



Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Curriculum Structure

I Semester Scheme of Studies

Sl. No.	Teaching Department	Course Code	Course Name	Hours per week			Total Contact Hours/week	Credits	CIE Marks		Theory SEE Marks		Practice SEE Marks		Total Marks
				L	T	P			Max	Min	Max	Min	Max	Min	
Integrated Courses															
1	SC	25SC11I	Engineering Mathematics-I	4	0	4	8	6	50	20	50	20	-	-	100
2	CS	25CS01I	IT Skills	3	0	4	7	5	50	20	-	-	50	20	100
3	EE/EC	25EE01I	Fundamentals of Electrical & Electronics Engineering.	3	0	4	7	5	50	20	-	-	50	20	100
4	EC	25EC11I	Digital Electronics-I	4	0	4	8	6	50	20	50	20	-	-	100
Audit Course															
5	EC	25EC12I	Environmental Sustainability	2	0	0	2	2	50	20	-	-	-	-	50
6	Personality Development		NCC/NSS/YOGA/SPORTS...	Students are expected to engage in any one of these activities from 1 st semester to 6 th semester(No Credits)											
Total				16	0	16	32	24	250	-	100	-	100	-	450

Note: The course 25EE01I shall be taught by faculty from the Electrical & Electronics (E&E) department. In the event that E&E faculty are not available in the institution, the course 25EE01I shall be assigned to faculty from the Electronics & Communication (E&C) department. If both E&E and E&C departments exist in the institution, the course 25EE01I shall be taught by the E&C faculty.



**Government of Karnataka
Department of Technical Education**

C-25 Diploma Curriculum

Engineering Mathematics For Engineering Programmes

First Semester
(Effect from the AY 2025-26)



**Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION**

Curriculum Structure

I Semester Scheme of Studies- Diploma in _____Engineering

Sl. No.	Teaching Department	Course Code	Course Name	Hours per week			Total Contact Hours /week	Credits	CIE Marks		Theory SEE Marks		Practice SEE Marks		Total Marks
				L	T	P			Max	Min	Max	Min	Max	Min	
Integrated Courses															
1	SC	25SC11I	Engineering Mathematics-I	4	0	4	8	6	50	20	50	20	-	-	100

L: Lecture: T: Tutorial: P: Practice: SC-Science: T-Theory (Whole Class)::P-Practical(Batch wise)::I-Integrated (Both theory & Practice-Batch wise)

- For Engineering Mathematics-I, Theory for whole class and Practice batch wise

Integrated Course Template (T+P)



Government of Karnataka
DEPARTMENT OF TECHNICAL
EDUCATION

Program	Engineering	Semester	I
Course Name	Engineering Mathematics-I	Type of Course	Integrated
Course Code	25SC11I	Contact Hours	8 hours/week (104 hours/semester)
Teaching Scheme	L:T:P - 4:0:4	Credits	6
CIE Marks	50	SEE Marks	50

1. Rationale

The course is designed to give a comprehensive coverage at an introductory level to the subject of Matrices and Determinants, Vectors, Trigonometry, Complex numbers and Limits.

2. Course Outcomes: At the end of the Course, the student will be able to:

CO-01	Solve the system of linear equations using determinants and performs the same in MS Excel.
CO-02	Apply the knowledge extensively in finding product of two vectors and executes the same in GeoGebra graphing calculator tool..
CO-03	Able to solve physical problems using trigonometric ratios and visualize the graphs of trigonometric functions in GeoGebra graphing calculator.
CO-04	Able to solve problems on algebra of complex numbers and interpret the results graphically.
CO-05	Evaluate the limit of a single variable function and extract the limit values for discretized data of a one variable function in MS excel.

3. Course Content:

WEEK	CO	PO (L3- Highly mapped)	Theory (4 Hours per week)	Practice (4 Hours per week)
1	1	1,4,7	MATRICES: -Definition and order of matrices Types of matrices: Row matrix, Column matrix, Zero matrix (Null matrix), Square matrix, Diagonal matrix, Scalar matrix, Unit matrix (Identity matrix)	Practice-1: Introduction to MS Excel
	1	1,4,7	Algebra of matrices: Scalar multiplication and Transpose of a matrix	
	1	1,4,7	Addition and Subtraction of matrices (2x2 only)	Practice-2: Compute addition, subtraction, scalar multiplication of matrices in MS Excel.
	1	1,4,7	Product of two matrices (2x2 only) and Problems	
	1	1,4,7	Problems continued	

2	1	1,4,7	DETERMINANTS: Definition, Expansion of determinant of order 2 and Problems	Practice-3: Compute multiplication, transpose of matrices in MS Excel.
	1	1,4,7	Cramer's Rule (Determinant method): Solution of the system of linear equations with two unknowns and Problems	Practice-4: Compute determinant, and inverse of matrices in MS Excel.
	1	1,4,7	Minors, Co-factors, evaluating Adjoint of square matrices explicitly by finding minor and co-factors (2X2 only) and Problems	
3	1	1,4,7	Definition of Singular and non-singular matrices, Inverse of a matrix (2X2 only) and Problems	Practice-5: Solve the system of linear equations by Cramer's rule in MS Excel.
	1	1,4,7	Characteristic equation and characteristic roots of a matrix (2X2 only) and problems	
	2	1,4,7	VECTORS: Definition, notation and types of vectors [Null, Unit, Equal, Coplanar and Collinear vectors]	Practice-6: Installation and introduction to tools in GeoGebra.
	2	1,4,7	Position vector & its magnitude and problems	
4	2	1,4,7	Problems on equilateral, isosceles, right-angled triangle	Practice-7: Finding magnitude of a vector, sum and difference of two vector and visualize it in GeoGebra graph.
	2	1,4,7	Expression and formula for unit vector along the given vector and problems	
	2	1,4,7	Addition and Subtraction of two vectors (Algebraically) and problems	Practice-8: Verifying whether the given three position vectors are vertices of an equilateral triangle in MS excel.
	2	1,4,7	Scalar product (dot product) of two vectors and problems	
5	2	1,4,7	Applications of Scalar product: Cosine of an angle between two vectors and problems	Practice-9: Find the scalar product of two vectors also find the angle between two vectors degrees in GeoGebra. Visualize the dot product of two vectors and hence verify the property of orthogonality.
	2	1,4,7	Condition for two vectors to be orthogonal or perpendicular and problems	
	2	1,4,7	Projection of $\vec{a}$ on $\vec{b}$ and $\vec{b}$ on $\vec{a}$ and problems	Practice-10: Find the work done by the force applied at different angles on the body to move it from point A to B. Hence analyze the amount of work done and give the physical interpretation.
	2	1,4,7	Work done by the vector (force) and problems	
6	3	1,4,7	TRIGONOMETRY: Recapitulation of Trigonometric ratios and identities.	Practice-11: Plot the graphs of trigonometric functions for $\sin x$, $\cos x$ and $\tan x$ in the interval $[-\pi, \pi]$ in GeoGebra.
	3	1,4,7	Define radian of an angle. Conversion of angles (Degree to Radian and Radian to Degree) and Problems	
	3	1,4,7	Allied angles: Definition of allied angle, ASTC Rule	Practice-12: Verify the ASTC rule of quadrants in GeoGebra.

	3	1,4,7	Rules of allied angles ($-\theta, 90^\circ \pm \theta$ & $270^\circ \pm \theta$) and simple Problems.	
7	3	1,4,7	Rules of allied angles ($180^\circ \pm \theta$ & $360^\circ \pm \theta$) and simple Problems.	Practice-13: Construction of clinometer for measurement of sides and angles of a triangle.
	3	1,4,7	Problems continued on Allied angles	
	3	1,4,7	Problems continued on Allied angles	
	3	1,4,7	Compound Angles: Formulae for $\sin(A \pm B)$, $\cos(A \pm B)$ and $\tan(A \pm B)$ (without proof) and T-functions of 15° , 75° and 105°	Practice-14: Usage of clinometer (DEMONSTRATION)
8	3	1,4,7	Multiple Angles: $\sin 2A$, $\cos 2A$, $\tan 2A$ with proof	Practice 15: Using clinometer find the heights and distances of physical objects in the surroundings.
	3	1,4,7	Multiple Angles: $\sin 3A$ and $\cos 3A$ with proof	
	3	1,4,7	Applications of Trigonometry: Introduction to Heights and Distances	Practice-16: Using clinometer measure the heights and distances of objects in the surrounding.
	3	1,4,7	Problems based only on angle of inclination	
9	4	1,4,7	COMPLEX NUMBERS: - Definition, real and imaginary parts of a complex number $z = a + ib$. Examples	Practice-17: Plot the Cartesian complex numbers z_1, z_2, z_3, z_4 and z_5 . Also plot $z_1 + z_2, z_3 - z_4, 2z_1, z_3/z_4$ and $z_4 \times z_5$ in the graph sheets
	4	1,4,7	Modulus and amplitude of a complex number and Problems	
	4	1,4,7	Conjugate of a complex number and Problems	Practice-18: Plot the polar complex numbers z_1, z_2, z_3, z_4 and z_5 . Also plot $z_1 + z_2$ and $z_3 - z_4$ in the graph sheets
	4	1,4,7	Addition and subtraction of complex numbers and Problems	
10	4	1,4,7	Multiplication of complex numbers and Problems	Practice-19: Generate 50 random data, construct the frequency distribution table and plot Bar chart using MS Excel.
	4	1,4,7	Ratio of two complex numbers and Problems	
	4	1,4,7	Polar form of a complex number and Problems	Practice-20: Generate 50 random data, construct the frequency distribution table and plot Pie chart using MS Excel.
	4	1,4,7	Exponential form of a complex numbers and Problems	
11	4	1,4,7	Conversion of Cartesian form into polar and exponential forms and Problems	Practice-21: Generate 50 random data, construct the frequency distribution table and plot Line graph using MS Excel.
	4	1,4,7	Problems continued	
	5	1,4,7	LIMIT OF FUNCTIONS: Constants and variables, Definition of function. Concept of limits	Practice-22: Generate 50 random data, construct the frequency distribution table and scatter plot using MS Excel.
	5	1,4,7	Evaluation of limits by factorization method and problems	
12	5	1,4,7	Problems continued	Practice-23: Generate 50 random data, construct the frequency
	5	1,4,7	Evaluation of limits by rationalization method and problems	

				distribution table and plot Histogram using MS Excel.
	5	1,4,7	Problems continued	Practice-24: Plot the following functions in GeoGebra and visualize the graphs. i) Odd function ii) Even function iii) Algebraic function iv) Trigonometric functions v) Exponential functions vi) Logarithmic functions
	5	1,4,7	Evaluation of limit of a function of the type $\lim_{x \rightarrow \infty} \left(\frac{f(x)}{g(x)} \right)$ and Problems	
13	5	1,4,7	Problems continued	Practice-25: Using MS Excel, verify that, as x tends to zero the ratio $\frac{\sin x}{x}$ tend to 1, for 20 discrete data in the interval [0.5, 0.1]. (DEMONSTRATION)
	5	1,4,7	Standard Limits (without proof): a) $\lim_{x \rightarrow a} \left(\frac{x^n - a^n}{x - a} \right) = na^{n-1}$, where n is rational b) $\lim_{\theta \rightarrow 0} \left(\frac{\sin \theta}{\theta} \right) = 1$, where θ is in radians c) $\lim_{\theta \rightarrow 0} \left(\frac{\tan \theta}{\theta} \right) = 1$ where θ is in radians d) $\lim_{x \rightarrow 0} \left(\frac{e^x - 1}{x} \right) = 1$	
	5	1,4,7	Problems on Standard Limits	Practice-26: Evaluation of limits of standard type in <i>wolfram alpha</i> . (DEMONSTRATION)
	5	1,4,7	Problems continued	

4. References:

1. NCERT Mathematics Books for Class XI and XII.
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 40th Edition, 2007.
3. G.B.Thomas, R. L. Finney, Calculus and Analytic Geometry, Addison Wesley, 9th Edition, 1995.
4. V.Sundaram, R.Balasubramanian, K.A.Lakshminarayanan, Engineering Mathematics, 6/e., Vikas Publishing House.
5. Reena Garg & Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishing House, New Delhi.
6. Online resources (courtesy you tube)
 - i) <https://www.youtube.com/watch?v=wbJcJCKBcMg> – Excel for beginners
 - ii) <https://www.youtube.com/watch?v=RDFb--em5Kg> – construction of clinometer.
 - iii) <https://www.youtube.com/watch?v=tn6UoIz-1yM> – using clinometer.
 - iv) <https://www.geogebra.org/download?lang=en-> to download GeoGebra.
 - v) <https://www.youtube.com/watch?v=RYGBhRN9oHQ&list=PLqZ0eZtMcAlugmcomSSvjPBfewVbX35L7> - Basics of GeoGebra
 - vi) <https://www.youtube.com/@grantsander9529> – More videos on GeoGebra

5. CIE and SEE Assessment Methodologies:

Sl. No	Assessment	Test Week	Duration (minutes)	Max marks	Average of all CIE=50 Marks
1.	CIE-1 Theory Test	4	90	50	
2.	CIE-2 Practice Test	7	180	50	
3	CIE-3 Theory Test	10	90	50	
4.	CIE-4 Practice Test	13	180	50	
5	CIE-5 Portfolio evaluation of all the activities through Rubrics	1-13		50	
Total Continuous Internal Evaluation (CIE)					50 Marks
Semester End Examination (SEE) -Theory			180	100	50 marks (100 marks Scaled down to 50 marks)
Total Marks					100 Marks
Minimum marks to pass in CIE & SEE is 40% individually					

6. CIE Theory Test Model question paper:

CIE 1(at the end of 4th week)

Program	_____ Engineering		Semester	I
CourseName	Engineering Mathematics-I		Marks	50
Course Code	25SC11I		Duration	90 min
Name of the Course Coordinator:				
Section A (Answer any six questions, each question carries 5 marks)				
Q. No.	Questions	CL	CO	PO
1			1	
2			1	
3			1	
4			1	
5			1	
6			1	
7			1	
8			1	
9			1	
Section B (Answer any four questions, each question carries 5 marks)				
10			2	
11			2	
12			2	
13			2	
14			2	
15			2	

Signature of the Course Coordinator Signature of the HOD Signature of the IQAC Chairman

CIE 3(at the end of 10th week)

Program	_____ Engineering	Semester	I		
CourseName	Engineering Mathematics-I	Marks	50		
Course Code	25SC11I	Duration	90 min		
Name of the Course Coordinator:					
Section A (Answer any one question, each question carries 5 marks)					
Q. No.	Questions	CL	CO	PO	
1			2		
2			2		
Section B (Answer any six questions, each question carries 5 marks)					
3			3		
4			3		
5			3		
6			3		
7			3		
8			3		
9			3		
10			3		
Section C (Answer any three questions, each question carries 5 marks)					
11			4		
12			4		
13			4		
14			4		
15			4		

7. CIE Practice Test:

Program	Engineering			Semester	I
CourseName	Engineering Mathematics-I			Test	II/IV
Course Code	25SC11I	Duration	3 Hrs	Marks	50
Name of the Course Coordinator:					
Questions				CO	Marks
a.					50
OR					
b.					
Scheme of assessment					
a) Observation					10
b) Conduction					20
c) Result and Output					10
d) Viva					10
II--CIE (ANY ONE QUESTION FROM PRACTICE 1 TO 12(Except 1 and 6)					50
IV--CIE (ANY ONE QUESTION FROM PRACTICE 15 TO 24)					
Total Marks					

Signature of the Course Coordinator

Signature of the HOD

Signature of the IQAC Chairman

8. Suggestive Activities:

The List is only shared as an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose activities that are relevant to the topic and on the availability of such resources at their institution.

Note: Minimum 3 suggested activities should be done.

Sl. No.	Suggestive Activities
01	Application of matrices in coding and decoding.
02	Applications of vectors in dynamics
03	Applications of trigonometry in respective programme domains
04	Plotting circles of different radii ($ z - z_0 = r$), discs ($ z - z_0 \leq r$) and annulus ($R_1 \leq z - z_0 \leq R_2$) in complex plane and record the same in a document.
05	Evaluation of limits using Wolfram alpha platform.

9. Sample Rubrics for Assessment of Activity (Qualitative Assessment)

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

Sl. No.	Dimension	Beginner 2	Intermediate 4	Good 6	Advanced 8	Expert 10	Students Score
1	Knowledge	Poor knowledge About the subject	Normal knowledge about the subject	Good knowledge about the subject	Very good knowledge about the subject	Excellent knowledge about the subject	8
2	Problems solving ability	Solved minimum number of problems with maximum mistakes	Solved minimum number of Problems	Solved problems with few mistakes	Solved maximum number of problems	Solved all problems in neat manner	10
3	Strategies and Procedure	Hardly uses an effective strategy to solve problems.	Rarely uses an effective strategy to solve problems.	Sometimes uses an effective strategy to solve problems, but does not do it consistently.	Typically, uses an effective strategy to solve the problem(s).	Typically, uses an efficient and effective strategy to solve the problems	10
4	Completion	Several of the problem are not completed	Only 30% of the questions are answered correctly	Only 50% of the questions are answered correctly	Only 75% of the questions are answered correctly	All assignment questions are answered correctly	8
5	Neatness and Organization	The work appears sloppy and unorganized. It is hardly to know what information goes together.	The work appears sloppy and unorganized.	The work is presented in an organized fashion but may be hard to read at times.	The work is presented in a neat and organized fashion that is usually easy to read.	The work is presented in a neat, clear, organized fashion that is easy to read.	8
Total marks=8+10+10+8+8=44							44

Equipment/software list with Specification for a batch of 30 students

Sl. No.	Particulars	Specification	Quantity
01	Computers	12 th Generation, Intel Core i3, Graphic card, RAM 16GB, Storage:1TB	30
02	Operating System and software	Windows 10,MS Office, MS excel, GeoGebra	30
03	Internet	High Speed Internet	01
04	Printer	Wireless Multifunctioning printer	03
05	Projector	High resolution, Wi-fi enabled	02
06	UPS	As per standards	5KV

PROBLEMS FOR PRACTICE:

MATRICES AND DETERMINANTS

- If $A = \begin{bmatrix} 4 & 5 \\ 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 6 \\ 1 & 3 \end{bmatrix}$, find the matrix $3A + 2B$.
- If $A = \begin{bmatrix} 4 & 5 \\ 3 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 4 \\ 4 & 1 \end{bmatrix}$, find the matrix $A - 2B$.
- If $A = \begin{bmatrix} 3 & 2 \\ 2 & 0 \end{bmatrix}$ then find $A + A^T$ matrix.
- If the matrix $A = \begin{bmatrix} x & 3 \\ 3 & x \end{bmatrix}$ is a singular matrix find the value of x .
- If $A = \begin{bmatrix} 4 & 3 \\ 2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -3 & 2 \\ 4 & 1 \end{bmatrix}$ find AB matrix.
- Solve the system of linear equations by applying Cramer's rule $3x + 2y = 8; 2x + 5y = 9$.
- Solve the equations $x + y = 3; 2x + 3y = 8$ by Cramer's rule.
- Solve the system equations $2x - y = 3; x + 2y = 4$ by determinant method.
- Solve the system equations $2x + 3y = 5; x + 4y = 5$ by applying Cramer's rule.
- If $A = \begin{bmatrix} 5 & -2 \\ 3 & 1 \end{bmatrix}$ verify that $A(\text{adj}A) = |A|I$ where $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$
- If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix}$, find AB matrix and also find $(AB)^T$ matrix.
- If $\begin{vmatrix} x & 2 \\ 3 & 4 \end{vmatrix} = \begin{vmatrix} 3 & 2 \\ 0 & x \end{vmatrix}$ find the value of x .
- Find adjoint of the matrix $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$
- If $A = \begin{bmatrix} 3 & 2 \\ 1 & 2 \end{bmatrix}$ then find the inverse of the matrix A if it exists
- Find A^{-1} if $A = \begin{bmatrix} 5 & 5 \\ 1 & 2 \end{bmatrix}$
- Find characteristic equation and characteristic roots of the matrix $A = \begin{bmatrix} 1 & 2 \\ 4 & 3 \end{bmatrix}$.
- Find characteristic roots of the matrix $A = \begin{bmatrix} 3 & 4 \\ 2 & 1 \end{bmatrix}$.
- Find characteristic equation and characteristic roots of the matrix $A = \begin{bmatrix} 3 & 2 \\ 4 & 5 \end{bmatrix}$.
- Find characteristic equation and characteristic roots of the matrix $A = \begin{bmatrix} 5 & 2 \\ 4 & 3 \end{bmatrix}$.

VECTORS

- Find the magnitude of vector $i + 2j + k$.
- If $\vec{a} = i + 2j - k, \vec{b} = 3i - 5j + 2k$ find the magnitude of $3\vec{a} - 2\vec{b}$.
- If $\vec{a} = i + 2j + k$ and $\vec{b} = 2i + 4j - k$ then find $|2\vec{b} - 3\vec{a}|$.
- If $\vec{a} = 2i + j + 2k, \vec{b} = i + 3j + k$ and $\vec{c} = 2i + 2j - k$, find $(\vec{a} + \vec{b}) \cdot \vec{c}$.
- Find the projection of $\vec{a} = i + 2j + k$ on $\vec{b} = 2i - 3j + k$.

6. If the vectors $\lambda i + 5j - 6k$ and $7i + 2j + 4k$ are orthogonal find λ .
7. Find the unit vector of $\vec{a} = 2i + 3j - k$.
8. If $\vec{a} = i + 2j - 3k$, $\vec{b} = 3i - 5j + 2k$, find $\vec{a} \cdot \vec{b}$.
9. If $A = (3, -4, 2)$, $B = (-6, 8, 4)$ then find the position vectors of A and B . Also find $\overrightarrow{AB}$ and $|\overrightarrow{AB}|$.
10. If $\vec{a} = i + 2j + 3k$ and $\vec{b} = 4i - j - 5k$, find $\vec{a} + \vec{b}$ and $|\vec{a} + \vec{b}|$.
11. If $\vec{a} = 2i - j + k$ and $\vec{b} = 3i + j - k$, find $\vec{a} \cdot \vec{b}$.
12. If $\vec{a} = i + j + 2k$ and $\vec{b} = 2i - j + k$, then show that $\vec{a} + \vec{b}$ is perpendicular to $\vec{a} - \vec{b}$.
13. Find the unit vector of $\vec{a}$ if $\vec{a} = 3i + 4j + k$.
14. If $\overrightarrow{OA} = 2i - 3j$ and $\overrightarrow{OB} = 8i + 5j$ then find $|\overrightarrow{AB}|$.
15. If $\vec{a} = 2i + 5j - 6k$, $\vec{b} = 5i - j + 2k$, find $\vec{a} \cdot \vec{b}$.
16. Find unit vector in the direction of $\vec{a} = 5i - j + 2k$.
17. If the vertices of a triangle have position vectors $4i + 5j + 6k$, $5i + 6j + 4k$ and $6i + 4j + 5k$, then prove that triangle is an equilateral triangle.
18. Show that the position vectors of the points $2i + 3j + 5k$, $3i + 5j + 2k$ and $5i + 2j + 3k$ form an equilateral triangle.
19. If $\vec{a} = 3i - j + \lambda k$, $\vec{b} = 3i + 3j - 4k$ are orthogonal, find the value of λ .
20. Find the cosine of the angle between the vectors $\vec{a} = 2i + 3j - k$ and $\vec{b} = i + 2j + 2k$.
21. Find the cosine of the angle between the vectors $4i - 2j - 3k$ and $2i - 3j + 4k$.
22. Find the cosine of the angle between the vectors $i + j - 3k$ and $2i + j - k$.
23. Find $\cos \theta$ if θ is the angle between the vectors $\vec{a} = 3i - 2j + 5k$ and $\vec{b} = 2i + 3j + k$.
24. Find the cosine of the angle between the two vectors $\vec{a} = 4i - 2j - 3k$ and $\vec{b} = 2i - 3j + 4k$.
25. Find the projection of the vector $\vec{b} = 3i + 5j + k$ on the vector $\vec{a} = 2i + j - 2k$.
26. Find the projection of the vector $\vec{a} = 2i + j - 2k$ on the vector $\vec{b} = 3i + 5j + k$.
27. A particle is acted by constant forces $3i - j + 2k$, $-i + 3j + k$, $i + j - 2k$ and is displaced from the point $(-1, 2, 3)$ to $(2, -1, 5)$. Calculate the total work done by the forces.
28. A force $\vec{F} = 2i + j - 2k$ acting on particle at $(3, 2, 2)$ displaces it to the point $(1, 3, -1)$, find the work done.
29. Find the work done by the force $\vec{F} = 5i + 3j + 7k$ in moving a particle from the point $A(1, 2, -1)$ to $B(3, 1, -4)$.

TRIGONOMETRY

1. Convert 120° into radian and $\frac{3\pi}{2}$ into degree.
2. Find the value of *i.* $\sin 300^\circ$ *ii.* $\cot 225^\circ$
3. Prove that $\tan(45^\circ + A) = \frac{1 + \tan A}{1 - \tan A}$
4. Write the formula of $\sin(A - B)$ then find the value of $\sin 15^\circ$
5. Find the value of $\sin 120^\circ \cos 330^\circ - \sin 240^\circ \cos 390^\circ$
6. Simplify $\frac{\cos(360^\circ - A) \tan(360^\circ + A)}{\cot(270^\circ - A) \sin(90^\circ + A)}$
7. Simplify $\frac{\sec(360^\circ - A) \cot(90^\circ - A)}{\tan(360^\circ + A) \csc(90^\circ + A)}$
8. Prove that $\sin 2A = 2 \sin A \cos A$
9. Prove that $\cos 2A = \cos^2 A - \sin^2 A$
10. Prove that $\cos 2A = 2 \cos^2 A - 1$

11. Prove that $\cos 2A = 1 - 2\sin^2 A$
12. Prove that $\sin 3A = 3\sin A - 4\sin^3 A$
13. Prove that $\cos 3A = 4\cos^3 A - 3\cos A$.
14. From a point on the ground, the angle of elevation of the top of a building is 30° . If the distance from the point to the base of the building is 50 meters, find the height of the building.
15. A tower is 30 meters high. The angle of elevation from a point on the ground to the top of the tower is 30° . Find the distance of the point from the base of the tower.
16. A tower casts a shadow 20 meters long when the angle of elevation of the sun is 60° . Find the height of the tower.

COMPLEX NUMBERS:

1. Find the value of $1 + i^{10} + i^{20} + i^{30}$
2. Express $\sqrt{3} - i$ in polar form.
3. Express $-1 - i$ in polar form.
4. Find the modulus and amplitude of $\sqrt{3} + i$.
5. Find the modulus and amplitude of $1 - i$.
6. Find the modulus and amplitude of $1 + i$.
7. Express $\frac{(1+3i)}{(1+i)}$ in $a + ib$ form.
8. Express $\frac{(1+3i)}{(1+i)}$ in $a + ib$ form.
9. Express $(1+2i)(3+i)$ in $a + ib$ form.
10. Express $\frac{(2-i)}{(1-i)(3+i)}$ in $a + ib$ form.
11. Find the conjugate of $\frac{(1+i)(1-2i)}{(3+i)}$.
12. Find the modulus and amplitude of $1 + \sqrt{3}i$.
13. Find the real and imaginary parts of $(5+3i)(1-2i)$
14. Find the real and imaginary parts of $(5+3i)(1-2i)$

LIMITS

1. Find $\lim_{x \rightarrow 2} \left(\frac{x^4 - 16}{x - 2} \right)$.
2. Find the value of $\lim_{x \rightarrow -2} \left[\frac{x^3 + 8}{x + 2} \right]$.
3. Find $\lim_{x \rightarrow 0} \left(\frac{3x + \tan 2x}{\sin 3x - 5x^2} \right)$.
4. Evaluate $\lim_{x \rightarrow \infty} \left(\frac{x^2 + x + 1}{2x^2 - 3x - 4} \right)$.
5. Evaluate $\lim_{\theta \rightarrow 0} \frac{\sin 2\theta}{\sin 3\theta}$.
6. Evaluate $\lim_{\theta \rightarrow 0} \left[\frac{\theta}{\tan 5\theta} \right]$.
7. Evaluate $\lim_{x \rightarrow 0} \left(\frac{\sqrt{1+x} - \sqrt{1-x}}{x} \right)$.
8. Evaluate $\lim_{n \rightarrow \infty} \left[\frac{(5-n^2)(n-2)}{(2n-3)(n+3)(5-n)} \right]$.
9. Evaluate $\lim_{x \rightarrow 1} \frac{x^2 - 2x + 3}{x^2 + x + 1}$.
10. Evaluate $\lim_{x \rightarrow -3} \frac{x^2 + 4x + 3}{x^2 + 5x + 6}$.
11. Evaluate $\lim_{\theta \rightarrow 0} \left(\frac{1 - \cos 2\theta}{\theta^2} \right)$.

12. Evaluate $\lim_{x \rightarrow \infty} \left(\frac{5x^2+3x}{7x^2+2x} \right)$.
13. Evaluate $\lim_{x \rightarrow 1} \frac{x^2+5x-6}{x^2-3x+2}$.
14. Evaluate $\lim_{\theta \rightarrow 0} \frac{\tan m\theta}{\tan n\theta}$.
15. Evaluate $\lim_{x \rightarrow 2} \frac{x^2-9x+14}{x^2-4}$.
16. Find $\lim_{\theta \rightarrow 0} \frac{\sin 4\theta}{\tan 5\theta}$.
17. Find $\lim_{x \rightarrow 2} \frac{x^2+5x-14}{x^2+x-6}$.
18. Find $\lim_{x \rightarrow 0} \frac{\sqrt{2+x}-\sqrt{2-x}}{x}$.
19. Evaluate $\lim_{x \rightarrow \infty} \frac{2x^2+3x+5}{6x^2-5x+2}$.
20. Evaluate $\lim_{\theta \rightarrow 0} \frac{\tan 2\theta}{\theta}$.
21. Evaluate: $\lim_{x \rightarrow 0} \frac{\sqrt{1+3x}-\sqrt{1-3x}}{x}$.
22. Evaluate $\lim_{x \rightarrow \infty} \left(\frac{x^2+x+1}{2x^2-3x-4} \right)$.
23. Evaluate $\lim_{x \rightarrow 1} \left(\frac{2x-2}{x^2-1} \right)$.
24. Evaluate $\lim_{x \rightarrow 2} \left[\frac{x^2-4}{\sqrt{x+2}-\sqrt{3x+2}} \right]$.
25. Find the value of $\lim_{x \rightarrow -2} \left[\frac{x^3+8}{x+2} \right]$.
26. Evaluate $\lim_{x \rightarrow 1} \frac{x^2-2x+3}{x^2+x+1}$.
27. Evaluate $\lim_{x \rightarrow 0} \frac{\sin px}{\tan qx}$.
28. Evaluate $\lim_{x \rightarrow -3} \frac{x^2+4x+3}{x^2+5x+6}$.
29. Evaluate $\lim_{x \rightarrow \infty} \left(\frac{5x^2+3x}{7x^2+2x} \right)$.
30. Evaluate $\lim_{x \rightarrow 1} \frac{x^2+5x-6}{x^2-3x+2}$.
31. Evaluate $\lim_{x \rightarrow 3} \frac{x^3-27}{x-3}$.
32. Evaluate $\lim_{x \rightarrow 2} \frac{x^2-9x+14}{x^2-4}$.



Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Program	Computer Science and Engineering	Semester	1/2
Course Name	IT Skills	Type of Course	Integrated
Course Code	25CS01I	Contact Hours	7 per week
Teaching Scheme	3: 0:4	Credits	5
CIE Marks	50	SEE Marks	50 (Practice)

1. Rationale:

In today's fast-changing digital world, foundational IT skills are crucial for technical professionals. This course equips students with hands-on experience in key areas, including computer fundamentals, cybersecurity, problem-solving, **Cloud Computing**, IoT, Artificial Intelligence (AI), and prompt engineering. Additionally, it covers IT certifications to help students build industry-relevant expertise and enhance their job readiness.

2. Course Outcomes: At the end of the Course, the student will be able to:

CO-01	Demonstrate knowledge of computer hardware, software, networking, and internet services.
CO-02	Identify common cyber threats and implement security measures.
CO-03	Apply algorithmic thinking and block-based coding to create simple programs.
CO-04	Explain applications of digital technologies such as Cloud, IoT and AI.
CO-05	Apply AI tools and prompt engineering techniques to generate meaningful outputs.

3. Course Content

W e e k	C O	P O	Lecture(3HRS) (Knowledge Criteria)	Practice(4HRS) (Performance Criteria)
1	1	1, 4	Introduction to Computers ▪ Definition and basic understanding of a computer.	1. Identify the parts of a computer system.

			- Generations of Computers - Classification of computer based on their size, purpose, functionality, and technology. - Functional Block Diagram of a Digital Computer. Memory Systems: Types of Memory and Their Usage: Primary Memory, Secondary Memory: Input/output Systems Software: System software vs. application software	2. Identify the operating system and hardware specifications of a computer.. 3. Basic folder/ file operations (GUI based) 4. Install application software such as web browser, scratch. 5. Hardware scavenger hunt (students identify components in disassembled PC images). Case Study: Prepare a report on important factors to be considered while buying a computer (based on purpose and budget).
2	1	1, 4	Internet skills: - What is Computer Networks? - Types of Networks. Physical and Logical address, Protocols, Key Devices in a Network (Router, Switch, Modem, Access Point) - What is Internet? Common Applications of the Internet; - Browsers, Web Server, Client-Server Model, URL, Search Engine, Domain name and domain name system, websites. - Personal website, website hosting.	1. Explore and list 3 real-world examples for each type of network (LAN, MAN, WAN). 2. Find your Physical (MAC) and Logical (IP) Address 3. Create an email account (e.g., Gmail, Outlook) and explore its security settings 4. Using a Search Engine Effectively : Search for "How does a Search Engine work?" 5. Design, develop and host a personal website using any free platform such as wix.com or worldpress.com 6. Test Internet speed
3	2	1, 4, 7	Cybersecurity - Introduction to Cybersecurity - What is Cybersecurity? - CIA -triad - Importance and Risks - Common Threats: Malware, Phishing, Ransomware, Social Engineering - Cybersecurity Best Practices	1. Identify different cyber threats using real-world examples 2. Install and run an antivirus scan 3. Create strong passwords using password managers 4. Enable and test multi-factor authentication (MFA) 5. Implement User Access Control (UAC) settings on a system 6. Identify safe vs. unsafe websites using browser security indicators

			Secure Authentication and Access Control - Importance of Strong Passwords and - Multi-Factor Authentication (MFA) - Role of User Access Control and Privileged Accounts - Password Management Tools Safe Browsing and Data Protection - Secure Websites (HTTPS, SSL Certificates) - Identifying Fake Websites and Links - Basics of Encryption and Secure File Sharing - Importance of Backups	7. Encrypt and decrypt a file using built-in OS tools 8. Set up and perform a basic data backup
4	2	1, 4, 5, 7	Cyber security best practices - Awareness on cyber safety - Do's and don'ts w.r.t - Password Management - Safe Browsing and Email Habits - Software and System Security - Data Protection and Backup - Social Engineering and Phishing Awareness - Secure Mobile and IoT Devices - Staying Safe from Online Predators, Cyberbullying and Cyber harassment, Using Social Networks Safely.	1. Spot Fake Websites and Phishing Emails 2. Analyze real vs. fake websites (check for HTTPS, domain names, security certificates). 3. Identify phishing emails (hover over links, check sender email, grammar errors). 4. Update and Patch Management - Check if your OS and software are up to date (Windows Update, Linux apt upgrade). - Test an antivirus scan and remove unnecessary apps. 5. Implement a Backup Strategy 6. Encrypt and Secure Sensitive Files 7. Recognizing Scam Calls and Messages
5	3	1, 2, 3, 4, 7	Introduction to Problem Solving - What is problem-solving? - Problem-solving cycle. - Introduction to block-based coding (Scratch, Blockly, MIT App Inventor / Klaritree or similar tool).	1. Explore the interface of the block coding tool 2. Develop algorithms and draw flowchart - for basic arithmetic operations. - Metric conversions.

			Understanding algorithms, flowcharts, and sequencing.	
6	3	1, 2, 3, 4, 7	What are variables? Storing and updating values. Using variables for score counters and timers. Basic Elements of Block-Based Coding: - Motion Blocks - Looks Blocks - Events Blocks - Control Blocks - Operators Blocks - Variables Blocks	- Create a simple animated sequence (e.g., making a sprite move in Scratch). - Design a flowchart for a real-world task - Create a score counter for a simple game. - Develop an interactive greeting app that responds to user input.
7	3	1, 2, 3, 4, 7	Decision Making - What are conditions? (if, if-else, nested if). - Boolean logic (AND, OR, NOT). - Applying conditional logic in games and applications.	- Develop algorithms and draw flowchart to demonstrate comparison and logical operations (eg. Comparison of two number) - Create an interactive story with decision-making (yes/no choices). - Build a traffic light simulator using conditional statements.
8	3	1, 2, 3, 4, 7	Understanding Loops and Repetition - Importance of loops in coding. - Types of loops (repeat, repeat until, forever). - Practical use of loops in problem-solving.	- Create a bouncing ball animation using loops. - Design a counting program that prints numbers from 1 to 20 using loops.
9	4	1, 4, 7	Cloud Computing - What is Cloud Computing? Cloud Computing benefits and use cases - Cloud service models (IaaS, PaaS, SaaS)	- Create a free cloud account (AWS, Azure, or GCP) - Explore the cloud console and key services - Set up cloud storage and upload/download files - Create Online Forms and Surveys to capture data using cloud services
10	4	1, 4, 7	Internet of Things (IoT) - What is IoT? - Characteristics	Create a simple visual block code to blink LED in Arduino board using visual block code, upload code to Arduino board and demonstrate.

			- Components of IoT (Sensors, Actuators, Communication, Cloud, Analytics) - Use Cases of IoT across various industries. - Examples of IoT in everyday life	2. Create a Traffic signal controller with 3 LED (RED, YELLOW and GREEN), upload code to Arduino board and demonstrate. Note : Students and Teachers to use visual block code platform such as a. https://www.tinkercad.com/ b. https://mblock.cc for building IoT application and demonstration.
1 1	4, 5	1, 4, 7	Artificial Intelligence - What is AI? - Types of AI (Weak AI, Strong AI, General AI) - AI in Everyday Life: Real-world applications - AI Systems like prediction, recommendation ,etc. - AI Applications (Healthcare, Finance, Robotics, etc.)	Explore AI tools such as : ChatGPT, Deepseek, Gemini,Grok, Copilot, NapkinAI, Sora,etc
1 2	5	1, 4, 7	Prompt Engineering - What is Prompt Engineering? - Role of AI language models - Types of AI prompts: Direct, Instructional, Conversational - Understanding AI capabilities and limitations Structuring Effective Prompts - Key principles of writing effective prompts - Clarity, specificity, and context in prompts - Role of tone, format, and constraints Domain-Specific Prompting - Using AI for content creation (writing, marketing, coding) - AI in education and research - Customizing prompts for business applications	- Exploring different AI models (ChatGPT, Claude, Bard) - Testing basic prompts and analyzing responses - Improving weak prompts - Experimenting with structured vs. unstructured prompts
1 3	1, 2,	1, 7	IT Certifications and Career Paths	Research and present a report on popular IT certifications.

	3, 4	- Overview of IT certifications (Entry-level to Expert) - Importance of certifications in IT careers - Choosing the right certification based on career goals (Networking, Security, Cloud, Development, etc.)	2. Identify career interests and match them with relevant certifications. 3. Develop a career roadmap with certification milestones.
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4. References

Sl No	Description
1	<i>Computer Fundamentals</i> by P.K. Sinha (11th Ed.)
2	<i>Data Communications and Networking</i> by Behrouz Forouzan (5th Ed.)
3	<i>Cybersecurity for Beginners</i> by Raef Meeuwisse – Covers threats
4	<i>Coding for Kids: Scratch</i> by Jon Woodcock
5	<i>Cloud Computing Basics</i> by Anders Lisdorf
6	<i>IoT for Beginners</i> by Adeel Javed
7	<i>Artificial Intelligence: A Guide for Thinking Humans</i> by Melanie Mitchell
8	<i>The Tech Career Guide</i> by Aki Ito
9	Learn Prompting
10	AI Playground
11	Tinkercad Circuits
12	Blockly Games
13	https://onlinecourses.swayam2.ac.in
14	https://www.geeksforgeeks.org
15	Essentials of Prompt Engineering Coursera
16	https://www.ncerc.ac.in

5. Suggestive Online courses

Sl no	Topic Name	Reference Courses	Self Assessment Link	Source
1	Cyber security	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_014222737382490112870/overview		Coursera
2	Security Attacks	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01384249523170508816531_shared/overview	https://infyspringboard.onwingspan.com/web/en/viewer/html/lex_auth_01384249741937049615982_shared?collectionId=lex_auth_01384249523170508816531_sharedandcollectionType=Course	IIHT
3	Introduction to Problem Solving	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0131149320724398081685_shared/overview	https://infyspringboard.onwingspan.com/web/en/viewer/iap/lex_auth_0132344659742228487432_shared?collectionId=lex_auth_0131149320724398081685_sharedandcollectionType=Course	Infosys Wingspan
4	Flowcharts	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0135015559136952327909/overview		Skillsoft

5	Block coding	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01317717283605708885_shared/overview	https://infyspringboard.onwingspan.com/web/en/viewer/html/lex_auth_013165205899452416510_shared?collectionId=lex_auth_01317717283605708885_sharedandcollectionType=Course	IIHT
6	Block coding	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0130944046684160001693_shared/overview		IIHT
7	Cloud Computing	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_29245015089922640000_shared/overview	https://infyspringboard.onwingspan.com/web/en/viewer/iap/lex_auth_01268242367501107260_shared?collectionId=lex_29245015089922640000_sharedandcollectionType=Course	Infosys Wingspan
8	Internet of Things	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_21553622882521997000_shared/overview	https://infyspringboard.onwingspan.com/web/en/viewer/iap/lex_12361814852557394000_shared?collectionId=lex_21553622882521997000_sharedandcollectionType=Course	Infosys Wingspan
9	Artificial Intelligence	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_8840337130015322000_shared/overview	https://infyspringboard.onwingspan.com/web/en/viewer/iap/lex_26105618936746710000_shared?collectionId=lex_8840337130015322000_sharedandcollectionType=Course	Infosys Wingspan

6. CIE Assessment Methodologies

6. CIE Assessment Methodologies					
Sl.No	CIE Assessment	Test Week	Duration (minutes)	Max marks	Average of all CIE=50 Marks
1.	CIE-1Theory Test	4	90	50	
2.	CIE-2Practice Test	7	180	50	
3	CIE-3Theory Test	10	90	50	
4.	CIE-4Practice Test	13	180	50	
5	CIE-5 ▪ Portfolio evaluation (20) ▪ Online Course/s of minimum 10 Hrs. in Infosys Spring Board/ Swayam/NPTEL/AWS /any other (30)	1-13		50	
Total					50 Marks

Note:

Portfolio evaluation

Each laboratory exercise will be evaluated for a total of 20 marks. The evaluation will include the following components:

- Written description of the experiment in the observation book.
- The results obtained from the experiment.
- Corrections and evaluations of the experiment completed in the previous class, documented in the record book.

The average of all exercises shall be considered for the final assessment at the end of course.

Rubrics for the Mini Project (if included) should be defined by the course coordinator.

7. SEE – Practice Assessment Methodologies

Sl.No	SEE – Practice Assessment	Duration (minutes)	Max marks	Min marks to pass
1.	Semester End Examination-Practice	180	50	20

8. Theory Test model question paper

Program		Computer Science and Engineering			Semester -1	
Course Name		IT Skills			Test	III
Course Code		25CS01I	Duration	90 min	Marks	50
Name of the Course Coordinator:						
Note: Answer any one full question from each section. Each full question carries equal marks.						
Q.No	Questions			Cognitive Level	Course Outcome	Marks
Section - 1						
1	a. Explain the significance of the functional block diagram of a digital computer with a neat diagram. (5) b. Explain the evolution of computers through different generations, highlighting key technological advancements in each generation. (10) c. Explain the different types of networks (LAN, MAN, WAN) with suitable real-world examples. How do they differ in terms of scale and application?(10)			L2	1	25
2	a. Classify computers based on size and purpose. Provide one real-world use case for each type. (5) b. Explain how advancements in computer generations (from			L2	1	

	vacuum tubes to AI) have impacted business productivity. (10) c. Describe the client-server model using the example of an online banking website. (10)			
Section – 2				
3	a. <i>A friend unknowingly clicks a phishing link and shares their bank credentials. Using the CIA triad, explain the potential risks. Then, outline steps they should take immediately to mitigate damage. (10)</i> b. What is Multi-Factor Authentication (MFA)? How does it improve authentication security? Provide an example (8) c. Define Cybersecurity and explain the CIA Triad model. Why is it essential in today's digital world? (7)	L2	2	25
4	a. Describe the importance of password management tools. How do they contribute to secure authentication? Illustrate with examples of popular tools. (10) b. Explain how HTTPS and SSL certificates ensure secure browsing. How can users verify a website's security? (8) c. Compare phishing and ransomware attacks in terms of intent, delivery method, and impact. (7)	L2	2	
Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.				

**Signature of the Course Coordinator Signature of the HOD Signature of the IQAC
Chairman**

9. CIE Practice Test model question paper

Program	Computer Science and Engineering			Semester	1
Course Name	IT Skills			Test	II
Course Code	25CS01I	Duration	180 min	Marks	50
Name of the Course Coordinator:					
Questions				CO	Marks
You have been hired as an IT Support Specialist in a company. Your first assignment is to set up a secure computer system, connect it to a network, and develop a simple automated task using block-based coding. You are required to: - Set up a computer system by identifying its hardware and software specifications. - Find and document system details like CPU, RAM, storage, and operating system. - Identify whether the installed software is system software or application software. - Configure network settings and verify the internet connection. - Retrieve and document the IP address, MAC address, and default gateway. - Ensure cybersecurity best practices to protect the system and online accounts. - Develop a simple program using block-based coding (Scratch, Blockly, or MIT App Inventor) to automate a basic task. - Create an interactive quiz that asks a user three questions and gives feedback on their answers. OR - Develop a program where a sprite moves when arrow keys are pressed.				2	50
Scheme of assessment Computer System Setup - 10 Network Configuration and Internet Connectivity - 10 Cybersecurity Best Practices – 10 Block-Based Coding - 20					
Total Marks					50

Sign of the Course Coordinator

Signature of the HOD

10.SEE- Model Practice Question Paper

Program	Computer Science and Engineering		Semester	1
Course Name	IT Skills	Course Code : 25CS011	Duration	180 min
Questions			CO	Marks
As an IT specialist, you are tasked with setting up a secure digital environment for a small business. You must: - Configure and document the computer hardware and software specifications of a system. - identify the IP and MAC addresses and enable basic security settings. - identify phishing threats and implement Multi-Factor Authentication (MFA). - Develop a simple interactive program using block-based coding that automates a basic business task of greeting customers - Use AI tools to generate a business report and refine the output using effective prompt engineering techniques.			1,2,3,5	50
Scheme of assessment - System setup - 10 - Cybersecurity Measures - 10 - Block-Based Coding and Algorithmic Thinking - 10 - Report Submission and Presentation - 20				
Total Marks				50

1. Signature of the Examiner

2. Signature of the Examiner

11. Equipment/software list with Specification for a batch of 30 students

Sl.No.	Particulars	Specification	Quantity
01	Desktop/Laptop PC with Windows/Linux	Intel i3, 500GB Hard Disk/SSD, 8GB RAM, Monitor, Mouse, Keyboard or higher configuration	30
02	Internet Connection	100 Mbps speed or higher subscription	1
03	LAN connectivity/ High speed Wireless AP	32 Port Switch with LAN cabling/ Wifi Adapters (32 No.)	1
04	Online UPS	5KV with 3 -6 hours backup	1
05	Projector	Multimedia Projector	1

06	White Board	Plane white board / Smart Board/Smart TV	1
07	Audio Speakers	Multimedia, Two-way hybrid speaker system	2



Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Program	Electrical & Electronics Engineering	Semester	I / II
Course Name	Fundamentals of Electrical and Electronics Engineering	Type of Course	Integrated
Course Code	25EE01I	Contact Hours	7 hours/week 91 hours/semester
Teaching Scheme	3:0:4	Credits	5
CIE Marks	50	SEE Marks	50 (Practice)

1. Rationale:

Fundamentals of Electrical and Electronics Engineering is essential for all streams of diploma engineering.

At the end of this Course the student is able to gain knowledge about electrical safety, DC and AC circuits,

Electrical wiring circuits, protective devices, electrical machines, and working of electronics devices

2. Course Outcomes: At the end of the Course, the student will be able to:

CO-01	Comply with the Electrical safety procedures
CO-02	Analyze simple electrical circuits and Wire up simple domestic electrical wiring systems with proper protective device
CO-03	Identify different types of electrical machines and interpret Name plate details of given electrical machines
CO-04	Test and report condition of given Battery and connect UPS to AC Mains.
CO-05	Identify and select the Electronic components for given application

3. Course Content

WEEK	CO	PO	Theory	Practice
1	1	1,4	Electrical safety Procedures: - Meaning of Electrical Safety - Safety precautions in electrical working place - Electrocution (Electric shock) and How to free a person from electrocution.	- Demonstrate use of Personal Protective Equipment (PPE) and types - Electrocution (Electric shock) Use Videos to demonstrate how to free a person from electrocution
	1	1,4	First aid in Electrical injury and methods Electrical fire, causes and preventions Fire extinguishers and types	Demonstration of Pipe and plate Earthing methods Know your Electrical lab. Identify power supply, various components with symbols, Check earthing by measuring the voltage between neutral and earth points.
	1	1,4	- Types of Electrician Tools and their functions - Earthing Definition, necessity and types Advantages of Earthing	
2	2	1,4	Sources of Electricity - Sources of Electricity- Conventional and Non-conventional sources - Advantages of electrical energy - Effects of electric current and its applications	Video demonstration on identification and observation of different ranges and types of meters Verification of Ohm's Law using simple circuit
	2	1,4	Definition, units and meters; Electric Current, Voltage, Resistance, Potential Difference, EMF Ohm's Law; Statement, explanation, Applications and limitations.	Demonstrate experimentally Open circuit, closed circuit and short circuit conditions in Simple series circuit.
	2	1,4	Circuit conditions- open, close, and short circuit	
3	2	1,4	Features of Series and Parallel circuits	Determine the equivalent Resistance in series resistive circuit
	2	1,4	Simple problems on Series circuit	
	2	1,4	Simple problems Parallel circuit.	Determine the equivalent Resistance in parallel resistive circuit

4	2	1,4	Definitions, units and meters; - Electrical work, power and energy, - Simple problems on Electrical energy consumption (Unit/ KWh)	1. Measure the AC voltage, current, power , using relevant measuring instruments in a Single phase AC circuit 2. Measurement of energy in a Single phase AC circuit
	2	1,4	AC Fundamentals - Sinusoidal voltage,current, - definitions of amplitude, cycle, time-period, frequency	Demonstrate the measurement of Amplitude, peak-peak value, time period and frequency of AC quantity using CRO and function generator.
	2	1,4	- Single phase and Three phase electrical power supplies - Applications of single-phase and three-phase power - Merits of three phase system over single phase system.	
5	2	1,4	Protective Devices - Meaning - Necessity of protective devices - Functions and Applications of ✓ Rewireable Fuse ✓ Glass cartridge fuse ✓ HRC fuse	Wire up and test PVC Conduit wiring to control two lamps and one socket independently by providing suitable protective devices.
	2	1,4	✓ Kit-kat fuse ✓ MCB ✓ ELCB	Wire up and test to control one lamp from two places using suitable protective devices (Two- way control/ Staircase wiring)
	2 2	1,4	Types of wiring systems and accessories	
6	3	1,4	Electromagnetic Induction: - Definition, Faraday's laws, Statically and dynamically induced EMF generation. - Self and mutual induced EMF.	Control a lamp using Electromagnetic Relay

	3 3	1,4	Transformers: Function, working, video demonstration on construction of transformer	Determine experimentally the transformation ratio of a given Transformer
	3	1,4	Classification and applications, Transformation ratio.	
7	3	1,4	Generators: DC and AC Generators- definition, types and applications	Study the Name plate details of a given Electrical machine
	3	1,4	DC Motors: - Definition, types and applications. - BLDC motor applications	Video demonstration of construction of three phase Induction Motor.
	3	1,4	AC Motors: - Definition ,Types & Applications - Necessity of starters for AC motors. - Types and applications.	Wire up a starter to start and reverse the 1 Phase/3 phase AC motor.
8	4	1,4	Cells and Batteries: Definition, symbol, types, comparison and applications	Construct a simple battery using primary cells for the required voltage and to light an LED through a resistor in series.
	4	1,4	Lead Acid battery and its maintenance	Video demonstration on construction of Lithium-Ion battery
	4	1,4	Lithium-Ion battery and its applications	
9	4	1,4	Ampere-Hour Capacity, Selection criteria of batteries	Test and report the condition of given Lead Acid battery /Lithium-Ion battery
	4	1,4	UPS Meaning, types and applications	
	4	1,4	Block diagram of online UPS system.	Connect UPS in an electrical lighting system and observe continuity of supply. Measure the AC voltage.
10	4	1,4	Introduction of Alternate Energy Sources and Applications	Video Demonstration on working of a Simple Electric Vehicle
	4	1,4	Evolution of Electric Vehicles, Batteries used for EVs	
	4	1,4	- Electric Motors used in EVs - Battery and UPS ratings for Solar powered Street lighting	Video demonstration on solar powered street lighting

11	5	1,4	Electronic Components Resistors, Capacitors and Inductors - Definition, Unit, Types, and Applications.	Identify and determine the value of resistance, inductance and capacitance using LCR meter Compute the value of a given carbon resistor using colour coding.
	5	1,4	- Definitions of conductors, insulators and semiconductors with examples - comparison and applications	Identify the terminals of Diode.
	5	1,4	Semiconductor Diode; - Definitions of P and N type semiconductors, - Diode and its Symbol - Working of Diode in forward and reverse bias - Types of diodes and ratings - Applications	Connect the diode in forward and reverse bias modes and observe the status of the LED connected in the circuit.
12	5	1,4	Rectifier Definition, types, working of Bridge rectifier	Trace the input and output waveforms of an IC Bridge rectifier.
	5	1,4	Transistor - Definition and Types - Symbol - Applications	
	5	1,4	Digital fundamentals - Integrated Circuits (IC) - Definition, advantages and applications - Logic Gates- Symbol, Boolean expression and truth table of AND, OR, NOT, NAND, NOR, EX- OR gates	Verify the truth tables of AND, OR, NOT, NAND, NOR, EX-OR gates
13	5	1,4	Sensors and Actuators; Definition, Types and Applications of sensors	1. Construct Photo-diode circuit and Test for its working
	5	1,4	LDR, Photodiode, and Photo transistor (opto-isolator), Solar cell- Symbol and Applications	2. Detect an object using IR proximity sensor
	5	1,4	- Definition of Actuator, Types and applications. - PLC- Block diagram and PLC applications.	Video demonstration on working of any simple Mechanical/ Electrical Actuator. List commercially available PLCs.

4.References:

1. ABC of Electrical Engineering by B. L. Theraja and A. K. Theraja, S Chand Pu
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 usinkbnnnjbbh 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
7. <https://www.youtube.com/watch?v=mc979OhitAg&list=PLWv9VM947MKi7yJ0FCfzTBXpQUQd3K>
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12. <http://www.electronics-tutorials/>
13. <http://www.pitt.edu/~qi4/Academic/ME2082/Transistor%20Basics.pdf>
14. <http://www.technologystudent.com/elec1/transis1.htm>
15. <http://www.learningaboutelectronics.com/>
16. <http://www.electrical4u.com/>
17. <https://www.youtube.com/watch?v=zLW>
18. <https://www.youtube.com/watch?v=8PTNjw-hQIM>

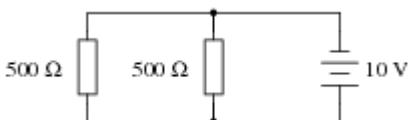
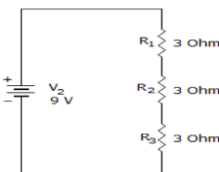
5. CIE Assessment Methodologies

Sl. No	CIE Assessment	Test Week	Duration (minutes)	Max marks	Average of all CIE=50 Marks
1.	CIE-1TheoryTest	4	90	50	
2.	CIE-2 Practice Test	7	180	50	
3	CIE-3TheoryTest	10	90	50	
4.	CIE-4 Practice Test	13	180	50	
5	CIE-5 Portfolio evaluation of all the activities through Rubrics	1-13		50	50 Marks
Total					

6. SEE – Practice Assessment Methodologies

Sl.No	SEE – Practice Assessment	Duration (minutes)	Max marks	Min marks to pass
1.	Semester End Examination-Practice	180	50	20

7. CIE Theory Test model question paper

Program	Electrical & Electronics Engineering			Semester -I/II	
Course Name	Fundamentals of Electrical and Electronics Engineering			Test	I/II I
Course Code	25EE01I	Duration	90 min	Marks	50
Name of the Course Coordinator:					
Note: Answer any one full question from each section. Each full question carries equal marks.					
Q.No	Questions		Cognitive Level	Course Outcome	Marks
Section - 1					
1	a) List any 5 electrician tools. Mention their function.		1	1	5
	b)State and explain Ohm’s Law. List the limitations of Ohm’s Law.		2	2	8
	c)Compare single-phase and three-phase power.		3	2	6
	d)Calculate the total current drawn by the below circuit.		4	2	6
					
2	a)Define earthing. List the different types of earthing.		1	1	5
	b)With simple diagrams explain open circuit, short circuit and closed circuit		2	2	8
	c)What are the Advantages of three phase power over single phase power.		3	2	6
	d) Find the equivalent resistance and the current flowing through 3-ohm resistance in the circuit below.		4	2	6
					
Section - 2					
3	a)List any 5 sources of electrical energy		1	1	5
	b) Draw a sinusoidal waveform and name amplitude, instantaneous value, time period, frequency and cycle.		2	2	8
	c)How to free a person from electrocution?		3	2	6
	d)An electric fan draws a current of 0.9 Amps when connected to a single-phase, 230 volts, 50 HZ AC supply through an electric regulator. Determine the resistance of the regulator.		4	2	6

4	a)List the safety precautions to be taken in an electrical working place	1	1	5
		2	2	8
	b)Define Current, Voltage and Resistance. Mention their symbol and Units.	3	2	6
	c)List the different types of fire extinguishers. Which type of fire extinguisher do you use to extinguish fire caused by wood and cooking oil?	4	2	6
	d)A 9 Volt cell when used in an electrical circuit turns on a LED. State the effect of electric current. Justify			
Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.				

Signature of the Course Coordinator

Signature of the HOD

**Signature of the
IQAC Chairman**

8. CIE Practice Test model question paper

Program	Electrical & Electronics Engineering			Semester	I/II
Course Name	Fundamentals of Electrical and Electronics Engineering			Test	II/IV
Course Code	25EE01I	Duration	180 min	Marks	50
Name of the Course Coordinator:					
Questions				CO	Marks
NOTE : Any ONE of the following questions may be allotted to each student					50
1. Verify Ohm's Law using a simple circuit.				1	
2. Demonstrate experimentally Open circuit, closed circuit and short circuit conditions in Simple series circuit.				2	
3. Determine the equivalent Resistance in series circuit				2	
4. Determine the equivalent Resistance in parallel circuit				2	
5. Measure the AC voltage, current, power using relevant measuring instruments in a Single phase AC circuit				2	
6. Measurement of energy in a Single phase AC circuit				2	
7. Measure Amplitude, peak-peak value, time period and frequency of AC quantity using CRO and function generator.				2	
8. Wire up and test PVC Conduit wiring to control two lamps and one socket independently by providing suitable protective devices.				2	
9. Wire up and test to control one lamp from two places using suitable				2	
10. protective devices (Two- way control/ Staircase wiring)				2	
11. Wire up Panel board wiring with protective devices (fuse, MCB, load, Neutral link)				2	
12. Control a lamp using Electromagnetic Relay				2	
13. Demonstrate the concept of Electromagnetic induction using coil, magnet and galvanometer				3	
14. Determine experimentally the transformation ratio of a given Transformer				3	
15. Wire up a starter to start and reverse the 1 Phase/3 phase AC motor.				3	
Scheme of assessment					
a) Identification of meters/ equipment/wires/tools etc					5
b) Writing Circuit/writing diagram and Procedure					12
c) Conduction					18
d) Results					5
e) Viva-voce					10
Total Marks					50

Signature of the Course Coordinator

Signature of the HOD

9. Suggestive Activities:

The List is an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose **any two** activities that are relevant to the topic

Sl.No.	Suggestive Activities
01	Given the practical working circuits, measure Resistance, Current, Voltage, Power and Energy in DC and AC (Single phase) Circuits Using suitable meters/ instruments.
02	List out the different types of wiring systems used in your laboratories or house with their representation
03	Mini-Projects: Like preparing extension box, switch box and wiring models
04	List out the different protective devices used in your laboratories or house with their ratings.
05	Applications of Electromagnetic Induction, statically induced and dynamically induced emf, self and mutual induced emfs
06	Prepare a report on types of starters and enclosures used for various industrial applications of AC motors.
07	Types of Cells and Battery maintenance
08	Visit a nearby Battery charging shop or showroom and prepare a report of the visit.
09	Prepare a report on various types of diodes used for various industrial applications.
10	Prepare a report on various types of sensors and actuators used for various industrial applications.
11	Mini-Projects: Connect and test a sensor (domain application) to a Digital circuit
12	Prepare a report stating HP rating, types and applications of FHP motors.

10. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Student Score
		2	4	6	8	10	
1		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	8
2		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	6
3		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	2
4		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	2
	Average Marks=(8+6+2+2)/4=4.5						5

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

11. SEE- Model Practice Question Paper

Program	Electrical & Electronics Engineering		Semester	I/II	
Course Name	Fundamentals of Electrical and Electronics Engineering	Course Code	25EE01I	Duration	180 min
Questions			CO	Marks	
NOTE : Any ONE of the following questions may be allotted to each student				50	
1. Verify Ohm’s Law using a simple circuit.			1		
2. Demonstrate experimentally Open circuit, closed circuit and short circuit conditions in Simple series circuit.			2		
3. Determine the equivalent Resistance in series circuit			2		
4. Determine the equivalent Resistance in parallel circuit			2		
5. Measure the AC voltage, current, power using relevant measuring instruments in a Single phase AC circuit			2		
6. Measurement of energy in a Single phase AC circuit			2		
7. Measure Amplitude, peak-peak value, time period and frequency of AC quantity using CRO and function generator.			2		
8. Wire up and test PVC Conduit wiring to control two lamps and one socket independently by providing suitable protective devices.			2		
9. Wire up and test to control one lamp from two places using suitable					
10. protective devices (Two- way control/ Staircase wiring)			2		
11. Wire up Panel board wiring with protective devices (fuse, MCB, load, Neutral link)			2		
12. Control a lamp using Electromagnetic Relay			2		
13. Demonstrate the concept of Electromagnetic induction using coil, magnet and galvanometer			2		
14. Determine experimentally the transformation ratio of a given Transformer			3		
15. Wire up a starter to start and reverse the 1 Phase/3 phase AC motor.			3		
16. Construct a simple battery using primary cells for the required voltage and to lit an LED through a resistor in series.			3		
17. Identify and determine the value of resistance, inductance and capacitance using digital multi meter/LCR meter			4		
18. Compute the value of a given carbon resistor using colour coding.			5		
19. Connect the diode in forward and reverse bias modes and observe the status of LED connected in the circuit.			5		
20. Trace the input and output waveforms of an IC Bridge rectifier.			5		
21. Verify the truth tables of AND, OR, NOT, NAND, NOR, EX-OR gates (ANY 3)			5		
22. Construct Photo-diode circuit and Test for its working					
23. Detect an object using IR proximity sensor					
Scheme of assessment					
a) Identification of meters/ equipment/wires/tools etc				5	
b) Writing Circuit/writing diagram and Procedure				12	
c) Conduction				18	
d) Results				5	
e) Viva-voce				10	
Total Marks				50	

1) Signature of the Examiner

2) Signature of the Examiner

12. Equipment/software list with Specification for a batch of 30 students

	Particulars	Specification	Quantity
01	Dual Channel ,continuously variable DC Regulated Power Supply with Current and Overload Protection	30 V, 2 A	05
02	Fixed DC Regulated Power Supply	+/- 15 V, 2 A	05
03	Portable Moving Coil DC Voltmeters	a) 0 - 1 V b) 0 - 10 V c) 0 - 30 V	Each 05 No.
04	Portable Moving Iron AC Voltmeters	a) 0 - 300 V b) 0 - 600 V	Each 05 No.
05	Portable Moving Coil DC Ammeters	a) 0 - 100 mA b) 0 - 1 A c) 0 - 2 A	Each 05 No.
06	Portable Moving Iron AC Ammeters	a) 0 - 2 A b) 0 - 5 A c) 0 - 10 A	Each 05 No.
07	Watt-meters	a) 150/ 300V, 2 A, UPF b) 300/ 600 V, 5/ 10 A, LPF	Each 02 No.
08	Rheostats	25 Ohms, 50 Ohms, 150 Ohms, 220 Ohms (all rated at 3 A)	Each 05 No.
09	Rheostat Loads	1 KW, 230 V	02
10	Wire wound Resistors	-5 Ohms 2 Watts, 25 Ohms 5 Watts, 330 Ohms 2 Watts, 560 Ohms 2 Watts, etc.	Each 05 No.
11	Soldering Iron	60 W	05
12	Single Phase Energy meter	10 A, 230 V, 50 Hz, Digital type	05
13	Multimeter Digital	$\frac{3}{4}$ "	06
14	Dual Trace Oscilloscope	30 MHz	02
15	Three Phase Induction Motor	1 HP – 440 V 50 Hz, 2 HP – 440 V 50 Hz.	Each 02 No.
16	Three phase DOL, Star-Delta, Auto transformer starter		Each 02 No.
17	UPS	1 KVA	01
18	Battery and Hydrometers	Battery Lead-Acid type, 140 A-hr	02
19	I C Trainer kit		05
20	Digital IC's	7400, 7402, 7404, 7408, 7486 etc	Each 10 No
21	Wooden Wiring board	(2x3) ft	10

22	Wiring accessories 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 No
22	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 No
23	Simple PANEL BOARD/ CUBICAL consisting of bus-bars, CB/MCB/ELCB, meters, HRC fuses, magnetic contactors, cables, earthing points.		01



Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Program	Electronics and Communication Engineering	Semester	1
Course Name	Digital Electronics-I	Type of Course	Integrated
Course Code	25EC11I	Contact Hours	8 hours/week (104 hours/semester)
Teaching Scheme	L: T:P :: 4:0:4	Credits	6
CIE Marks	50	SEE Marks	50 (Theory)

1. Rationale:

Digital electronics stems from its inherent advantages in reliability, versatility, scalability, and integration, reflecting its critical role in modern technology. Digital systems have transformed various industries, leading to advances in computing, communication and automation, making it a fundamental aspect of contemporary engineering and technology.

2. Course Outcomes: At the end of the Course, the student will be able to:

CO-01	Understand and perform arithmetic and conversion operations on different number systems.
CO-02	Formulate, simplify and implement simple logic functions using logic gates.
CO-03	Build and analyze various combinational circuits in a real time environment.
CO-04	Identify and utilize the suitable ICs for different applications.

3. Course Content

WEEK	CO	PO	Theory	Practice
1	1	1,2	Introduction to Digital Electronics, Importance, and Its applications. https://youtu.be/DBTna2ydmC0?feature=shared <u>Number Systems</u> • Comparison between analog and digital signals with real-world examples. • Number systems: Binary, Decimal and Hexadecimal. Relevance and examples.	1. Demonstrate number system and its conversion by using scientific calculator and verify theoretically. 2. Familiarize Digital IC Trainer Kit and do the following, ☐ Precautions to be taken while handling ICs. ☐ Analyze Pin diagram of an IC. ☐ Demonstrate the testing of an IC using an IC tester.

			https://youtu.be/FFDMzbrEXaE?feature=shared <u>Conversion between number systems with examples</u> • Binary to decimal and vice versa. • Hexadecimal to decimal and vice versa. • Binary to hexadecimal and vice-versa (bitwise grouping only).	☐ Demonstrate equivalent analog voltages for positive logic of logic 0 and logic 1 using Multimeter
2	1,4	1,2	<u>Arithmetic operations and Codes</u> • Arithmetic operations. ☐ Addition and Subtraction on 4 bit and 8 bit binary numbers with examples (integers only). ☐ Addition and subtraction of Hexadecimal numbers. • 1's & 2's complement of binary numbers with examples. • Representation of signed binary numbers. Problems on subtraction using 2's complement. • Codes: BCD, Gray and ASCII- its features with examples, applications	1. Perform BCD addition with simple examples. 2. Develop Binary to Gray code converter using IC 7486 and vice -versa.
3	4	2,5	<u>Digital Integrated Circuits</u> https://study.com/academy/lesson/video/digital-integrated-circuits-definition-types-examples.html • IC: Concept, Classification-Based on Scale of Integration. • IC- advantages and disadvantages • Logic-family concept, need and types of logic families. • Logic-family definitions: Propagation delay, fan-out, fan-in, power dissipation, noise margin, speed and speed-power product.	1. Verify the functionality of all the logic gates in the following ICs. a. 7432 b. 7408 2. Tabulate the parameters: Propagation delay, fan-out, fan-in, power dissipation, noise margin of the following ICs as per their Data Sheet. a. 7404 b. 7486
4	2,4	1,2	<u>Boolean Algebra and Logic Gates:</u> • Boolean algebra: Understanding of Constants, variables, functions with examples. • Boolean identities and Boolean Laws. • Logic-gates (NOT, OR, AND, NOR, NAND, EX-OR and EX-NOR) Symbol, function, expression and truth-table. • De-Morgan's Theorems with proof and examples.	1. Verification of Truth Table for all the logic gates. 2. Verify De-Morgan's Theorems using Logic gates.

5	2,4	1,2	<u>Universal Logic Gates & Boolean expression simplification</u> • Universal Logic Gates: Concept, examples. • Realization of all logic gates using NAND Gate. • Simplification of Boolean expressions using Boolean algebra. • Build the logic circuit using logic gates for simplified Boolean expression.	1. Realization of NOT, OR, AND gates using NOR Gates. 2. Realization of NAND, EX-OR, EX-NOR gates using NOR Gates.
6	2,4	1,2	<u>Boolean expression forms & conversions</u> • SOP and POS forms: Conversion into standard SOP forms. • Conversion into standard POS forms. • Translate SOP and POS expressions into truth-table. • Convert truth-table to SOP and POS expressions.	1. Simplify a given SOP (3 variable) using Boolean laws and realize it using logic gates. 2. Simplify a given POS (3 variable) using Boolean laws and realize it using logic gates.
7	2,4	1,2	<u>Boolean expression simplification using K Map</u> • Karnaugh Map: Need, Examples. • Map grouping rules. • Simplification of 2 and 3 variable Boolean expressions using K-map. • Realize the above simplification using logic gates.	1. Reduce any 4 variable Boolean expressions using K-map. 2. Realize and verify the above simplified Boolean expression using logic gates.
8	3,4	2,3,4	<u>Combinational Circuits: Arithmetic Circuits</u> • Features of combinational circuits, applications and examples. Half adder (HA): Concept, truth-table, logical expression, gate-level implementation. • Full adder (FA): Concept, truth-table, logical expression, gate-level implementation. • Half Subtractor (HS): Concept, truth-table, logical expression, gate-level implementation. • Full Subtractor (FS): Concept, truth-table, logical expression, gate-level implementation.	1. Construct and Verify Full Adder. 2. Construct and Verify Full Subtractor.

9	3,4	2,3,4	<u>Combinational Circuits: Adders & Comparators</u> - Serial adders and Parallel adders: Concept, comparison & their applications. - Working 8-bit serial adder. 3-bit parallel adder: Concept, Block diagram and its working. 1-bit magnitude comparator: Concept, Block diagram, truth-table, logical expression, gate-level implementation and application.	1. Implement 3-bit parallel adder using IC 7483. 2. Realize 1 bit comparator using logic gates.
10	3,4	2,3,4	<u>Combinational Circuits: Multiplexers</u> - Multiplexers (Mux): Concept, general block diagram, No. of inputs to select line calculation. 2:1 Mux: Block diagram, truth-table, logical expression, gate-level implementation. 4:1 Mux: Block diagram, truth-table, logical expression, gate-level implementation. - Applications of Mux.	1. Implementation of 2:1 Mux using logic gates. 2. Verify the functionality of 4:1 Mux using IC 74151.
11	3,4	2,3,4	<u>Combinational Circuits: De-Multiplexers</u> - De-Multiplexers (De-Mux): Concept, general block diagram, No. of inputs to select line calculation. 1:2 De-Mux: Block diagram, truth-table, logical expression, gate-level implementation 1:4 De-Mux: Block diagram, truth-table, logical expression, gate-level implementation - Applications of De-Mux.	1. Implementation of 1:2 De-Mux using logic gates 2. Verify the functionality of 1:4 De-Mux using IC 74139.
12	3,4	2,3,4	<u>Combinational Circuits: Encoders & Decoders</u> 4:2 Encoder: Block diagram, truth-table, logical expression, gate-level implementation, Applications. 2:4 Decoder: Block diagram, truth-table, logical expression, gate-level implementation, Applications. - Decimal-to-BCD encoder: Logic diagram, working, truth-table and application. - BCD-to-Decimal decoder: Logic diagram, working and truth-table.	1. Implement 4:2 Encoder using Logic gates. 2. Implement 2:4 Decoder using Logic gates.

13	3,4	2,4	<u>7 - Segment Display</u> • Seven-segment display: Principle and types. • Identify and list ICs for 7-segment display and Decoder. • BCD-to-seven segment decoder: Logic diagram, working and truth table (Only Anode Type)	Implement BCD to 7 Segment decoder using a suitable IC.
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NOTE

1. In practice sessions all video demonstrations should be followed by MCQ/Quiz/Subjective questions and evaluation has to be documented.
2. Online course completion certification to be done on relevant topics on Swayam/NPTEL/Infosys Springboard platforms or any other platform.
3. Problems statement to be collected from the relevant industries, resolve and submit it to the course coordinator.

4. References:

- i) 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.
- ii) Digital Electronics –principles and integrated circuits. Anil K. Maini. Wiley publications, first edition. ISBN:978-81-265-1466-3.
- iii) Digital principles and applications. Donald P Leach, Albert Paul Malvino, GoutamSaha, McGraw Hill Publisher, 7th edition, ISBN:978-0-07-014170-4.
- iv) Digital Systems-principles and applications. Ronald J. Tocci, Neal S.Widmer, Gregory L. Moss, Prentice Hall Publications, 8th edition, ISBN:0-13-085634-7.
- v) Digital Computer Fundamentals, -Thomas C Bartee, McGraw-Hill Publisher, 4th edition. ISBN 0-07-003892-9.

5. CIE Assessment Methodologies

Sl.No	CIE Assessment	Test Week	Duration (minutes)	Max marks	Average of all CIE=50 Marks
1.	CIE-1Theory Test	4	90	50	
2.	CIE-2 Practice Test	7	180	50	
3	CIE-3 Theory Test	10	90	50	
4.	CIE-4 Practice Test	13	180	50	
5	CIE-5 Portfolio evaluation of all the activities through Rubrics	1-13		50	
Total					50 Marks

Note: -

Portfolio evaluation includes average of (a) and (b)

- (a) Any one of the suggested activity model with report and presentation evaluated for 50 marks
- (b) Each laboratory exercise will be evaluated for a total of 50 marks. The evaluation will include the following components:
 1. Written description of the experiment in the observation book.
 2. Conducting the experiment and the associated learning outcomes.
 3. The results obtained from the experiment.
 4. Corrections and evaluations of the experiment completed in the previous class, documented in the record book.

6. SEE - Theory Assessment Methodologies

Sl. No	SEE – Theory Assessment	Duration	Exam Paper Max marks	Exam Paper Max Marks scale down to (Conversion)	Min marks to pass
1.	Semester End Examination-Theory	3 Hours	100	50	20

7. CIE Theory Test model question paper

Program		Electronics and Communication Engg.			Semester -1	
Course Name		Digital Electronics-I			Test	I/III
Course Code			Duration	90 min	Marks	50
Name of the Course Coordinator:						
Note: Answer any one full question from each section. Each full question carries equal marks.						
Q.No	Questions			Cognitive Level	Course Outcome	Marks
Section - 1						
1	a) Choose any 3 Analog signals and any 2 Digital signals from real environment			L3	C01	05
	b) Convert the given Binary to Hexadecimal and a given Hexadecimal to Binary			L3	C01	5+5
	c) Convert the given Binary to Gray and the given Gray to Binary			L3	C01	5+5
2	a) Chart main advantages of digital signals over analog signals?			L3	C01	05
	b) Convert the given Decimal to Hexadecimal and a given Hexadecimal to Decimal.			L3	C01	5+5
	c) Perform addition of the given 4-bit binary number and subtraction of the given 4 bit binary number.			L3	C01	5+5
Section - 2						

3	a) Mention and explain any 5 Boolean laws in Boolean algebra.	L2	CO2	5
	b) Create a truth table for a 3-input AND gate and OR gate.	L2	CO2	10
	c) Realize the basic logic function using only NAND or NOR gates.	L3	CO2	10
4	a) State and Interpret De-Morgan's theorem.	L2	CO2	5
	b) Express basic logic gates using only NAND gate?	L2	CO2	10
	c) Simplify the given Boolean expression and implement using suitable Logic gates.	L3	CO2	10

Note for the Course coordinator:

1. Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes. All questions must be framed under Understand (L2) & Apply (L3) cognitive level using Revised Bloom's Taxonomy.

Signature of the
Course Coordinator

Signature of the
HOD

Signature of the
IQAC Chairman

8. CIE Practice Test model question paper

Program	Electronics and communication Engineering			Semester	1
Course Name	Digital Electronics-1			Test	II/IV
Course Code		Duration	180 min	Marks	50
Name of the Course Coordinator:					
Questions				CO	Marks
Write-up for two experiments and conduction of any one experiment.					50
Scheme of assessment					
a) Writing the Circuit diagram, tabular column, calculations etc. for two experiments.					20
b) Rig up and Conduction of any one					15
c) Result					05
d) Viva-voce					10
Total Marks					50

Signature of the
Course Coordinator

Signature of the
HOD

Signature of the
IQAC Chairman

9. Suggestive Activities for students:

The List is an Example and not inclusive of all possible activities of the course. Students and Faculty are encouraged to choose activities that are relevant to the topic.

Note: Activity can be undertaken by either an individual or a team comprising up to 5 students.

Sl.No.	Suggestive Activities for students
01	Designing a Simple Digital lock. To design and implement a digital lock using combinational logic that requires a specific 3-bit binary code to unlock. Components: * 7404 (NOT Gate IC) * 7408 AND Gate IC * 7432 (OR Gate IC) * 7486 (XOR Gate IC) * Breadboard, jumper wires, logic switches, LEDs, resistors.
02	Designing a Simple Parity Checker. To design a simple parity checker using combinational logic that determines whether a binary number has even or odd parity. Components: * 7404 (NOT Gate IC) * 7408 (AND Gate IC) * 7432 (OR Gate IC) * Breadboard, jumper wires, logic switches, LEDs, resistors
03	Designing a Simple 4-bit BCD Adder. To design and implement a 4-bit Binary-Coded Decimal (BCD) adder that adds two 4-bit BCD numbers and produces a BCD result. Components: * 7404 (NOT Gate IC) * 7408 (AND Gate IC) * 7432 (OR Gate IC) * 7486 (XOR Gate IC) * Breadboard, jumper wires, logic switches, LEDs, resistors
04	Designing a Simple Binary-to-Decimal Converter. To design and implement a binary-to-decimal converter using combinational logic that converts a 4-bit binary number to its decimal equivalent, displaying the result on LEDs. Components: * 7404 (NOT Gate IC) * 7408 (AND Gate IC) * 7432 (OR Gate IC) * 7447 (BCD to 7-segment Decoder IC) or equivalent * 7-segment displays (if using a BCD decoder) * Breadboard, jumper wires, logic switches, resistors.
05	Designing a Simple 4-bit Binary Alarm System. To design and implement a basic 4-bit binary alarm system that triggers an alarm when a specific 4-bit binary code is entered. Components: 7404 (NOT Gate IC) 7408 (AND Gate IC) 7432 (OR Gate IC) 7486 (XOR Gate IC) Breadboard, jumper wires, logic switches, buzzer or LED (for alarm), resistors.

10. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Students Score
		10	20	30	40	50	
1		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	40
2		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	30
3		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	50
4		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	20
Average Marks=(40+30+50+20)/4=35							35

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

11. Equipment/software list with Specification for a batch of 30 students

Sl.No.	Particulars	Specification	Quantity
01	Digital trainer kits.		15
02	IC tester, logic probes.		05
03	Digital Multimeters		15
04	Suitable ICs		20 Each
05	Patch cards (Different lengths)		300



Government of Karnataka
Department of Technical Education

Course Code	Programme Specific	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	-

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:

Unit-1 Ecosystem	<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.	
Unit-2 Air Pollution	<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	
Unit-3 Noise Pollution:	<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	
Unit- 4 Water and Soil Pollution:	<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	
Unit-5 Renewable sources of Energy	<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.	

Unit-6 Solid Waste Management and Environmental Acts	<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	Contact Hrs
1. Ecosystem	Structure of ecosystem, Biotic & Abiotic components, Aquatic (Lentic and Lotic) and terrestrial ecosystem.	1
	Global warming - Causes, effects.	2
	Green House Effect, Ozone depletion - Causes, effects	3
2. Air and Pollution	Air pollution, Natural sources of air pollution, Man Made sources of air pollution	4
	Air pollutants and Types, Effects of Particulate Pollutants and control by Cyclone separator	5
	Effects of Particulate Pollutants and control by Electrostatic Precipitator, Air (prevention and control of pollution) act 1981.	6
3. Noise Pollution	Noise pollution: sources of pollution, Measurement of Noise pollution level.	7
	Effects and Control of Noise pollution.	8
	Noise pollution (Regulation and Control) Rules, 2000	
4. Water and Soil Pollution:	Sources of water pollution. Types of water pollutants, Characteristics of water pollutants.	9
	Control measures of water pollution.	10
	Definition and list unit operations in water and Wastewater Treatment process, Water (prevention and control of pollution) act 1974.	11
	Water conservation – Importance of Rainwater Harvesting	12
	Soil pollution, Causes and Effects due to Fertilizers, Pesticides and Insecticides	13
	Preventive measures of Soil Pollution due to Excessive use of Fertilizers, Pesticides and Insecticides.	14
5. Renewable sources of Energy	Solar Energy: Basics of Solar energy.	15
	Solar collectors and advantages of Advanced solar collectors.	
	Solar water heater, Solar stills and their uses.	16
	Biomass: Overview of biomass as energy source. Thermal characteristics of biomass as fuel.	17
	Wind energy: Current status and future prospects of wind	18

	energy. Wind energy in India.	
	Need of new Energy sources, Different type's new energy sources. Environmental benefits of New Energy Sources-Hydrogen energy	19
	Environmental benefits of New Energy Sources- Ocean energy resources	20
	Environmental benefits of New Energy Sources-Tidal energy conversion.	21
6. Solid Waste Management and Environmental Acts	Solid waste generation, Sources, Characteristics of solid waste Solid Waste Management rules 2016	22
	E- Waste generation Sources and characteristics, E waste management rules 2016	23
	Plastic Waste generation Sources and characteristics, Plastic Waste Sources and characteristics	24
	Recycled plastic rules 2016, Importance of Environment (protection) act 1986,	25
	Occupational health and safety measures.	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.

Course Assessment and Evaluation Chart

Sl. No	Assessment	Test Week	Duration In minutes	Max marks	Conversion
1.	CIE-1 Written Test (Theory)	7	90	50	Average of three tests 50
2.	CIE-2 Written Test (Theory)	10	90	50	
3	CIE-3 Written Test (Theory)	13	90	50	
Total CIE Marks					50
Total Marks					50

CIE Theory Test model question paper

Programme Name				Semester -1	
Course Name	Environmental Sustainability			Test	I/II/III
Course Code	Programme Specific	Duration	90 min	Marks	50
Name of the Course Coordinator:					
Note: Answer any one full question from each section. Each full question carries equal marks.					
Q.No	Questions				Marks
Section - 1					
1					25
2					25
Section - 2					
3					25
4					25
Note for the Course coordinator: Each question may have one, two, three, four or five sub divisions. Optional questions in each section carry the same weightage of marks.					