Install and test electrical wiring system.
C04	Identify and Operate electrical machines, Batteries and UPS.

CO5	Identify and test the different electronic devices.
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5. COURSE TOPICS:

Unit No	Unit Name	Hours
1	Electrical Safety	6
2	Electrical Fundamentals	15
3	Protective Devices and Wiring circuits	15
4	Electric Machines and Batteries and UPS	15
5	Introduction to Electronic Devices and Digital Electronics	27
	Total	78Hr

6. 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

Sl No	Unit skill set (In cognitive domain) <i>On successful completion of the class, the students will be able to</i>	Topics/Subtopics	Practical	Hours L-T-P
UNIT-1 Electrical Safety				
1	Comply with the Electrical safety	1. Electrical Symbols 2. Electrical safety - Identify Various types of safety signs and what they mean - Demonstrate and practice use of PPE - Demonstrate how to free a person from electrocution - Administer appropriate first aid to victims, bandaging, heart attack, CPR, etc. - Fire safety, causes and precautionary activities. - Use of appropriate fire extinguishers on different types of fires. - Demonstrate rescue techniques applied during fire hazard, correct method to move injured people during emergency - Inform relevant authority about any abnormal situation - Earthing: Types	1. Electrical symbols related to electrical engineering. 2. Electrical safety 3. Electrical earthing	02-00-04

		➤ http://nreeder.com/Flash/symbols.htm ➤ http://bouteloup.pierre.free.fr/iufm/as/de/house/safety.html		
UNIT-2				
Electrical Fundamentals				
2	1. Identify and select the different measuring devices. 2. Identify different electrical supply systems 3. Identify open circuit, close circuit and short circuit conditions.	1. Describe the sources of electrical energy. 2. Electrical current, voltage, emf, potential difference, resistance with their SI units. 3. Mention the meters used to measure different electrical quantities. Identification Measuring devices • Ammeter • Voltmeter • Wattmeter • Ohmmeter • Digital Multimeter • Megger • Tong tester 4. Explain supply systems like AC, DC. ➤ http://nreeder.com/Flash/units.htm	1. Connect voltmeter and ammeter in a simple circuit. (Practicing of identification and connection of different meters)	1:0:2
3	Calculate basic electrical quantities	• Relationship between V, I and R. (Ohms law) • Behavior of V, I in Series and Parallel DC circuits. • Describe open circuit, close circuit and short circuit • http://nreeder.com/Flash/ohmsLaw.htm	1. Measure current, voltage and analyze effective resistance in series circuit 2. Demonstrate effects of shorts and opens in a circuit	1:0:2
4	Connect resistances in different combination	1. Equation to find the effective Resistances connected in series 2. Equation to find effective Resistances connected in parallel 3. Resistances connected series and parallel combinations 4. Simple problems.	1. Determine the equivalent Resistance of parallel connected resistances.	1:0:2
5	Calculate and measurement of different parameters of an AC quantity.	Ac sinewave: Sinusoidal voltage, current, amplitude, time-period, cycle, frequency, phase, phase difference, and their units. ➤ http://nreeder.com/Flash/freqPeriod.htm ➤ http://nreeder.com/Flash/oscill	Generate and demonstrate the measurement of frequency, time period and phase difference of	1:0:2

		oscope.htm	AC quantity using CRO and function generator.	
6	1. Calculate and measure electric power and energy 2. Identify and differentiate Single phase and Three phase supply	1. Electrical work, power and power factor • SI units • Mention the meters used to measure them ➤ http://nreeder.com/Flash/powerLaw.htm	• Measure the voltage, current, power using relevant measuring instruments in a Single-phase load.	1:0:2
7.		1. Electrical energy • SI units • Mention the meters used to measure them 2. Single phase and Three phase supply.	1. Measure single phase energy using relevant measuring instruments in a Single-phase load. 2. Measure the voltages in Three phase supply.	
UNIT-3				
Protective Devices and Wiring circuits				
8.	1. Identify and select Protective Devices for given current and voltage rating 2. Identify and select the various electrician tools	• Necessity of Protective Devices • Various Protective devices and their functions • fuse wire, • Glass cartridge fuse • HRC fuse • Kit-kat fuse • MCB • MCCB • RCCB • ELCB • Relay • Different types of electrician tools and their function. • Describe various wiring tools. • State procedure of care and maintenance of wiring tools.	1. Wire up and test PVC Conduit wiring to control one lamp from two different places using suitable protective devices.	1:0:2

9	1. Identify and select Wiring systems for a given applications 2. Identify and select the cables used for different current and voltage ratings. 3. Draw the wiring diagram	1. Describe different types of wiring systems. • Surface conduit • concealed conduit • PVC casing capping 2. Wiring systems and their applications. 3. Describe the types of wires, cables used for different current and voltage ratings.	1. Wire up and test PVC Conduit wiring to control of 2 sockets and 2 lamps.	2:0:4
10	Estimate and plan electrical wiring	Explain Plan and estimate the cost of electrical wiring for one 3m × 3m room consisting of 2 lamps, 1 ceiling fan, 2 three pin sockets.	Prepare the estimation and plan	1:0:2
UNIT-4 Electrical Machines and Batteries and UPS				
11	1. Identify the types of transformer. 2. verify the transformation ratio.	Transformer • working principle • Transformation ratio • Types and applications with their ratings	Connect the Single- phase transformer as Step-Up, Step-Down transformer and verify the transformation ratio.	1:0:2
12	1. Start and run the induction motor. 2. Troubleshoot DOL/Star-delta starter and induction motor	1. Induction motor • Single phase and three phase Induction motor. • Necessity of starters. • Describe DOL AND STAR-DELTA starters. 2. What are different causes and remedies for a failure of starter and induction motor.	1. Construct a suitable circuit to start and reverse the direction of three phase induction motor using DOL/ Star-delta starter. 2. Troubleshoot the DOL/ Star-delta starter and induction motor	2:0:4
13	Select and test the battery for a given application	Battery • Types of batteries (Lead acid battery, lithium, sealed maintenance free (SMF) battery, Modular battery). • Selection criteria of batteries for different applications. • Ampere-Hour Capacity. • Efficiency	Testing Condition of charging and discharging of a Lead-acid battery	1:0:2
14	Select the size of the UPS for a given application	UPS • List the types and applications • Selection criteria of UPS • Sizing of UPS	Sizing of UPS	1:0:2

UNIT-5 Introduction to Electronic Devices and Digital Electronics				
15	Identify and differentiate Conductors, insulators and semiconductors.	1. Compare Conductors, insulators and semiconductors with examples. 2. Identification of types and values of resistors-color codes. ➤ http://nreeder.com/Flash/resistor.htm	Determine the value of resistance by color code and compare it with multimeter readings.	1:0:2
16	Identify and test PN junction Diode	PN junction diode • Symbol • Characteristics • Diode as switch. • Types of diodes and ratings • Applications	Identify the terminals of a Diode and test the diode for its condition.	1:0:2
17	Build and test bridge rectifier circuit	Rectifier • Need for AC to DC conversion • Bridge rectifier with and without C filter, • Rectifier IC.	Construct and test bridge rectifiers using semiconductor diode and rectifier IC. Compare the waveforms using CRO.	1:0:2
18	1. Identify and test Transistor 2. Build and test transistor as an electronic switch	Transistor (BJT) • Symbol • Structure • Working principle	1. Identification of transistor terminals and test. 2. Construct and test the transistor as an electronic switch	1:0:2
19.	1. Identify and test different digital IC	• Comparison of analog and digital signal • Digital systems, examples. • Binary numbers, Boolean identities and laws. • Digital system building blocks: Basic logic gates, symbols and truth tables. IC-Definition and advantages.	• Test a Digital IC. • Identification and selection of suitable ICs for basic gates. 1. Verify NOT, AND, OR, NOR, EXOR and NAND gate operations (two inputs).	2:0:4
20	Identify and test various Sensors and actuators.	1.Sensors • Concept • Types: Temperature, Pressure, Water, Light, Sound, Smoke, proximity Sensors, Flow, humidity, voltage, vibration, IR (Principle/working, ratings/specifications, cost, and applications) 2.Actuators • Concept • Types and applications. • Relay as an actuator.	2. Connect and test an IR proximity sensor to a Digital circuit. • Connect and test a relay circuit using an Opto-coupler. (Photo Diode & Transistor) Refer note	2:0:4

21	Know the application of Microcontroller and PLC	• Microcontroller as a programmable device, and list of real-world applications. • PLC and Their applications. (Activity based learning)	• Identify different application microcontroller. • Identify commercially available PLC and their specifications	1:0:2
TOTAL				26-0-52=78 Hours

7. PRATICAL SKILL EXERCISES

Sl. No.	Practical Out Comes/Practical exercises	Unit No.	PO	CO	L: T:P Hrs.
1	• Identify Various types of safety signs and what they mean Demonstrate and practice use of PPE • Demonstrate how to free a person from electrocution appropriate first aid to victims, bandaging, heart attack, CPR, etc. • Fire safety, causes and precautionary activities. • Use of appropriate fire extinguishers on different types of fires. • Demonstrate rescue techniques applied during fire hazard. • Inform relevant authority about any abnormal situation during fire hazard.	1	1,4	1	0:0:2
2	• Demonstrate different types of earthing/using videos. • Prepare a Report on types of Earthing	1	1,4	1	0:0:2
3	Connect voltmeter and ammeter in a simple circuit. (Practicing of identification and connection of different meters)	2	1,4	2	0:0:2
4	1.Determine the equivalent Resistance of series connected resistances. 2.Demonstrate effects of shorts and opens in a circuit	2	1,4	2	0:0:2
5	Determine the equivalent Resistance of parallel connected resistances.	2	1,4	2	0:0:2
6	Generate and demonstrate the measurement of frequency, time period and phase difference of AC quantity using CRO and function generator.	2	1,4	2	0:0:2
7	Measure the voltage, current, power using relevant measuring instruments in a Single-phase load.	2	1,4	2	0:0:2
8.	1.Measure single phase energy using relevant measuring instruments in a Single-phase load.				

	2. Measure the voltages in Three phase supply.				
9.	Wire up and test PVC Conduit wiring to control one lamp from two different places using suitable protective devices.	3	1,4	3	0:0:2
10	2. Wire up and test PVC Conduit wiring to control of 2 sockets and 2 lamps.	3	1,4	3	0:0:2
11	Wire up and test PVC Conduit wiring to control one lamp from two different places.	3	1,4	3	0:0:2
12	Plan and estimate the cost of electrical wiring for one 3mx3m room consisting of 2 CFL 1ceiling fan, 2 three pin sockets.	3	1,4	3	0:0:2
13	Connect the Single- phase transformer as Step-Up, Step-Down transformer and verify the transformation ratio.	4	1,4	4	0:0:2
14	Construct a suitable circuit to start and reverse the direction of three phase induction motor using DOL/star-delta starter.	4	1,4	4	0:0:2
15	Troubleshoot the DOL/Star-delta starter and induction motor	4	1,4	4	0:0:2
16	Testing Condition of charging and discharging of a Lead-acid battery.	4	1,4	4	0:0:2
17	Estimate the UPS rating for a computer lab with 50 computers/domestic.	4	1,4	4	0:0:2
18	Determine the value of resistance by color code and compare it with multimeter readings	5	1,4	5	0:0:2
19	Identify the terminals of a Diode and test the diode for its condition.	5	1,4	5	0:0:2
20	Construct and test bridge rectifiers using semiconductor diode and rectifier IC. Compare the waveforms using CRO.	5	1,4	5	0:0:2
21	Identification of transistor terminals and test. Construct and test the transistor as an electronic switch.	5	1,4	5	0:0:2
22	Test an IC. Verify the truth-table AND, OR, NOT logic gates.				
23	Verify the truth-table NAND, NOR, EX-OR, EX-NOR logic gates.	5	1,4	5	0:0:2
24	Connect and test anIR proximity sensor to a Digital circuit. NOTE: Any sensor listed in the theory may be used for condition appropriately.				
25	Connect and test a relay circuit using an Optocoupler. (Photo Diode & Transistor)	5	1,4	5	0:0:2
26	1.Identify MCS-51 variants 2.Identify commercially available PLC and their specifications.	5	1,4	5	0:0:2
Total					0:0:52 =52Hrs

8.MAPPING OF CO WITH PO

CO	Course Outcome	PO Mapped	Experiment	Cognitive Level R/U/A	Lecture & Practical Sessions in Hrs	TOTAL
C01	Comply with the safety procedures	PO1, PO4	1-2	A	6	
C02	Apply the fundamentals of electricity.	PO1, PO4	3-7	A	15	
C03	Install and test electrical wiring system and protective devices.	PO1, PO4	8-12	A	15	
C04	Identify and Operate electrical machines, Batteries and UPS.	PO1, PO4	13-17	A	15	
C05	Identify and test the different electronic devices.	PO1, PO4	18-26	A	27	

Course	CO's	Programme Outcomes (PO's)						
		1	2	3	4	5	6	7
Fundamentals of Electrical and Electronics Engineering	CO1	3	0	0	3	0	0	0
	CO2	3	0	0	3	0	0	0
	CO3	3	0	0	3	0	0	0
	CO4	3	0	0	3	0	0	0
Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0-Not Mapped								

9. SUGGESTED LEARNING RESOURCES:**Reference Books:**

1. ABC of Electrical Engineering by B. L. Theraja and A. K. Theraja, S Chand Publishers, New Delhi, 2014 Edition.
2. Basic Electrical and Electronics Engineering by S. K. Bhattacharya, Pearson Education India, 2012 Edition.
3. Electronic Devices and Circuits by I. J. Nagrath, PHI Learning Pvt. Ltd., 2007 Edition.
4. Basic Electrical Engineering by V. Mittle and Arvind Mittle, McGrawHill Companies, 2005 Edition.
5. The 8051 Microcontroller & Embedded systems by Susinkbnnnjbbh bb vvvvg assembly and C (2nd Edition) – M.A. Mazidi, J.C. Mazidi & R.D. McKinlay ISBN: 81-317-1026-2
6. Programmable Logic controllers, W BOLTON

e-Resources

1. https://www.youtube.com/watch?v=mc9790hitAg&list=PLWv9VM947MKi_7yJ0_FCfzTBXpQU-Qd3K
2. <https://www.youtube.com/watch?v=CWulQ1ZSE3c>
3. en.wikipedia.org/wiki/Transformer
2. www.animations.physics.unsw.edu.au/jw/AC.html
3. www.alpharubicon.com/altenergy/understandingAC.htm
4. www.electronics-tutorials

5. learn.sparkfun.com/tutorials/transistors
6. www.pitt.edu/~qi4/Academic/ME2082/Transistor%20Basics.pdf
7. www.technologystudent.com/elec1/transis1.htm
8. www.learningaboutelectronics.com
9. www.electrical4u.com
10. https://www.youtube.com/watch?v=zLW_7TPf310
11. <https://www.youtube.com/watch?v=8PTNjw-hQIM>

10. SUGGESTED LIST OF STUDENTS ACTIVITIES for CIE

Note: the following activities or similar activities for assessing CIE (IA) (Any one)

Each student should conduct different activity and no repeating should occur

1	Using suitable meters/ instruments give the practical working circuits to measure
2	Resistance, Current, Voltage, Power and Energy in DC and AC (Single phase) Circuits.
3	List out the different types of wiring systems used in your laboratories or house with their representation.
4	Mini-Projects: Like preparing extension box, switch box and wiring models,
5	List out the different protective devices used in your laboratories or house with their ratings.
6	Applications of Electro Magnetic Induction, statically induced and dynamically induced emf, self and mutual induced emfs.
7	Prepare a report on types of starters and enclosures used for various industrial applications of AC motors.
8	Types of Cells and Battery maintenance
9	Visit nearby Battery charging shop or show room and prepare a report of the visit.
10	Prepare a report on various types of diodes used for various industrial applications.
11	Prepare a report on various types of sensors and actuators used for various industrial applications.
12	Mini-Projects: Connect and test a sensor (domain application) to a Digital circuit

11. COURSE ASSESSMENT AND EVALUATION CHART

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 Hours	100	20	Average of three skill tests 20
4.	CIE Assessment 4 (Skill test) - At the end of 7th week	3 Hours	100		
5.	CIE Assessment 5 (Skill test) - At the end of 9th week	3 Hours	100		
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)	3 Hours	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

12. SCHEME OF VALUATION FOR SKILL TEST (CIE) & SEE

(CONTINUOUS INTERNAL & SEMESTER END EXAMINATION)

Sl. No.	Particulars	Marks
1.	Identification of meters/ equipment/wires/tools etc.	10
2.	Writing Circuit/writing diagram and Procedure*	25
3.	Conduction	35
4.	Results	10
5	Viva-voce	20
Total		100

12. RUBRICS FOR ACTIVITY

RUBRICS FOR ACTIVITY (Example only) Faculty need to develop appropriate rubrics for respective activity						
Dimension	Beginning	Developing	Satisfactory	Good	Exemplary	Student Score
	1	2	3	4	5	
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	
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	

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.	
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	
Average / Total Marks:						

Lab Equipment Requirement

The following are the specification of the apparatus required for FEEE lab and number of apparatus required for the batch of 20 students.

Sl. No.	Name of Equipment and Specification	Quantity Required
1	Dual Channel 30 V, 2 A continuously variable DC Regulated Power Supply with Current and Overload Protection	05 Nos.
2	+/- 15 V, 2 A, fixed DC Regulated Power Supply	05 Nos.
3	Portable Moving Coil DC Voltmeters a) 0 - 1 V b) 0 - 10 V c) 0 - 30 V	Each 05 Nos.
4	Portable Moving Iron AC Voltmeters a) 0 - 300 V b) 0 - 600 V	Each 05 Nos.
5	Portable Moving Coil DC Ammeters a) 0 - 100 mA b) 0 - 1 A c) 0 - 2 A	Each 05 Nos.
6	Portable Moving Iron AC Ammeters a) 0 - 2 A b) 0 - 5 A c) 0 - 10 A	Each 05 Nos.
7	Watt-meters a) 150/ 300V, 2 A, UPF b) 300/ 600 V, 5/ 10 A, LPF	Each 02 Nos.
8	Rheostats – 25 Ohms, 50 Ohms, 150 Ohms, 220 Ohms (all rated at 3 A)	Each 05 Nos.
9	Rheostat Loads s – 1 KW, 230 V	02 Nos.

10	Wire wound Resistors- 5 Ohms 2 Watts, 25 Ohms 5 Watts, 330 Ohms 2 Watts, 560 Ohms 2 Watts, etc.	Each 05 Nos.
11	Soldering Iron 60 W	05 Nos.
13	Single Phase Energy meter 10 A, 230 V, 50 Hz, Digital type	05 Nos.
14	Multi-meter Digital $\frac{3}{4}$ "	06 Nos.
15	Dual Trace Oscilloscope – 30 MHz	02 Nos.
16	Three Phase Induction Motors :1 HP – 440 V 50 Hz, 2 HP – 440 V 50 Hz.	Each 02 Nos.
17	Three phase DOL, Star-Delta, Auto transformer starter	Each 02 Nos.
18	UPS 1 KVA	01 Nos.
19	Battery Lead-Acid type, 140 A-hr and Hydrometers	02 Nos.

Sl. No.	Name of Equipment and Specification	Quantity Required
20	I C Trainer kit	05 Nos
21	Digital IC's 7400, 7402, 7404, 7408, 7486 etc	Each 10 Nos.
22	Wooden Wiring board (2x3) ft	10
23	Wiring accessories	
2	a) PVC conduit - $\frac{3}{4}$ " - 10 lengths b) Cap and casing - $\frac{3}{4}$ " - 10 lengths c) Switches Single Pole- 5A, 230 V d) Switches two way – 5 A, 230 V e) 3 Pin Sockets 5A, 230 V f) Bulb Holders – 5 A, 230 V g) 3 Pin Plug 5A, 230 V h) 60 Watts Lamps i) 100 Watts Lamps j) 15 W CFL lamps k) Copper Wires of sizes 1.5 mm ² , 2.5 mm ² , 4 mm ² – 1 coil each l) Gang boxes (1+1, 2+1, 2+2) m) Kit –Kat fuses 5A, 15 A n) MCB 16 A & 32 A/ 230 V, Single and Double Pole o) ELCB 16 A & 32 A/ 230 V, Double Pole p) Neutral link- 16 A, 230 V q) Screws of assorted sizes r) Testers	Each 10 Nos.

24		Electronic Components a) Diodes - BY 127 and IN 4001 b) Zener Diodes – 6.2 V, 5.6 V, 7.8 V c) Relays – solid state Sugar cube type, SPST, Coil 6V, Power circuit 230 V, 5 A. d) Spring Boards e) Bread Boards f) Tag Boards.	Each 10 Nos.
25		Simple PANEL BOARD/ CUBICAL consisting of bus-bars, CB/MCB/ELCB, meters, HRC fuses, magnetic contactors, cables, earthing points.	1 No

Government of Karnataka

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

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/subtopics.
3. Online coding platform wherever mentioned.
4. Hands on coding should be practiced.
5. About 15 to 20% of the topics/subtopics 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/subtopics 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.	

	b. https://studio.code.org/projects Suggested programs are listed in Table 1 1.5 Introduction to Application development 1.6 Simple android application development (No knowledge of programming language is required). Note: <i>i. The purpose of application development is to ignite and promote programming skills.</i> <i>ii. Application development should be done using any App builder platforms such as</i> <i>iii. MITApp Inventor: https://appinventor.mit.edu/</i> <i>iv. Thunkable: https://thinkable.com/</i> <i>v. ibuildapp: https://ibuildapp.com/</i> <i>vi. The student should be introduced to the android application development environment for further research and learning https://developer.android.com/</i> 1.7 Activity: create a simple Android application (Unique for each student) publish on the learning management system.		
2	UNIT 2 - DESIGN AND DEVELOP WEB PAGES		10-0-20
2	2.1 Basic web technologies ▪ Browser ▪ Web -Server ▪ Client-Server Model ▪ URL ▪ SEO techniques ▪ Domain names and domain name system. 2.2 Creating Web-pages with HTML5 - Static	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	

web pages. ▪ Introduction, Editors ▪ Tags, Attributes, Elements, Headings ▪ Links, Images, List, Tables, Forms ▪ Formatting, Layout, Iframes. 2.3 Formatting web pages with style sheets (CSS3). ▪ Introduction to CSS ▪ Inline CSS, Internal CSS, Classes and IDs ▪ div, Color, Floating, Positioning ▪ Margins, Padding, Borders ▪ Fonts, Aligning Text, Styling Links 2.4 Creating a web page dynamic using JavaScript. ▪ Dynamic web page and Introduction to JS ▪ Basic syntax ▪ Functions ▪ Events Note: Refer https://www.w3schools.com 2.6 Creating dashboards in websites. 2.6 Activity: Personal website design and launch with a free platform or Create a Blogging website. ▪ Online platforms (Learning and executing) ▪ https://www.w3schools.com/ ▪ https://studio.code.org ▪ https://www.khanacademy.org Note: 1) The student must be introduced to website development platforms - wordpress.com. 2) The student must be made familiar	5. Creating and launching dashboard based personal website.	
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	with launching websites. Certification available: • HTML - W3schools • CSS - W3schools • JavaScript - W3schools		
3	UNIT 3 -BUSINESS PROCESS AUTOMATION/ERP		03:0:06
3	3.1 Introduction to business process automation. 3.2 Organization structure and functions composition-Properties and applications ▪ Structure ▪ Types ▪ Functional Units 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. 3.3 Workflows ▪ Introduction ▪ Components ▪ Use and use cases Note: Use free and open-source platform to demonstrate and create workflows. Example: https://airflow.apache.org/ https://taverna.incubator.apache.org/ https://trello.com/ https://www.processmaker.com/ 3.4 Enterprise resource planning ▪ History ▪ Evolution ▪ Uses of ERP ▪ ERP software tools.	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.	

	Note: The student should be introduced into Enterprise resource planning software tools to understand importance of ERP. Examples: ▪ https://erpnext.com/ ▪ www.bitrix24.com ▪ https://www.odoo.com/ 3.5 Activity: ▪ 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
	4.1 Fundamentals of cloud 4.2 Cloud service models ▪ IaaS (Infrastructure-as-a-Service) ▪ PaaS (Platform-as-a-Service) ▪ SaaS (Software-as-a-Service) 4.3 Cloud deployment types ▪ Public, ▪ Private, ▪ Hybrid ▪ Community Cloud 4.4 Cloud services: ▪ 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	1. Understand Cloud concepts 2. Identify and use Cloud services 3. Understand IoT concepts 4. Identify IoT applications	

	executable code and rich text in a single document, along with images, HTML, LaTeX, and more. ▪ 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. Note: Above cloud services are not compulsory for all branches; teacher can recommend other cloud service based on need of engineering branch. 4.5 Working of IoT and IoT components (Only brief introduction and demonstration through videos) 4.6 Explain concept of Internet of Things with examples ▪ Smart home ▪ Smart city ▪ Smart farming Note: a. Teacher can also select specific area of work where Things (autonomous computing devices) could be interconnected over TCP/IP to establish IoT. b. The students should be introduced to the IoT environment for further research and study. Example: ▪ https://www.raspberrypi.org/ ▪ https://www.arduino.cc/		
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	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.		
5	UNIT 5 - CYBERSECURITY AND SAFETY		4-0-8
	5.1 Introduction to Cyber security and cyber safety. ▪ 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). 5.2 Common threats - Demonstration ▪ Phishing ▪ DoS attack ▪ Man in the middle attack ▪ Eavesdropping ▪ Spamming 5.3 Activity ▪ Identification of basic security issues in computers of your college and fixing the same. ▪ Visit nearby government organization. ▪ Identify basic cybersecurity issues and fixing the same ▪ Demonstrate the importance of cybersecurity, password policy, and cyber safety.	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: - 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
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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 th week	60	20	
3	CIE Assessment 3 (Skill Test) - At the end of 5 th week	3 hrs	20	Average of three skill test 20
4	CIE Assessment 4 (Skill Test) - At the end of 7 th week	3 hrs	20	
5	CIE Assessment 5 (Skill Test) - At the end of 9 th week	3 hrs	20	
6	CIE Assessment 6 (Student activity)- At the end of 11 th 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:

<i>Marks: 15</i>	<i>Unit-1 Ecosystem</i>	<i>Allotted Hrs: 03</i>
Structure of ecosystem, Biotic & Abiotic components, Aquatic (Lentic and Lotic) and terrestrial ecosystem. Global warming - Causes, effects, Green House Effect, Ozone depletion.		
<i>Marks: 20</i>	<i>Unit-2 Air Pollution</i>	<i>Allotted Hrs: 03</i>
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		
<i>Marks: 10</i>	<i>Unit-3 Noise Pollution:</i>	<i>Allotted Hrs: 02</i>
Noise pollution: sources of pollution, measurement of pollution level, Effects and Control of Noise pollution, Noise pollution (Regulation and Control) Rules, 2000		
<i>Marks: 20</i>	<i>Unit- 4 Water and Soil Pollution:</i>	<i>Allotted Hrs: 06</i>
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 Rainwater Harvesting. Soil pollution, Causes, Effects and Preventive measures of Soil Pollution due to Excessive use of Fertilizers, Pesticides and Insecticides		
<i>Marks: 20</i>	<i>Unit-5 Renewable sources of Energy</i>	<i>Allotted Hrs: 07</i>
<i>Solar Energy:</i> Basics of Solar energy. Definition and advantages of advanced solar collectors. Solar water heater and Solar stills and their uses. <i>Biomass:</i> Overview of biomass as energy source. Thermal characteristics of biomass as fuel. <i>Wind energy:</i> 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.		
<i>Marks: 15</i>	<i>Unit-6 Solid Waste Management and Environmental Acts</i>	<i>Allotted Hrs: 05</i>
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. Noise Pollution	Noise pollution: sources of pollution, Measurement of Noise pollution level.	CO3	1,5,7	7
	Effects and Control of Noise pollution.	CO3	1,5,7	8
	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.	CO4	1,5,7	9
	Control measures of water pollution.	CO4	1,5,7	10
	Definition and list unit operations in water and Wastewater Treatment process, Water (prevention and control of pollution) act 1974.	CO4	1,5,7	11
	Water conservation – Importance of Rainwater Harvesting	CO4	1,5,7	12
	Soil pollution, Causes and Effects due to Fertilizers, Pesticides and Insecticides	CO4	1,5,7	13
	Preventive measures of Soil Pollution due to Excessive use of Fertilizers, Pesticides and Insecticides.	CO4	1,5,7	14
5. Renewable sources of Energy	Solar Energy: Basics of Solar energy.	CO5	1,5,7	15
	Solar collectors and advantages of Advanced solar collectors.	CO5	1,5,7	16
	Solar water heater, Solar stills and their uses.	CO5	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.	CO5	1,5,7	18
	Wind energy in India.	CO5	1,5,7	18
	Need of new Energy sources, Different type's new energy sources.	CO5	1,5,7	19
6. Solid Waste Management and Environmental Acts	Environmental benefits of New Energy Sources-Hydrogen energy	CO5	1,5,7	19
	Environmental benefits of New Energy Sources- Ocean energy resources	CO5	1,5,7	20
	Environmental benefits of New Energy Sources-Tidal energy conversion.	CO5	1,5,7	21
	Solid waste generation, Sources, Characteristics of solid waste	CO6	1,5,7	22
	Solid Waste Management rules 2016	CO6	1,5,7	22
	E- Waste generation Sources and characteristics,	CO6	1,5,7	23
	E waste management rules 2016	CO6	1,5,7	23
	Plastic Waste generation Sources and characteristics,	CO6	1,5,7	24
	Plastic Waste Sources and characteristics	CO6	1,5,7	24

	Recycled plastic rules 2016, Importance of Environment (protection) act 1986,	CO6	1,5,7	25
	Occupational health and safety measures.	CO6	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, Wastewater 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, Wastewater 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	
C01	Importance Of ecosystem and terminology	1,5,7	R, U	03	02	02	04
C02	The extent of air pollution, effects, control measures and acts.	1,5,7	R, U	03	03	02	05
C03	The extent of noise pollution, effects, control measures and acts.	1,5,7	R, U	02	03	02	05
C04	The water and soil pollution, effects, control measures and acts	1,5,7	R, U	06	03	02	05
C05	Different renewable energy resources and efficient process of harvesting.	1,5,7	R, U	07	03	02	05
C06	Solid Waste Management and Environmental acts.	1,5,7	R, U	05	02	04	06
Total Hours of instruction				26	30		

R-Remember; U-Understanding.

Level of Mapping PO's with CO's

Course	CO's	Programme Outcomes (PO's)						
		1	2	3	4	5	6	7
Environmental Science	C01	3	0	0	0	2	0	1
	C02	3	0	0	0	2	0	1
	C03	3	0	0	0	2	0	1
	C04	3	0	0	0	2	0	1
	C05	3	0	0	0	2	0	1
	C06	3	0	0	0	2	0	1
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 $\geq 50\%$ 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								

Course Assessment and Evaluation Chart

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 30
2.	CIE Assessment 2 (Written Test -2) - At the end of 7 th week	80 minutes	30	
3.	CIE Assessment 3 (Written Test -3) - At the end of 13 th week	80 minutes	30	
4	CIE Assessment 4 (MCQ/Quiz) - At the end of 5 th week	60 minutes	20	Average of three 20
5	CIE Assessment 5 (Open book Test) - At the end of 9 th week	60 minutes	20	
6	CIE Assessment 6 (Student activity/Assignment)- At the end of 11 th week	60 minutes	20	
7.	Total Continuous Internal Evaluation (CIE) Assessment			50
Total Marks				50

Note:

1. Average marks of Three CIE shall be rounded off to the next higher digit.
2. Assessment of assignment and student activity is evaluated through appropriate rubrics by the respective course coordinator. The secured mark in each case is rounded off to the next higher digit.

MANDATORY STUDENT ACTIVITY: EACH STUDENT HAS TO SELECT ANY ONE OF THE LISTED

1. Students chose one thing to reduce at home each week and write journal entries about their successes and challenges implementing the change. In class, they form groups and create "Do You Know?" posters.
2. Students pretend they are architects and come up with a series of design changes to make their school more environmentally friendly. They then grade their projects according to a rubric.
3. A presentation for Green Team Club members to introduce themselves and the purpose of their club. They explain how to use their new recycling bins, in the classroom and in the cafeteria.
4. Ever wonder what's in your school's waste? This hands-on activity helps students assess their school's waste in order to think of ways to reduce it. The results can be incorporated into the school's recycling plan.
5. How do we measure climate change? What activities contribute to climate change?

6. 6. Start a compost or worm bin. Composting is a hands-on way to learn about important life science concepts such as ecosystems, food webs and biodegradation. Students experience how worms and other decomposers recycle fruits and vegetable scraps into compost. Use the compost in your college garden! Have green team students make up a skit and present details about the new composting program to all classrooms. Have them make signs for the bins (compost, recycle, and landfill), monitor the waste collection at lunchtime, cart the food waste to the compost, and decide how and where the compost will be used.
7. Paint posters and decorate bulletin boards or the doors to the cafeteria with waste- free lunch messages to announce or support a waste-free event, and have students vote for their favorite poster.
8. Conduct a classroom audit to identify waste and look for ideas to reduce and reuse. Empower the student to set goals, search for solutions and review progress.
9. Go on a field trip. Visit your local landfill, recycling centre, or a nearby composing facility where the students can see first-hand what is happening to waste and learn about the lifecycle of waste and its effect on the environment.
10. Home energy audit: Have students make a list of all the appliances and light bulbs in their house. How much energy does their house use if all the lights are on for 4 hours per day? If their appliances are on for 2 hours per day? How much energy could they save if they switched to energy-efficient appliances or lightbulbs?
11. Use recycled material in art projects: Recycled materials can make beautiful art projects such as jewelry, planters, and bird houses. Incorporating materials that would otherwise be thrown away into art projects can show your students how to find new uses for these items.
12. Life cycle : One way to show students what happens when you put something in the trash versus recycling or reusing the object is to do a life cycle analysis. This is a flow chart that shows the environmental impacts of an object, from extracting the raw materials to decomposition and everything in between. When something is put in the trash instead of being reused or recycled, the life cycle assessment will show a bigger environmental impact. When something is reused or recycled, the environmental impact is less because raw materials don't need to be extracted to create something new.

**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)					