

DRAFT CURRICULUM-2026

(C-26)



DIPLOMA IN COMPUTER ENGINEERING AND IOT

**STATE BOARD OF TECHNICAL EDUCATION AND TRAINING,
ANDHRA PRADESH**

I YEAR

ENGLISH

Course code	Course Title	No. Of periods/week	Total No. of periods	Marks for FA	Marks for SA	Credits
26CI101T	ENGLISH	3	90	30	70	3

TIME SCHEDULE

S. No.	Chapter/ Unit Title	No. of Periods	Weightage of marks	No. of Short Answer Questions	No. of Essay Questions	CO's Mapped
1.	Exploring English	10	11	1	1	CO1, CO2, CO3, CO4, CO5
2.	The Better You!	10	11	3	1	CO1, CO2, CO3, CO4, CO5
3.	Drive to Destiny!	10	14		1	CO1, CO2, CO3, CO4, CO5
4.	Renew, Rewire & Resolve!	10	14	1	1	CO1, CO2, CO3, CO4, CO5
5.	Brains & Bots	10		1		CO1, CO2, CO3, CO4, CO5
6	The Blue Planet: Mend or End	10	11	1	1	CO1, CO2, CO3, CO4, CO5
7	One World One Dream	10	11	1	1	CO1, CO2, CO3, CO4, CO5
8	The Net Norms	10	11	1	1	CO1, CO2, CO3, CO4, CO5
9	Managing Moods & Moments	10	11	1	1	CO1, CO2, CO3, CO4, CO5
Total		90	94	10	8	

COURSE OBJECTIVES

(i)	To inculcate knowledge of functional English and enrich vocabulary.
(ii)	To impart effective listening, speaking, reading, and writing skills.
(iii)	To sensitise the students on themes related to personality, technological advancements, sustainability, and human values.

COURSE OUTCOMES:

Upon completion of the course, the student shall be able to:

CO1	CI101.1	Learn and apply various English grammatical concepts to communicate in academic, professional, personal, and social contexts.
CO2	CI101.2	Use appropriate vocabulary in academic, professional, and in business correspondence and on social media platforms.
CO3	CI101.3	Listen and understand, read and comprehend different forms of academic, professional, and general listening and reading materials.
CO4	CI101.4	Communicate effectively and fluently in oral and written forms in various life situations.
CO5	CI101.5	Display scientific temper and universal human values technology for holistic development and harmonious living through demeanour and communication.

LEARNING OUTCOMES

1.0 EXPLORING ENGLISH

- 1.1 To read and comprehend simple sentences in a short passage.
- 1.2 To apply certain rules of spelling, correct the misspelt words and use dictionary to enrich vocabulary
- 1.3 To identify various parts of speech suitable to context and use articles & prepositions accurately.
- 1.4 To describe a given situation/ picture using simple sentences.
- 1.5 To value the importance of English for employability.

2.0 THE BETTER YOU!

- 2.1 TO READ and comprehend formal and informal conversations.
- 2.2 To use words suitable to the context in spoken and written communication.
- 2.3 To use the appropriate forms of verbs.
- 2.4 To engage in conversations in both formal and informal contexts.
- 2.5 To demonstrate positive attitude in personal and academic spheres.

3.0 DRIVE TO DESTINY

- 3.1 To read and comprehend paragraphs for specific and general information, and distinguish different types of paragraphs
- 3.2 To distinguish word pairs and use them contextually.
- 3.3 To frame sentences with proper subject-verb agreement.
- 3.4 To describe actions using appropriate tense.
- 3.5 To set and achieve academic and personal goals.

4.0 RENEW, REWIRE & RESOLVE

- 4.1 To read and comprehend the content and structure of e-mails for different purposes.
- 4.2 To recognize the root words and use appropriate affixes contextually.
- 4.3 To use various kinds of sentences for different communicative situations.
- 4.4 To draft E-mails for academic and professional purposes.
- 4.5 To apply the skills of critical thinking and creativity in solving problems.

5.0 Brains & Bots

- 5.1 To read and comprehend the description of a process with sequence markers.
- 5.2 To communicate using phrasal verbs intelligibly.
- 5.3 To use active and passive voice appropriately.
- 5.4 To describe processes and procedures using appropriate sentence forms.
- 5.5 To appraise the importance and use of robotics and artificial intelligence in human life.

6.0 THE BLUE PLANET: MEND OR END!

- 6.1 To read and comprehend the content, structure and purpose of formal and informal letters.
- 6.2 To describe using appropriate forms of adjectives
- 6.3 To substitute phrases or clauses with a single word.
- 6.4 To draft personal and professional letters.
- 6.5 To realise the importance of environmental protection and ensure sustainability.

7.0 ONE WORLD - ONE DREAM

- 7.1 To read and comprehend essay and analyse its features
- 7.2 To identify and create shortened forms of words or phrases.
- 7.3 To report the expressions of the speaker to a third person with necessary grammatical changes.
- 7.4 To draft well-organized essays for academic and professional purposes.
- 7.5 To appraise the importance of inclusivity in the society.

8.0 THE NET NORMS

- 8.1 To comprehend and analyse the given text for making notes and summarising.
- 8.2 To use contemporary language in informal communication.
- 8.3 To split or combine ideas using conjunctions for effective communication.

- 8.4 To make notes of textual information and summarize the information.
 8.5 To demonstrate ideal behaviour on the internet.

9.0 MANAGING MOODS & MOMENTS

- 9.1 To read and comprehend different types of reports.
 9.2 To analyse and evaluate grammatical errors.
 9.3 To use words and phrases in sentences of your own.
 9.4 To draft organized and comprehensive reports on experiments, events, visits and incidents.
 9.5 To assess the reasons and manage stress and manage time effectively.

CO-PO/PSO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PS01	PS02	PS03
CO1	PO's 1 to 4 are not directly applicable for English course. However, activities that use content from science and technology relevant to the Programme taken up by the student shall be exploited for communication in the Course.					3	2	Programme Specific Outcomes are Branch specific with technical aspects which are not directly applicable to English Language course.		
CO2						3	2			
CO3						3	2			
CO4						3	2			
CO5					1		2			
Average					1	3	2			

3-Strongly Mapped

2- Moderately Mapped

1- Slightly Mapped

Note: The gaps in CO and PO mapping will be met by one or more appropriate activities from the following:

- (i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (iv) Library Visits etc.,

COURSE CONTENT

1.0 EXPLORING ENGLISH

Reading – Roleplay – Picture Interpretation – Sounds and Spellings – Parts of Speech – Articles and Prepositions

2.0 THE BETTER YOU!

Reading – Dialogue Writing – Synonyms and Antonyms – Word order – Verbs

3.0 DRIVE TO DESTINY

Reading – Paragraph Writing – Homophones, Homonyms, Homographs – Concord – Tenses

4.0 RENEW, REWIRE & RESOLVE

Reading – E-mail Writing – Roots, Affixes – Kinds of Sentences

5.0 Brains & Bots

Reading – Describing Process – Phrasal Verbs – Voice

6.0 THE BLUE PLANET: MEND OR END!

Reading – Letter Writing – One-word Substitutes – Degrees of Comparison

7.0 ONE WORLD - ONE DREAM

Reading – Essay Writing – Abbreviations & Acronyms – Reported Speech

8.0 THE NET NORMS

Reading – Note making & Summarising – Gen-Z Vocabulary – Synthesis of Sentences

9.0 MANAGING MOODS & MOMENTS

Reading – Report Writing – Usage – Error Analysis

The text book “English Essentials” (A Textbook of English for I Year Engineering Diploma Courses - by SBTET, AP) is the prescribed text for this course. It comprises various language inputs and activities addressing the Learning outcomes specified in each unit. Every unit will have six major components: Listening, Speaking, Reading, Writing, Vocabulary, Grammar. The activities will be designed as Individual, Pair and Group activities to facilitate self and peer learning.

REFERENCE BOOKS

- Martin Hewings : *Advanced Grammar in Use*, Cambridge University Press
Murphy, Raymond : *English Grammar in Use*, Cambridge University Press
Sidney Greenbaum : *Oxford English Grammar*, Oxford University Press
Wren and Martin (Revised by N.D.V. Prasad Rao): *English Grammar and Composition*, Blackie ELT Books, S. Chand and Co.
Sarah Freeman : *Strengthen Your Writing*, Macmillan

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TESTS I, II & III

Unit Test	Learning Outcomes to be Covered
Unit Test – 1	From 1.1 to 3.5
Unit Test – 2	From 4.1 to 6.5
Unit Test – 3	From 7.1 to 9.5

ENGINEERING MATHEMATICS-I

Course Code	Course Title	No. of Periods/week	Total No. of periods	Marks for FA	Marks for SA	Credits
26CI102T	Engineering Mathematics-I	6	180	30	70	6

S.No.	Unit Title	No. of periods	COs mapped
1	Algebra	31	CO1
2	Trigonometry	63	CO2
3	Co-ordinate Geometry	26	CO3
4	Differential Calculus	34	CO4
5	Integral Calculus	26	CO5
Total Periods		180	

TIME SCHEDULE

S.No.	Chapter	No. of Periods	Marks Allotted	No. of Short Questions	No. of Essay Questions	COs mapped
Unit - I: Algebra						
1	Partial Fractions	6	4	0	1/2	CO1
2	Matrices and Determinants	25	15	1	1&1/2	CO1
Unit - II: Trigonometry						
3	Trigonometric Ratios	4	0	0	0	CO2
4	Compound Angles	8	3	1	0	CO2
5	Multiple and Sub-multiple angles	8	3	1	0	CO2
6	Transformations	9	4	0	1/2	CO2
7	Inverse Trigonometric Functions	8	4	0	1/2	CO2
8	Trigonometric Equations	8	4	0	1/2	CO2
9	Properties of triangles	8	4	0	1/2	CO2
10	Complex Numbers	8	3	1	0	CO2
11	Hyperbolic functions	2	0	0	0	CO2
Unit III: Co-ordinate Geometry						
12	Straight Lines	8	3	1	0	CO3
13	Circles	8	4	0	1/2	CO3
14	Conic Sections	10	4	0	1/2	CO3
Unit - IV: Differential Calculus						
15	Limits and Continuity	6	3	1	0	CO4
16	Differentiation	28	17	3	1	CO4
Unit - V: Integral Calculus						
17	Indefinite	18	11	1	1	CO5

	integration					
18	Definite integration	8	8	0	1	CO5
	Total	180	94	10	8	
Marks				30	64	

COURSE OBJECTIVES

Upon completion of the course, the student shall be able to	
(i)	To apply the principles of Algebra, Trigonometry and Co-ordinate Geometry to real-time problems in engineering.
(ii)	To build the concepts of indefinite integrals and definite integrals.

COURSE OUTCOMES

CO1	Resolve partial fractions and solve problems on matrices and determinants.
CO2	Use the concept of trigonometric functions, their inverses and complex numbers.
CO3	Find the equations and properties of straight lines, circles and conic sections in coordinate system.
CO4	Evaluate the limits and derivatives of various functions and apply to engineering problems.
CO5	Integrate various functions using different methods and evaluate definite integrals.

LEARNING OUTCOMES

UNIT - I

C.O. 1 Resolve partial fractions and solve problems on matrices and determinants.

L.O. 1.1 Define rational, proper and improper fractions of polynomials.

1.2 Explain the procedure of resolving proper fractions of the type

$$\frac{f(x)}{(ax+b)(cx+d)}$$

1.3 Define a matrix and order of a matrix.

1.4 State various types of matrices with examples (emphasis on 3rd order square matrices).

1.5 Compute sum, difference, scalar multiplication and product of matrices. Illustrate the properties of these operations such as commutative, associative and distributive properties with examples and counter examples.

1.6 Define the transpose of a matrix and state its properties – examples.

1.7 Define symmetric and skew-symmetric matrices with examples. Resolve a square matrix into a sum of symmetric and skew-symmetric matrices with examples.

1.8 Define determinant of a square matrix; minor, co-factor of an element of a 3x3 square matrix with examples. Expand the determinant of a 3x3 matrix using Laplace expansion formula. State and apply the properties of determinants to solve simple problems.

- 1.9 Distinguish singular and non-singular matrices. Define multiplicative inverse of a matrix and list properties of adjoint and inverse. Compute adjoint and multiplicative inverse of a square matrix.
- 1.10 Solve a system of three linear equations in three unknowns using Cramer's rule.

UNIT - II

C.O. 2 Solve problems using the concept of trigonometric functions, their inverses and complex numbers.

- L.O.**
- 2.1 Recall the trigonometric ratios and their values at specified angles.
 - 2.2 Draw graphs of trigonometric functions - Explain periodicity of trigonometric functions.
 - 2.3 Define compound angles and state the formulae of $\sin(A\pm B)$, $\cos(A\pm B)$, $\tan(A\pm B)$ and $\cot(A\pm B)$.
 - 2.4 Give simple examples on compound angles to derive the values of $\sin 15^\circ$, $\cos 15^\circ$, $\sin 75^\circ$, $\cos 75^\circ$, $\tan 15^\circ$, $\tan 75^\circ$ etc.
 - 2.5 Derive identities like $\sin(A+B) \sin(A-B) = \sin^2 A - \sin^2 B$ etc.
 - 2.6 Solve simple problems using the identities on compound angles.
 - 2.7 Derive the formulae of multiple angles $2A$, $3A$ etc., and sub-multiple angle $A/2$ in terms of angle A of trigonometric functions.
 - 2.8 Derive useful allied formulae like $\sin^2 A = (1 - \cos 2A)/2$ etc.
 - 2.9 Solve simple problems using the multiple and sub-multiple formulae.
 - 2.10 Derive the formulae on transforming sum or difference of two trigonometric ratios into a product and vice versa - examples on these formulae.
 - 2.11 Solve problems by applying these formulae to sum or difference or product of two terms.

Syllabus for Unit test-I completed

- 2.12 Explain the concept of inverse of a trigonometric function by selecting an appropriate domain and range.
- 2.13 Define inverses of six trigonometric functions along with their domains and ranges.
- 2.14 Derive relations between inverse trigonometric functions so that the given inverse trigonometric function can be expressed in terms of other inverse trigonometric functions with examples.
- 2.15 State various properties of inverse trigonometric functions and identities like $\sin^{-1} x + \cos^{-1} x = \frac{\pi}{2}$ etc.
- 2.16 Apply formulae like $\tan^{-1} x + \tan^{-1} y = \tan^{-1} \left(\frac{x+y}{1-xy} \right)$, where $x \geq 0, y \geq 0, xy < 1$ etc., to solve simple problems.
- 2.17 Explain what is meant by solution of trigonometric equations and find the general solutions of $\sin x = k$, $\cos x = k$ and $\tan x = k$ with appropriate examples.
- 2.18 Solve models of the type $a \sin^2 x + b \sin x + c = 0$ and $a \sin x + b \cos x = c$.
- 2.19 State sine rule, cosine rule, tangent rule and projection rule and solve a triangle using these formulae.
- 2.20 List various formulae for area of a triangle with examples.
- 2.21 Define a complex number, its modulus, conjugate, amplitude and list their properties.
- 2.22 Define arithmetic operations on complex numbers with examples.

- 2.23 Represent the complex number in various forms like modulus-amplitude (polar) form and Exponential (Euler) form with examples.
- 2.24 Explain the concept of hyperbolic trigonometric functions and list appropriate formulae.

UNIT - III

C.O. 3 Find the equations and properties of straight lines, circles and conic sections in coordinate system.

- L.O.** 3.1 Write different forms of a straight line – general form, point-slope form, slope- intercept form, two-point form, intercept form and normal form or perpendicular form.
- 3.2 Find distance of a point from a line, acute angle between two lines, intersection of two non-parallel lines and distance between two parallel lines.
- 3.3 Define locus of a point and circle.
- 3.4 Write the general equation of a circle and find its centre and radius.
- 3.5 Find the equation of a circle, given (i) centre and radius, (ii) two ends of the diameter (iii) three non collinear points of type (0,0) (a,0), (0, b).
- 3.6 Define a conic - Explain the terms focus, directrix, eccentricity, axes and latus-rectum of a conic.
- 3.7 Find the equation of a conic when focus, directrix and eccentricity are given.
- 3.8 Describe the properties of Parabola $y^2 = 4ax$.

Syllabus for Unit test-II completed

UNIT - IV

C.O. 4 Evaluate the limits and derivatives of various functions.

- L.O.** 4.1 Explain the concept of limit and meaning of $\lim_{x \rightarrow a} f(x) = l$ and state the properties of limits.
- 4.2 Evaluate the limits of the type $\lim_{x \rightarrow a} \frac{f(x)}{g(x)}$
- 4.3 State the Standard limits $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a}$, $\lim_{x \rightarrow 0} \frac{\sin x}{x}$, $\lim_{x \rightarrow 0} \frac{\tan x}{x}$, $\lim_{x \rightarrow 0} \frac{a^x - 1}{x}$, $\lim_{x \rightarrow 0} \frac{e^x - 1}{x}$, (without proof) and solve simple problems using these standard limits.
- 4.4 Explain the concept of continuity of a function at a point and on an interval
- 4.5 State the concept of derivative of a function $y = f(x)$ – definition, first principle as $\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ and also write standard notations to denote the derivative of a function.
- 4.6 Explain the significance of derivative in scientific and engineering applications.
- 4.7 Find the derivatives of standard algebraic, logarithmic, exponential and trigonometric functions using the first principle.

- 4.8 Find the derivatives of hyperbolic and inverse hyperbolic functions.
- 4.9 State the rules of differentiation of sum, difference, scalar multiplication, product and quotient of functions with simple illustrative examples.
- 4.10 Explain the method of differentiation of a function of a function (Chain rule) with illustrative examples.
- 4.11 Explain the method of differentiation of parametric functions with examples.
- 4.12 Explain the procedure for finding the derivatives of implicit functions with examples.
- 4.13 Explain the need of taking logarithms for differentiating some functions of $[f(x)]^{g(x)}$ type – examples on logarithmic differentiation.
- 4.14 Explain the concept of finding the second order derivatives with examples.
- 4.15 Define maximum and minimum values of a function and find the maximum and minimum values for quadratic polynomials.
- 4.16 Explain the concept of functions of several variables, finding partial derivatives and difference between the ordinary and partial derivatives with simple examples.

UNIT - V

C.O. 5 Integrate various functions using different methods and evaluate definite integrals.

- L.O.** 5.1 Explain the concept of Indefinite integral as an anti-derivative.
- 5.2. State the indefinite integral of standard functions and properties of $\int (u + v) dx$ and $\int k u dx$ where u, v are functions of x and k is constant.
- 5.3. Solve problems involving standard functions using these properties.
- 5.4. Evaluate integrals involving simple functions of the following type by the method of substitution.
- i) $\int f(ax + b) dx$, where $f(x)$ is in standard form.
 - ii) $\int (f(x))^n f'(x) dx$, $n \neq -1$
 - iii) $\int \frac{f'(x)}{f(x)} dx$
- 5.5. Find the integrals of $\tan x$, $\cot x$, $\sec x$ and $\operatorname{cosec} x$ w.r.t. x .
- 5.6. Evaluate the Standard integrals of the functions of the type :
- i) $\frac{1}{a^2 + x^2}, \frac{1}{a^2 - x^2}, \frac{1}{x^2 - a^2}$
 - ii) $\frac{1}{\sqrt{a^2 + x^2}}, \frac{1}{\sqrt{a^2 - x^2}}, \frac{1}{\sqrt{x^2 - a^2}}$
 - iii) $\sqrt{a^2 + x^2}, \sqrt{a^2 - x^2}, \sqrt{x^2 - a^2}$
- 5.7. Evaluate integrals using decomposition method for integrand of the type
- $$\frac{px + q}{(ax + b)(cx + d)}$$
- 5.8. Solve problems using integration by parts.
- 5.9 Use Bernoulli's rule to evaluate the integrals of the form $\int u.v dx$.
- 5.10. State the fundamental theorem of integral calculus.
- 5.11. Explain the concept of definite integral.
- 5.12. Solve simple problems on definite integrals.
- 5.13. State various properties of definite integrals.

5.14. Evaluate simple problems on definite integrals using these properties.

CO/PO – MAPPING

Syllabus for Unit test-III completed

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	3				3	2	2
CO2	3	3	2	2				3	2	2
CO3	3	3	2	2				3	2	2
CO4	3	3	3	3				3	3	3
CO5	3	3	3	3				3	3	3
Avg.	3	2.8	2.4	2.6				3	2.4	2.4

3 = Strongly mapped (High), **2** = moderately mapped (Medium), **1** = slightly mapped (Low)

Note: The gaps in CO/PO mapping can be met with appropriate activities as follows:

For PO5: Appropriate quiz programmes may be conducted at intervals and duration as decided by concerned faculty.

For PO6: Seminars on applications of mathematics in various engineering disciplines are to be planned and conducted.

For PO7: Plan activities in such a way that students can visit the Library to refer standard books on Mathematics and access the latest updates in reputed national and international journals. Additionally, encourage them to attend seminars and learn mathematical software tools.

COURSE CONTENT

Unit-I: Algebra

- 1. Partial Fractions:** Definitions of rational, proper and improper fractions of polynomials. Resolve rational fractions (proper fractions) of type $\frac{f(x)}{(ax+b)(cx+d)}$ into partial fractions.
- 2. Matrices:** Definition of a matrix, types of matrices - Algebra of matrices, equality of two matrices, sum, difference, scalar multiplication and product of matrices. Transpose of a matrix, Symmetric, skew-symmetric matrices - Determinant of a square matrix, minor and cofactor of an element, Laplace's expansion, properties of determinants - Singular and non-singular matrices, Adjoint and multiplicative inverse of a square matrix - System of linear equations in 3 variables-Solutions by Cramer's rule.

Unit-II: Trigonometry

- 3. Trigonometric ratios:** Definition of trigonometric ratios of any angle, values of trigonometric ratios at specified values, draw graphs of trigonometric functions, periodicity of trigonometric functions.
- 4. Compound angles:** Formulas of $\sin(A\pm B)$, $\cos(A\pm B)$, $\tan(A\pm B)$, $\cot(A\pm B)$, and related identities.
- 5. Multiple and sub-multiple angles:** Formulae for trigonometric ratios of multiple angles $2A$, $3A$ and sub multiple angle $A/2$.
- 6. Transformations:** Transformations of products into sums or differences and vice versa.

7. **Inverse trigonometric functions:** Definition, domains and ranges-basic properties.
8. **Trigonometric equations:** Concept of a solution, principal value and general solution of trigonometric equations:
 $\sin x = k$, $\cos x = k$, $\tan x = k$, where k is a constant. Solutions of simple quadratic equations and equations of type $a \sin x + b \cos x = c$.
9. **Properties of triangles:** Relations between sides and angles of a triangle- sine rule, cosine rule, tangent rule and projection rule-area of a triangle.
10. **Complex Numbers:** Definition of a complex number, modulus, conjugate and amplitude of a complex number- Arithmetic operations on complex numbers - Modulus-Amplitude (polar) form, Exponential form (Euler form) of a complex number.
11. **Hyperbolic functions:** Definition of hyperbolic and inverse hyperbolic trigonometric functions- and list formulae.

UNIT-III: Coordinate geometry

12. **Straight lines:** Various forms of a straight line - Angle between two lines, perpendicular distance from a point to the straight line, point of intersection of non-parallel lines and distance between parallel lines.
13. **Circle:** Locus of a point, Circle definition - Circle equation given (i) centre and radius, (ii) two ends of a diameter (iii) three non-collinear points of type $(0,0)$, $(a,0)$, $(0, b)$ - General equation of a circle –its centre and radius.
14. **Conic sections:** Definition of a conic - Equation of a conic when focus, directrix and eccentricity are given - Properties of parabola in the standard form $y^2 = 4ax$.

UNIT-IV: Differential Calculus

15. **Concept of Limit:** Definition and Properties of Limits and Standard Limits - Continuity of a function at a point.
16. **Concept of derivative:** Definition (first principle)- different notations- Derivatives of standard algebraic, logarithmic, exponential, trigonometric, inverse trigonometric, hyperbolic and inverse hyperbolic functions - Derivatives of sum, difference, scalar multiplication, product, quotient of functions - Chain rule, derivatives of parametric functions, derivatives of implicit functions, logarithmic differentiation - Second order derivatives – Define maximum and minimum values of a function and find the maximum or minimum values for quadratic polynomial. Functions of several variables, first order partial derivatives.

UNIT-V: Integral Calculus

17. **Indefinite Integration:** Integration regarded as an anti-derivative – Indefinite integrals of standard functions. Properties of indefinite integrals. Integration by substitution or change of variable. Integrals of $\tan x$, $\cot x$, $\sec x$ and $\operatorname{cosec} x$.

Evaluation of integrals which are of the following forms:

$$i) \frac{1}{a^2 + x^2}, \frac{1}{a^2 - x^2}, \frac{1}{x^2 - a^2}$$

$$ii) \frac{1}{\sqrt{a^2 + x^2}}, \frac{1}{\sqrt{a^2 - x^2}}, \frac{1}{\sqrt{x^2 - a^2}}$$

$$iii) \sqrt{a^2 + x^2}, \sqrt{a^2 - x^2}, \sqrt{x^2 - a^2}$$

Integration by decomposition of the integrand into simple rational, algebraic functions - Integration by parts, Bernoulli's rule.

18. **Definite Integration:** Definite integral, fundamental theorem of integral calculus,

properties of definite integrals, evaluation of simple definite integrals.

TEXTBOOK

Engineering Mathematics-I, a textbook for first year diploma courses, prepared & prescribed by SBTET, AP.

REFERENCE BOOKS

1. Shanti Narayan, A Textbook of matrices, S.Chand & Co.
2. Robert E. Moyer & Frank Ayers Jr., Schaum's Outline of Trigonometry, 4th Edition, Schaum's Series.
3. G.B.Thomas, R.L.Finney, Calculus and Analytic Geometry, Addison Wesley, 9th Edition, 1995.
4. Frank Ayers & Elliott Mendelson, Schaum's Outline of Calculus, Schaum's Series.
5. M.Vygodsky, Mathematical Handbook, Mir Publishers, Moscow.

SUGGESTED E-LEARNING REFERENCES

1. <https://www.khanacademy.org/>
2. <https://www.wolframalpha.com/>
3. <https://onlinecourses.nptel.ac.in/>
4. <http://tutorial.math.lamar.edu/>

UNIT TEST SYLLABUS

Unit Test	Learning Outcomes to be Covered
Unit Test – 1	From 1.1 to 2.11
Unit Test – 2	From 2.12 to 3.8
Unit Test – 3	From 4.1 to 5.14

ENGINEERING PHYSICS

Course Code	Course Title	No. of Periods/ week	Total No. of periods	Marks for FA	Marks for SA	Credits
26CI103T	Engineering Physics	3	90	30	70	4

TIME SCHEDULE

S. No	Major Topics	No. of Periods	COs
1.	Units and Measurements	09	CO1
2.	Elements of Vectors	11	
3.	Mechanics	10	CO2
4.	Fundamentals of Astrodynamics	13	
5.	Energy and Thermal Physics	12	CO3
6.	Concepts of Acoustics	12	
7.	Electricity and Magnetism	13	CO4
8.	Modern Physics	10	
	Total	90	

COURSE OBJECTIVES

Upon completion of the course the student shall be able to

(1)	To understand the basic concepts of physics for various Engineering applications as required for industries.
(2)	To equip the students with the scientific advances in technology and make the student suitable for any industrial organization.

COURSE OUTCOMES

CO1	CI103.1	Familiarize with various physical quantities, their SI units and errors in measurements; Understand the concepts of vectors for solving engineering problems.
CO2	CI103.2	Solve problems in engineering using appropriate equations and formulae related to Mechanics; Understand the concepts of gravitation, planetary motion with reference to applications in satellites
CO3	CI103.3	Familiarize with the knowledge of various forms of energy, thermal physics and concepts of acoustics in relevance to the societal requirements.
CO4	CI103.4	Familiarize with the basic knowledge of electricity, magnetism and advances in Modern Physics such as photoelectric cell, optical fibers, superconductors and nanotechnology.

LEARNING OUTCOMES

Upon completion of the course the student shall be able to

1 Units and Measurements

- 1.1 Introduction to Units and Measurements
- 1.2 Define the terms: a) Physical quantity b) Fundamental physical quantities and c) Derived physical quantities.
- 1.3 Explain the concept of units in measurement.
- 1.4 Define the term 'unit'.
- 1.5 Define fundamental units and derived units.
- 1.6 State the SI units of fundamental quantities along with their symbols.
- 1.7 State the common multiples and submultiples used in the SI system.
- 1.8 State the rules for writing SI units.
- 1.9 State the advantages of using SI units.
- 1.10 Differentiate between direct and indirect measurements.
- 1.11 Define accuracy and least count in the context of measurement.
- 1.12 Define error in measurement.
- 1.13 Define absolute, relative and percentage errors and state their respective formulae.
- 1.14 Solve numerical problems on errors in measurements.

2 ELEMENTS OF VECTORS

- 2.1 Explain the concept of vectors.
- 2.2 Define scalar and vector quantities with relevant examples for each.
- 2.3 Represent a vector geometrically.
- 2.4 Define equal vectors, negative vector, unit vector, position vector, co-initial vectors, co-planar vectors.
- 2.6 Resolve a given vector into its rectangular components.

- 2.7 State and explain the triangle law of addition of vectors.
- 2.8 State the parallelogram law of addition of vectors.
- 2.9 Derive the expressions for the magnitude and direction of the resultant vector using the parallelogram law.
- 2.10 Illustrate applications of the parallelogram law of vectors using examples (i) Bow and arrow (ii) working of a sling (iii) Flying of a bird.
- 2.11 Define dot product (scalar product) of two vectors.
- 2.12 Explain (i) work done (ii) power as examples of dot product.
- 2.13 Define cross product (vector product) of two vectors.
- 2.14 Explain (i) linear velocity (ii) torque as examples of cross product.
- 2.15 Solve numerical problems on (i) resolution of vectors (ii) the parallelogram law of vectors (iii) dot product.

3 MECHANICS

- 3.1 Define linear momentum; Mention its SI unit.
- 3.2 Define force. Mention its SI unit.
- 3.3 Define torque. Mention its SI unit.
- 3.4 Define concurrent forces, co-planar forces.
- 3.5 State and explain Lami's theorem.
- 3.6 State equations of motion of a body moving in a straight line with uniform acceleration.
- 3.7 Define projectile. Give examples.
- 3.8 Derive the equation for the path of an oblique projectile.
- 3.9 Define periodic motion.
- 3.10 Define Ideal Simple pendulum.
- 3.11 Write formula for the time period of a simple pendulum.
- 3.12 Solve numerical problems on equations of motion and simple pendulum.

4 FUNDAMENTALS OF ASTRODYNAMICS

- 4.1 Define acceleration due to gravity (g); Mention its SI unit.
- 4.2 State and explain Newton's universal law of gravitation.
- 4.3 Define universal gravitational constant (G) and mention its value in SI unit.
- 4.4 Derive the relationship between acceleration due to gravity (g) and the universal gravitational constant (G).
- 4.5 State and explain Kepler's laws of planetary motion.
- 4.6 Define orbital velocity and state its formula.
- 4.7 Define escape velocity and state its formula.
- 4.8 Derive the relationship between escape velocity and orbital velocity.
- 4.9 Define the term 'satellite'.
- 4.10 Define natural and artificial satellites. Give examples for each.
- 4.11 Mention the applications of artificial satellites.
- 4.12 Solve numerical problems on (i) Newton's law of gravitation (ii) orbital velocity (iii) escape velocity.

5 ENERGY AND THERMAL PHYSICS

- 5.1 Define work done; Mention its SI unit.
- 5.2 Define power; Mention its SI unit.
- 5.3 Define energy; Mention its SI unit.
- 5.4 List various forms of energy.
- 5.5 Define potential energy; Give examples and derive its equation.
- 5.6 Define kinetic energy; Give examples and derive its equation.
- 5.7 Derive the relationship between kinetic energy and linear momentum.
- 5.8 State the law of conservation of energy; Give any two examples.
- 5.9 State Boyle's law; Write its equation.

- 5.10 State Charles's volume law; Write its equation.
- 5.11 State Charles's pressure law; Write its equation.
- 5.12 Define an Ideal gas.
- 5.13 Derive the ideal gas equation ($PV = nRT$).
- 5.14 Solve numerical problems on (i) Work done (ii) Potential energy (iii) Kinetic energy (iv) Relation between K.E. and momentum (v) Gas laws

6 CONCEPTS OF ACOUSTICS

- 6.1 Define longitudinal waves. Give examples.
- 6.2 Define transverse waves. Give examples.
- 6.3 Define sound. Mention SI unit for intensity of sound.
- 6.4 Define musical sound.
- 6.5 Define noise.
- 6.6 Distinguish between musical sound and noise.
- 6.7 Define noise pollution.
- 6.8 Explain the sources of noise pollution.
- 6.9 Explain the effects of noise pollution.
- 6.10 Explain methods of minimizing noise pollution.
- 6.11 Explain the concept of echo.
- 6.12 Mention the applications of echo.
- 6.13 Define reverberation and reverberation time.
- 6.14 Write Sabine's formula and name the parameters in it.
- 6.15 Solve numerical problems on echo.

7 Electricity and Magnetism

- 7.1 State and explain Ohm's law.
- 7.2 Define electrical resistance; Mention its SI unit.
- 7.3 Define specific resistance (resistivity); Mention its SI unit.
- 7.4 State and explain Kirchhoff's Current Law.
- 7.5 State and explain Kirchhoff's Voltage Law.
- 7.6 Derive an expression for the balancing condition of Wheatstone's bridge with neat diagram.
- 7.7 Explain the concept of magnetic field.
- 7.8 Define uniform and non-uniform magnetic fields.
- 7.9 Define magnetic pole strength; Mention its SI unit.
- 7.10 Define magnetic moment; Mention its SI unit.
- 7.11 Define magnetic lines of force.
- 7.12 Write the properties of magnetic lines of force.
- 7.13 State Coulomb's inverse square law of magnetism. Write its equation.
- 7.14 Derive the expression for the moment of couple acting on a bar magnet placed in a uniform magnetic field.
- 7.15 Solve numerical problems on (i) Ohm's law (ii) Kirchhoff's first law (iii) Wheatstone bridge (iv) Coulomb's inverse square law of magnetism.

8 Modern Physics

- 8.1 State and explain photoelectric effect.
- 8.2 Write Einstein's photoelectric equation and name the terms in it.
- 8.3 Explain the working of a photoelectric cell.
- 8.4 List the applications of the photoelectric cell.
- 8.5 Define critical angle.
- 8.6 Explain the phenomenon of total internal reflection.
- 8.7 Define optical fiber; Explain the principle and working of an optical fiber.
- 8.8 List the applications of optical fiber.
- 8.9 Define Superconductor and superconductivity.

- 8.10 List the applications of superconductors.
 8.11 Define Nanotechnology and Nano materials.
 8.12 Write applications of Nano materials.

CO-PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	1	1	1		1
CO2	3	2	1	1	1		2
CO3	3	2	1	1	1		2
CO4	3	2	1	1	3		2

3 = strongly mapped, 2 = moderately mapped, 1 = slightly mapped

CO-PO MAPPING STRENGTH

Common-103	Engineering Physics				No of periods: 90	
	Mapped with CO No	CO periods addressing PO in Column-1		Level 1,2,3	Remarks	
		No	%			
PO1	CO1,CO2,CO3,CO4	39	43.3%	3	>40% level 3 (highly addressed) 25% to 40% level 2 (moderately addressed) 5%to25% level 1 (Low addressed) <5%(not addressed)	
PO2	CO1,CO2,CO3,CO4	15	16.6%	1		
PO3	CO1,CO2,CO3,CO4	8	8.8%	1		
PO4	CO1,CO2,CO3,CO4	8	8.8%	1		
PO5	CO1,CO2,CO3,CO4	9	10.0%	1		
PO6	-	-	-	-		
PO7	CO1,CO2,CO3,CO4	11	12.2%	1		

3 = strongly mapped, 2 = moderately mapped, 1 = slightly mapped

Note: The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following.

- (i) Seminars (ii) Viva-voce (iii) Assignments (iv) Quiz competitions (v) Industrial visits (vi) Techfest (vii) Mini project (viii) Group discussions (ix) Virtual labs (x) Library visit for e-books

COURSE CONTENT

1. Units and measurements:

Introduction – Physical quantity – Fundamental and Derived quantities – Unit- Fundamental and derived units - SI system of units –Multiples and Sub multiples – Rules for writing S.I. units-Advantages of SI units – Direct and indirect measurements – Accuracy and least count – Errors: Absolute, relative and percentage errors – Problems.

2. Elements of Vectors:

Introduction of Scalars and Vectors – Representation of a vector –Types of vectors - Resolution of vector into rectangular components – Triangle law of vectors - Parallelogram law of vectors- examples- derivation of magnitude and direction of resultant vector- Dot product- Cross product - Problems.

3. Mechanics:

Introduction to Mechanics – Momentum –force-torque. Concurrent and coplanar forces - Lami's theorem – equations of motion of a body moving in a straight line – projectile - path of projectile in oblique projection – periodic motion -Ideal simple pendulum- Time period of simple pendulum- Problems.

4. Fundamentals of Astrodynamics:

Concept of acceleration due to gravity (g) -Newton's law of gravitation- Universal Gravitational constant G – Relation between g and G - Kepler's laws of planetary motion – Orbital velocity and escape velocity – Satellites: Natural and artificial - Applications of artificial satellites – Problems.

5. Energy and thermal Physics

Work done, Power and Energy - forms of energy - Potential energy - Kinetic energy- Momentum- K.E and Momentum relation – Law of Conservation of energy- Boyle's law - Charle's volume law -Charle's pressure law- Ideal Gas equation- Problems.

6. Concepts of Acoustics

Longitudinal wave- transverse wave- musical sound - noise - Noise pollution – Causes, effects, Methods of minimizing noise pollution- Echo- Reverberation - Reverberation time-Sabine 's formula - Problems.

7. Electricity and Magnetism

Ohm's law- Resistance - Specific resistance - Kirchoff's laws - Wheatstone's bridge. Concept of magnetic field- magnetic pole strength – Magnetic Moment- magnetic lines of force - Coulomb's inverse square law of magnetism– Torque acting on a bar magnet- Problems.

8. Modern Physics

Photoelectric effect – Einstein photo electric equation – photoelectric cell – Applications of photoelectric cell – critical angle, Total internal reflection- Optical Fiber - Principle – working-Applications of optical fibers - Superconductivity– applications – Nanotechnology – applications.

REFERENCES

1. Intermediate physics - Volume - I & 2
2. Telugu Academy (English version)

3. Unified physics Volume 1, 2, 3 and 4
4. Dr. S.L Guptha and Sanjeev Guptha
5. Concepts of Physics, Vol 1 & 2 H.C. Verma
6. Text book of physics Volume I Resnick & Holiday
7. Fundamentals of physics Brijlal & Subramanyam
8. Text book of applied physics Dhanpath Roy
9. NCERT Text Books of physics Class XI & XII Standard
10. e-books/e-tools/websites/Learning Physics software

Table showing the scope of syllabus to be covered for unit tests

Unit test	Learning outcomes to be covered
Unit test - 1	From 1.1 to 3.12
Unit test - 2	From 4.1 to 6.15
Unit test - 3	From 7.1 to 8.12

ENGINEERING CHEMISTRY AND ENVIRONMENTAL STUDIES

Course Code	Course Title	No. of Periods per Week	Total No. of Periods	Marks for FA	Marks for SA	Credits
26CI104T	Engineering Chemistry and Environmental Studies	3	90	30	70	4

TIME SCHEDULE

Chapter No.	Unit Title/Chapter	No. of Periods	Weightage	No. of Short Questions (3 marks)	No. of Essay Questions (8 marks)	COs Mapped
1	Basic Concepts of Chemistry	14	18	2	1.5	CO1
2	Solutions, Acids and Bases	14	15	1	1.5	CO1
3	Electrochemistry	12	11	1	1	CO2
4	Corrosion	8	11	1	1	CO2
5	Water Treatment	8	11	1	1	CO3
6	Polymers and Engineering Materials	10	6	2	0	CO4
7	<i>Fuels and Alternative Energy Sources</i>	6	3	1	0	CO4
8	Environmental Studies	18	19	1	2	CO5

TOTAL	90	94	10	8	CO1,CO2, CO3,CO4, CO5
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COURSE OBJECTIVES

Upon completion of course the student shall be able to	
(i)	To develop a fundamental understanding of core chemical principles and their relevance to a wide range of engineering applications.
(ii)	To explore and analyze natural and anthropogenic environmental challenges through an interdisciplinary lens, incorporating physical, chemical and socio-cultural perspectives.
(iii)	To reinforce theoretical concepts by conducting relevant experiments exercises

COURSE OUTCOMES

CO1	CI104.1&CI104.2	Explain the basics of atomic structure, chemical bonding, oxidation-reduction, mole concept, concentration expressing methods of solutions, acids-bases, pH and buffer solutions.
CO2	CI104.3 & CI104.4	Explain electrolysis, Galvanic cell, batteries and corrosion.
CO3	CI104.5	Explain the chemistry involved in the treatment of hardness in water.
CO4	CI104.6 & CI104.7	Explain the preparation and applications of polymers, and understand the composition and uses of alloys, nanomaterials and green fuels.
CO5	CI104.8	Explain environmental concepts, pollution types, global issues, green chemistry principles and sustainable development goals.

LEARNING OUTCOMES

1.0 Basic Concepts of Chemistry

- 1.1** Explain the charge, mass of fundamental particles of an atom (electron, proton and neutron).
- 1.2** Understand the concept of Atomic number and Mass number.
- 1.3** Calculate the number of electrons, number of protons and number of neutrons in atoms, if Atomic number and Mass number are given.
- 1.4** Explain the Postulates of Bohr's atomic theory and its limitations.

- 1.5** Explain the values and significance of four Quantum numbers.
- 1.6** Define Orbital of an atom and draw the shapes of s, p orbitals.
- 1.7** Distinguish between orbit and orbital.
- 1.8** Explain (i). Aufbau principle (ii). Hund's rule and (iii). Pauli's exclusion principle.
- 1.9** Write the Electronic configuration of elements up to Atomic number 20.
- 1.10** Explain the significance of chemical bonding.
- 1.11** Understand the concept of Octet rule.
- 1.12** Define Ionic bond and explain it in the formation of NaCl.
- 1.13** Define Covalent bond and explain it in the formation of H₂, O₂ & N₂ molecules (Lewis Dot Method).
- 1.14** List out the Properties of Ionic compounds and Covalent compounds and distinguish between their properties.
- 1.15** Understand the electronic concept of oxidation, reduction and redox reactions
- 2.0 Solutions, Acids and Bases**
- 2.1** Define the terms: (i). Solution (ii). Solute and (iii). Solvent with examples.
- 2.2** Classify solutions based on physical state of solvent with examples.
- 2.3** Define the terms: (i). Atomic weight, (ii). Molecular weight, and (iii). Equivalent weight.
- 2.4** Calculate Molecular weight and Equivalent weight of the given Acids (HCl, H₂SO₄, H₃PO₄), Bases (NaOH, Ca(OH)₂, Al(OH)₃ and Salts (NaCl, Na₂CO₃, AlCl₃).
- 2.5** Define Mole and solve numerical problems on Mole concept.
- 2.6** Define Molarity, Normality and solve numerical problems on Molarity and Normality.
- (a). Calculate the Molarity & Normality, if Weight of solute and Volume of solution are given.
- (b). Calculate the weight of solute, if Molarity or Normality with volume of solution are given.
- 2.7** Explain Arrhenius theory of Acids and Bases and give its limitations.
- 2.8** Define pH and mention its Significance.
- 2.9** Define buffer solution and classify buffer solutions with examples. Give its applications.
- 3.0 Electrochemistry**
- 3.1** Define the terms (i). Conductor (ii). Semiconductor (iii). Insulator. (iv). Electrolyte (Strong and Weak) and (v). Non-electrolyte. Give two examples for each.
- 3.2** Define Electrolysis and Explain electrolysis by taking an example of molten NaCl.
- 3.3** State the applications of electrolysis.
- 3.4** Understand Electrode potential and Standard reduction potential (SRP).
- 3.5** Define electrochemical series and state its significance.
- 3.6** Define Galvanic cell. Explain the construction and working of Galvanic cell.
- 3.7** Distinguish between electrolytic cell and galvanic cell.
- 3.8** Define battery and list the types of batteries with examples.
- 3.9** Explain the construction, working and applications of (i). Dry cell (Leclanché cell) and (ii). Lithium-ion battery.
- 4.0 Corrosion**
- 4.1** Define the term corrosion.

- 4.2** State the factors which influencing the rate of corrosion.
- 4.3** Describe the formation of (a). Composition cell (b). Stress cell and (c). Concentration cell during corrosion.
- 4.4** Define rusting of iron and explain the mechanism of rusting of iron.
- 4.5** Explain the methods of prevention of corrosion by:
 (a). Protective Coatings (through flow chart with examples) and
 (b). Cathodic Protection Methods. ((i). Sacrificial Anode Process and (ii). Impressed Voltage Process)
- 5.0 Water Treatment**
- 5.1** Define soft water and hard water.
- 5.2** Define hardness of water and classify its types.
- 5.3** List out the salts that causing hardness of water (with Formulae).
- 5.4** State the disadvantages of using hard water in industries.
- 5.5** Define Degree of hardness and units of hardness (mg/L and ppm).
- 5.6** Explain the method of softening of hard water by Ion exchange method (By indicative reactions).
- 5.7** Explain the concept of Reverse Osmosis in removing hardness of water.
- 5.8** List out the applications and advantages of reverse osmosis technique.
- 5.9** List out the essential qualities of drinking water/potable water.
- 5.10** Explain Municipal treatment of water for drinking purpose (only flow chart).
- 6.0 Polymers and Engineering Materials.**
- 6.1** Explain monomers, polymers and the concept of polymerization.
- 6.2** Describe the methods of polymerization (a). Addition Polymerization of Polythene and (b). Condensation Polymerization of Bakelite (Only flow chart).
- 6.3** Define plastic. Write the monomers and uses of plastics:
 (i). PVC and (ii) Nylon (6,6).
- 6.4** Define Biodegradable polymers. State applications of (i). PHBV and (ii). PBAT.
- 6.5** Define an alloy. Write the composition and applications of the following alloys:
 (i). Stainless Steel and (ii). Nitinol.
- 6.6** Define Nano Materials and State applications of
 (i). Graphene and (ii). Nanotubes.
- 7.0 Fuels and Alternative Energy Sources**
- 7.1** Define the term fuel.
- 7.2** Classification of fuels as Natural fuels and Synthetic fuels.
- 7.3** Write the composition and uses of the following:
 (i). LPG (ii). CNG and (iii). Power alcohol.
- 7.4** State the Renewable and Non- renewable energy sources with examples.
- 7.5** Define Green fuel. State the advantages and disadvantages of hydrogen as a green fuel.
- 8.0 Environmental Studies**
- 8.1** Importance of environmental studies.
- 8.2** Define the following terms:
 (i). Pollution, (ii). Pollutant, (iii). Sink, (iv). Receptor, (v). Particulate Matter, (vi). Dissolved Oxygen (DO) and (vii). Threshold Limit Value (TLV).
- 8.3** State the uses of forest resources.

- 8.4** Define deforestation. Explain the causes, effects and controlling methods of deforestation.
- 8.5** Define Air pollution. Explain the causes, effects and controlling methods of Air pollution.
- 8.6** Explain the global impacts of Air pollution: (i). Global Warming, (ii). Ozone Layer Depletion and (iii). Acid Rain.
- 8.7** Define Water pollution. Explain the causes, effects and controlling methods of Water pollution.
- 8.8** Define e – pollution. State the sources of e – pollution. Explain its health effects and its management.
- 8.9** Define Green Chemistry. List the Green Chemistry Principles.
- 8.10** Define Sustainable Development and List the Sustainable Development Goals.

CO-PO/PSO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-
CO2	3	1	1	1	1	-	1	-	-	-
CO3	3	1	1	1	1	-	1	-	-	-
CO4	3	1	1	-	1	-	1	-	-	-
CO5	3	1	-	-	1	1	1	-	-	-
Average	3	1	1	1	1	1	1	0	0	0

3 = Strongly mapped 2 = Moderately mapped 1 = Slightly mapped

Note: The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:

- (i). Seminars (ii). Tutorials (iii). Guest Lectures (iv). Assignments (v). Quiz Competitions,
- (vi). Industrial Visit (vii). Tech Fest (viii). Mini Project (ix). Group Discussions
- (x). Virtual Classes and (xi). Library Visits etc.

COURSE CONTENT

1. Basic Concepts of Chemistry

Atomic Structure:

Introduction - Fundamental particles – their mass and charge – Atomic number and Mass number - definition with examples – calculation of electrons, protons and neutrons in atoms – Bohr’s atomic theory and limitations - Quantum numbers –

Orbital concept, shapes of s, p orbitals – Distinguish between orbit and orbital - Aufbau principle - Hund's rule - Pauli's exclusion Principle - Electronic configuration of elements (Atomic number(Z) from 1 to 20).

Chemical Bonding:

Introduction – Octet rule - Types of chemical bonds – Ionic bond (NaCl) and Covalent bond (H₂, O₂ & N₂ molecules) as examples – Properties of Ionic and Covalent compounds. Electronic concept of oxidation, reduction and redox reactions.

2.Solutions, Acids and Bases

Solutions:

Introduction – Idea of solute, solvent and solution - Types of solutions based on physical state of solvent – Atomic weight – Molecular weight, Equivalent Weight (Acids, Bases and Salts) - Mole concept – Numerical problems on Mole concept - Methods of expressing concentration of a solution – Molarity - Normality – Numerical problems on Molarity and Normality.

Acids and Bases:

Introduction - Arrhenius theory of acids and bases – pH Scale – its significance – Buffer solution – Definition – Types of buffer solutions with examples – its applications.

3.Electrochemistry

Introduction - Conductors, Semiconductors, Insulators with examples - Electrolytes (Strong and Weak) and Non-electrolytes – Definition – Examples – Electrolysis – Definition – Electrolysis of molten NaCl – Applications of electrolysis – Electrode potential - Standard reduction potential – Definition – Electrochemical series – Significance – Construction and working of Galvanic cell – Differences between Electrolytic cell and Galvanic cell - Batteries - Types of batteries – Definition and examples – construction, working and applications of: (i). Dry Cell (Leclanché Cell) and (ii). Lithium-ion battery.

4.Corrosion

Introduction – Definition - Factors influencing the rate of corrosion – Composition cell, Stress cell and Concentration cell during corrosion – Rusting of iron and its mechanism – Prevention of corrosion - Protective Coating methods (flow chart with examples) - Cathodic Protection methods.

5.Water Treatment

Introduction – Soft and Hard water – Hardness of water – Types of hardness – salts responsible for hardness - Degree of hardness – Methods of expressing hardness (mg/L and ppm) – Disadvantages of using hard water in industries - Softening of hard water by Ion exchange method – Concept of Reverse Osmosis process – Applications and Advantages of Reverse Osmosis - Essential qualities of drinking water/potable water – Municipal treatment of water for drinking purpose (only flow chart).

6.Polymers and Engineering Materials

Polymers:

Introduction- Monomers - Polymers - Polymerization – Types of Polymerization – Addition polymerization (Polythene) and Condensation polymerization (only flow chart of Bakelite) - Plastics – monomers and uses of PVC and Nylon (6,6) - Biodegradable Polymers: (i). PHBV and (ii). PBAT (Composition and Uses).

Engineering Materials:

Alloys - Definition - Composition and applications of (i). Stainless Steel and (ii). Nitinol
Nano Materials – Definition - Applications of (i) Graphene and (ii). Nanotubes.

7.Fuels and Alternative Energy Sources

Introduction – Definition - Classification of fuels – Composition and uses of (i). LPG (ii). CNG and (iii). Power alcohol - Renewable and Non-renewable energy sources – Advantages and disadvantages of Hydrogen as a green fuel.

8.Environmental Studies

Introduction - Importance of environmental studies – Important terms related to environment – Pollution, Pollutant, Sink, Receptor, Particulate Matter, Dissolved Oxygen (DO), Threshold Limit Value (TLV) - Uses of forest resources – Deforestation - Definition – causes, effects, controlling methods – Air pollution – Definition, causes, effects, controlling methods - Global impacts of Air pollution – Global warming, Ozone layer depletion, Acid rain – Water pollution – Definition, causes, effects, controlling methods – e - pollution, Definition, sources, effects, management - Green Chemistry – Definition – Principles of Green Chemistry – Sustainable Development – Definition – Goals.

REFERENCE BOOKS

- 1. Jain & Jain-Engineering Chemistry**
- 2. O.P. Agarwal, Hi-Tech-Engineering Chemistry**
- 3. B. K. Sharma-Engineering Chemistry**
- 4. A. K. De-Engineering Chemistry**
- 5. Mahua Basu & S. Xavier-Fundamentals of Environmental Studies**
- 6. Anubha Kaushik & C.P Kaushik-Environmental Studies**

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TEST-I, UNIT TEST-II & UNIT TEST-III

Unit Test	Learning outcomes to be covered
Unit Test – 1	From 1.1 to 2.9
Unit Test – 2	From 3.1 to 5.10
Unit Test – 3	From 6.1 to 8.10

PYTHON PROGRAMMING

Course code	Course Title	No. of Periods/Week	Total No. of periods	Marks for FA	Marks for SA	Credits
26CI105T	Python Programming	6	180	30	70	6

Time Schedule

Chapter No.	Chapter/Unit Title	No. of Periods	Marks	No. of Short Answer Questions	No. of Essay Type Questions	CO's Mapped
1.	Introduction to Python Programming	40	14	02	01	CO1
2.	Control Flow and Loop statements	25	14	02	01	CO2
3.	Functions and Arrays	40	22	02	02	CO3
4.	Data Structures	35	22	02	02	CO4
5.	Object Oriented Programming basics, Python Libraries and File Handling	40	22	02	02	CO5
Total		180	94	10	08	

Course Objectives	<p>i)To know the fundamentals of Python programming and to understand syntax, scripting and program execution in 'Python'</p> <p>ii)To develop various python programs using control structures, functions & arrays</p> <p>iii) To develop programs using data structures</p> <p>iv) To Implement OOPs basic concept and Python Libraries</p> <p>v) To implement file handling concepts</p>
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Course Outcomes	CO1	CI105T.1	Explain Basic concepts of Python programming as well as scripting, debugging and execution.
	CO2	CI105T.2	Develop Python programs using Control statements & Loops.
	CO3	CI105T.3	Develop Python programs using Functions and arrays.
	CO4	CI105T.4	Develop Python programs using Data structures.

	CO5	CI105T.5	Develop Python application programs using OOP basic concepts, Python libraries and Files,
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Learning Outcomes:

1.0 Introduction to python programming

- 1.1 Recite history of Python.
- 1.2 List Python features
- 1.3 List and Explain Applications of Python
- 1.4 Explain Python Integrated Development and Learning Environment (IDLE)
- 1.5 Explain process of Running Python Scripts.
- 1.6 Explain Identifiers, Keywords, Indentation & Variables
- 1.7 List and explain various data types
- 1.8 Explain declaration & initialization of variables.
- 1.9 Explain Input and Output statements.
- 1.10 Explain formatted input output.
- 1.11 State the usage of comments
- 1.12 List and Explain various Operators.
- 1.13 Explain Boolean values.
- 1.14 Explain Operator precedence rules.
- 1.15 State the purpose of modules.
- 1.16 Define functions.
- 1.17 List types of functions
- 1.18 List and Explain Built-in Functions.
- 1.19 Explain the Steps in Developing a simple python program and execution.

2.0 Control Flow and Loop Statements

- 2.1 List and Explain various Control Flow constructs.
 - 2.1.1 If
 - 2.1.2 If-Else
 - 2.1.3 if-elif-else
- 2.2 List and Explain various Loop Statements.
 - 2.2.1 for Loop
 - 2.2.2 while loop
- 2.3 Use break, continue & pass statements.
- 2.4 Implement the python programs using control structures

3.0 Functions and Arrays

- 3.1 Give introduction to functions
- 3.2 Use Function Arguments: Default arguments, Keyword arguments, Variable Length arguments, Anonymous Functions & Return Statement.
- 3.3 List and explain Scope of variables
- 3.4 Explain creation of modules.
- 3.5 Explain importing of modules.
- 3.6 Explain Python Variables: Namespace and scoping
- 3.7 Explain Python Packages
- 3.8 List and Explain Strings: String slices, immutability
- 3.9 List and Explain String functions and methods.
- 3.10 Explain about String module.
- 3.11 Explain about Python Arrays.
- 3.12 Explain accessing of elements in an Array.
- 3.13 Explain Array methods.

4.0 Data Structures

- 4.1 Explain Python Lists.
- 4.2 Describe Basic List Operations.
- 4.3 Explain List Slices.
- 4.4 Explain List methods.
- 4.5 Explain List traversing.
- 4.6 Explain mutability.
- 4.7 Explain aliasing.
- 4.8 Explain Cloning of lists.
- 4.9 Explain List comprehension.
- 4.10 Tuples.
 - 4.10.1 Explain Tuple assignment.
 - 4.10.2 Explain Tuple as return value.
 - 4.10.3 Explain Tuple Comprehension
- 4.11 Dictionaries
 - 4.11.1 Explain creation of dictionary.
 - 4.11.2 Explain Dictionary operations and methods.
 - 4.11.3 Explain Dictionary Comprehension.
- 4.12 Explain Sets.

5.0 Object oriented programming, Python Libraries & File Handling

- 5.1 Create Classes
- 5.2 Create Objects
- 5.3 Explain Data Hiding
- 5.4 Explain Data Abstraction
- 5.5 Explain Inheritance.
- 5.6 Explain method overloading and overriding.
- 5.7 Give introduction to python library.
- 5.8 Import modules in a python program
- 5.9 Use Python standard library's functions and modules
 - 5.9.1 Turtle, Random, Datetime, CSV, Numpy & Pandas
- 5.10 Create Python library
- 5.11 Give introduction to Files
- 5.12 Explain opening and closing Files
- 5.13 Explain reading and writing Files
- 5.14 Use Standard Input, Output and error streams
- 5.15 Explain exception handling
 - 5.15.1 Define Error and Exception
 - 5.15.2 State the difference between Error and Exception
 - 5.15.3 Use user-defined exceptions.
 - 5.15.4 Use try except block.
 - 5.15.5 Explain raising exceptions.

CO-PO/PSO Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CI105T.1	3	1	2	1	1	1		2	1	
CI105T.2	3	2	2	1	1	1	1	2	2	2
CI105T.3	3	2	2	1	1	1		2	2	2
CI105T.4	3	1	2	1	1	1	1	2	2	2
CI105T.5	3	1	2	1	2	3	2	2	2	2
Average	3	1.75	2	1	1.2	1.8	1.3	2	1.8	1.8

3=strongly mapped, 2=moderately mapped, 1=slightly mapped

COURSE CONTENT

UNIT – I: Introduction

Introduction to Python, installation, Applications, IDLE, Data types, variables, Input and Output statements, Operators, expressions, statements, precedence of operators, comments, modules, functions, types of functions, built-in functions, flow of python program execution.

UNIT – II: Control Flow and Loop Statements:

Control Flow- If, if-else, if-elif-else, for, while, break, continue, pass statements.
sample python programs using control flow and Loop statements.

UNIT – III: Functions and Arrays:

Introduction to Functions: Defining, Calling Functions, Passing Arguments, Types of function arguments -Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Function Returning multiple values, Scope of the Variables in a Function - Global and Local Variables.

Modules: Creating modules, import statement, name spacing, Python Packages.

Strings: string slices, immutability, string functions and methods, string module.

Python arrays: Access the Elements of an Array, array methods.

UNIT – IV: Data Structures

Lists: list operations, list slices, list methods, list traversing, mutability, aliasing, cloning lists, list comprehension.

Tuples: tuple assignment, tuple as return value, tuple comprehension.

Dictionaries: operations and methods, comprehension.

sets.

UNIT – V: Object Oriented Programming , Python Libraries & File Handling

Object Oriented Programming in Python: Basics of Classes, Objects, Methods, Constructor, Data hiding, Abstraction, Inheritance, overriding.

Python Libraries: Introduction, importing modules in python program, use python standard library functions and modules - Python libraries - Turtle, Random, Datetime, CSV, Numpy & Pandas.

File Handling: Open Files, File Processing and Closing a File.

Error and Exceptions: Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User Defined Exceptions

REFERENCE BOOKS:

1. Python Programing by K. Nageswara Rao, Shaikh Akbar -Scitech Publications (India) Pvt. Ltd.
2. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
3. Learning Python, Mark Lutz, Orielly
4. Think Python, Allen Downey, Green Tea Press
5. Core Python Programming, W.Chun, Pearson.
6. Introduction to Python, Kenneth A. Lambert, Cengage

Table specifying the scope of syllabus to be covered for unit tests

Unit Test	Learning outcomes to be covered
Unit test-1	From 1.1 to 2.1
Unit test-2	From 2.2 to 3.13

Unit test-3	From 4.1 to 5.15
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CODING FUNDAMENTALS

Course code	Course Title	No. of Periods/Week	Total No. of periods	Marks for FA	Marks for SA	Credits
26CI106A	CODING FUNDAMENTALS	2	60	NIL	NIL	NIL

TIME SCHEDULE

S.No.	Chapter/Unit Title	No. of Periods	CO's Mapped
1.	Fundamentals of Computers	10	CO1
2.	Programming Methodology	15	CO2
.	Introduction to coding	10	CO3
4.	Fun with functions	15	CO4
5.	Understanding arrays and collections	10	CO5
Total Periods		60	

Course Objectives

Course Objectives	<ul style="list-style-type: none"> i) To know the fundamentals of Computers ii) To familiarize with programming methodologies like algorithms and flowcharts iii) To understand coding basics iv) To familiarize with functions v) To familiarize with arrays and collections
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Course Outcomes:

At the end of the course the student able to:		
CO1	CI106A.1	Explain computer fundamentals
CO2	CI106A.2	Explain various flowchart, algorithm methods
CO3	CI106A.3	Explain the concept of coding and basics of coding
CO4	CI106A.4	Explain the concept of functions, events and event handlers
CO5	CI106A.5	Explain the arrays and collections

Learning Outcomes:

1.0 Fundamentals of Digital Computer

- 1.1. Define various terms related to computers – Computer, Hardware, Software, Firmware, High Level Language, Low Level Language
- 1.2. Draw and explain block diagram of a computer in detail
- 1.3. Describe the current family of CPUs used in Computers.

- 1.4. State the use of storage devices used in a computer.
- 1.5. List the two types of memory used in a computer.
- 1.6. State the importance of cache memory.
- 1.7. Explain the generations of computers.
- 1.8. Classification of computers - based on a) size, b) processor.
- 1.9. State the importance of binary number system for use in Digital Computers

2.0 Implement Programming Methodology.

- 2.1. State the different steps involved in problem solving.
- 2.2. Define an algorithm.
- 2.3. List four characteristics of algorithm.
- 2.4. Define flowchart
- 2.5. Define a program
- 2.6. Differentiate between program and algorithm.
- 2.7. State the steps involved in algorithm development.
- 2.8. Differentiate between algorithm and flowchart.
- 2.9. Develop algorithms for simple problems.
- 2.10. Draw the various symbols used in flowcharts.
- 2.11. Draw flowcharts for simple problems.

3.0 Introduction to coding

- 3.1. Define coding.
- 3.2. Define Pseudocode
- 3.3. Explain the Process of writing code
- 3.4. Define variables.
- 3.5. Explain naming of variables
- 3.6. List Data types.
- 3.7. Explain operations on variables.
- 3.8. Explain AND, OR and NOT logical operators
- 3.9. State Combining of logical operators.
- 3.10. List different Relational operators
- 3.11. List Different control statements
- 3.12. Explain Nested control statements
- 3.13. Define loops
- 3.14. Explain Increment loops
- 3.15. List Different types of loops
- 3.16. State Entry criteria for a loop
- 3.17. State Exit criteria for a loop
- 3.18. Explain Break statement
- 3.19. Explain Continue statement
- 3.20. List Examples of sequential execution, selection and iteration
- 3.21. Define bug

4.0 Fun with functions

- 4.1 Define functions.
- 4.2 Examples of functions
- 4.3 List Advantages using functions
- 4.4 State different function parameters.
- 4.5 State about returning a value in a function.
- 4.6 Define an event.
- 4.7 List different event handlers.

5.0 Understanding arrays and collections

- 5.1. Explain collections.
- 5.2. Define arrays.

- 5.3 List various types of arrays with examples.
- 5.4 Explain the process of iterating over collections.
- 5.5 Explain modifying collections

CO-PO/PSO Matrix:

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CI106A.1	3							3	1	1
CI106A.2	1	2	2	1		3		1	3	1
CI106A.3	3	1		1		1	1	3	1	1
CI106A.4	3		2	2	1		1	2	1	2
CI106A.5	3		2		1	1	1	2	1	2
Average	2.7	1.5	2	1.25	1.3	1.7	1.25	2.2	1.3	1.3

3=Strongly mapped , 2=moderately mapped, 1=slightly mapped

COURSE CONTENT

1.0 Fundamentals of Digital Computer

Computer, Hardware, Software, Firmware, High Level Language, Low Level Language - Block diagram of a digital computer, Clock speed and word length, Functional blocks of a CPU: ALU and Control unit, classification of computer memory, generations & classification of computers, binary number system.

2.0 Programming Methodology.

Steps involved in problem solving – Define an algorithm , Program - Characteristics of algorithm - Differentiate between program and algorithm- Steps involved in algorithm development - Differentiate algorithm and flowchart - Algorithms for simple problems - Symbols used in flowcharts -Flowcharts for simple problems.

3.0 Introduction to coding

Need for coding – correlate coding with real life examples - pseudo code – process of writing pseudo code – Define Variables - naming of variables-Different data types in variables- operations on variables –Different types of logical operators and their functions i.e AND , OR and NOT – combining logical AND , OR and NOT operators - different types of relational operators -Different types of control statements if, if-else - Nested control statements - loops in coding-increment loops-decrement loops – entry criteria-exit criteria-break statement-continue statement-sequential execution, selection and iteration-Define bug

4.0 Fun with functions

Functions-examples-user defined and built-in functions- Different function parameters-returning a value in a function - Events- Event Handlers

5.0 Understanding arrays and collections

Collections-Arrays – examples for arrays and collections-Process of iterating over collections-Modifying collections.

REFERENCE BOOKS

1. Information Technology - Curtin.
2. Computer Science Theory & Application - E. Balaguruswamy, B. Sushila
3. Introduction to Computers (Special Indian Edition) - Peter Norton

4. How to solve it by computer-R.G.Dromey-Pearson Education
5.introduction to coding-class VI,VII,VIII,IX,X by cbse academic
https://cbseacademic.nic.in/web_material/codeingDS/classVI_Coding_Student_Handbook.pdf

PYTHON PROGRAMMING LAB

Course code	Course Title	No. of Periods/Week	Total No. of periods	Marks for FA	Marks for SA	Credits
26CI107L	Python Programming Lab	6	180	40	60	6

TIME SCHEDULE:

Chapter No.	Chapter/Unit Title	No. of Periods	CO's Mapped
1.	Exercises on basics, expressions and operators.	30	CO1
2.	Exercises on control structures,	35	CO2
3.	Exercises on functions and Arrays	35	CO3
4.	Exercises on Data structures	40	CO4
5.	Exercise on Object orientation, python libraries and file handling	40	CO5
Total Periods		180	

COURSE OUTCOMES

CO1	CI107L .1	Execute Simple python programs (basics, expressions and operators)
CO2	CI107L.2	Execute Python programs using control structures
CO3	CI107L.3	Execute python programming using Functions, Arrays
CO4	CI107L.4	Develop Python programs using Data structures
CO5	CI107L.5	Develop Python programs using OOP Concepts, Python libraries and File handling

LEARNING OUTCOMES

The student can able to:

1. Write and execute simple python Program.
2. Write a program to demonstrate various data types in Python
3. Write /execute simple 'Python' program: Develop minimum 2 programs using different data types (numbers, string, tuple, list, and dictionary).
4. Write a program to perform different Arithmetic Operations on numbers in Python

5. Write /execute simple 'Python' program: Develop minimum 2 programs using Arithmetic Operators, exhibiting data type conversion.
6. Write a Python script that prints prime numbers less than 20.
7. (i) Write simple programs to convert U.S. dollars to Indian rupees.
(ii) Write simple programs to convert bits to Megabytes, Gigabytes and Terabytes.
8. Write simple programs to calculate the area and perimeter of the square, and the volume & perimeter of the cone.
9. Write program to: (i) determine whether a given number is odd or even.
(ii) Find the greatest of the three numbers using conditional operators.
10. Write a program to: i) Find factorial of a given number. ii) Generate multiplication table up to 10 for numbers 1 to 5.
11. Write a python program to find factorial of a number using Recursion
12. Write a program to To print Factors of a given Number.
13. Write a program to: i) Find factorial of a given number. ii) Generate multiplication table up to 10 for numbers 1 to 5 using functions.
14. Write a program to: i) Find factorial of a given number using recursion. ii) Generate Fibonacci sequence up to 100 using recursion.
15. Write a python program to define a module to find Fibonacci Numbers and import the module to another program
16. Write a python program to define a module and import a specific function in that module to another program
17. Write a program to create, concatenate and print a string and accessing sub-string from a given string
18. Write a Python class to reverse a string word by word.
19. Write a program to Create a list, add element to list, delete element from the lists.
20. Write a program to Sort the list, reverse the list and counting elements in a list.
21. Write a program to demonstrate working with tuples in python.
22. Write a program to Create dictionary, add element to dictionary, delete element from the dictionary.
23. Write a program to To calculate average, mean, median, and standard deviation of numbers in a list.
24. Write a program to: i) To create simple file and write "Hello World" in it.
ii) To open a file in write mode and append Hello world at the end of a file.
25. Write a program to: i) To open a file in read mode and write its contents to another file but

replace every occurrence of character 'h' ii) To open a file in read mode and print the number of occurrences of a character 'a'.

26. Write a program that inputs a text file. The program should print all of the unique words in the file in an alphabetical order
27. Write a Program to Add two complex number using classes and objects.
28. Write a Program to Subtract two complex number using classes and objects.
29. Write a pandas program to load the CSV into a dataframe and perform arithmetic operations on the data loaded.
30. Write a program to create a 5 * 5 Numpy array with random integers between 1 and 100.

CO-PO/PSO MATRIX

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CI107L.1	2	2	2	1	2			3		2
CI107L.2	2	3	2					2		2
CI107L.3	3	3	2	3		2	2	2		
CI107L.4	2	2	2		2	3	1	2	3	
CI107L.5	3	3	2		2	2	2	2	2	
Average	2.3	2.3	2	2.3	2	2.3	2	2	2.5	2

3=strongly mapped, 2=moderately mapped, 1=slightly mapped

S.No.	Name of the Experiment	Objectives	Key Competencies
1.	Write and execute simple python Program.	Write a simple python program to print Hello World! and debug and execute	<ul style="list-style-type: none"> • Know the usage of Python IDLE • Edit and save the program • Check for the syntax errors and clear the errors • Run the program and check for the output.
2.	Write a program to demonstrate different number data types in Python	Write a simple python program using integer, float, string and debug and execute	<ul style="list-style-type: none"> • Know the usage of Python IDLE • Edit and save the program • Check for the syntax errors and clear the errors • Run the program and check for the output.
3.	Write /execute simple 'Python' program: Develop minimum 2 programs using different data types (numbers, string, tuple, list, dictionary).	Write a Python program to identify different data types.	<ul style="list-style-type: none"> • Identify different data types • Write basic python program using data types • Evaluate arithmetic expression

			<ul style="list-style-type: none"> • Run the program • Rectify the syntactical errors • Execute the program and check the output for its correctness
4.	Write a program to perform different Arithmetic Operations on numbers in Python	Write a program to perform different Arithmetic Operations such as addition, subtraction, multiplication and division	<ul style="list-style-type: none"> • Identify different arithmetic operators • Write basic python program using arithmetic operations • Evaluate arithmetic expression • Run the program • Rectify the syntactical errors • Execute the program & Check the output for its correctness
5.	Write /execute simple 'Python' program: Develop minimum 2 programs using Arithmetic Operators, exhibiting data type conversion.	Write a Python program to identify arithmetic operators and data type conversion	<ul style="list-style-type: none"> • Identify different arithmetic operators • Build arithmetic expressions • Identify the priorities of operators • Evaluate arithmetic expression • Run the program • Rectify the syntactical errors • Execute the program and Check the output for its correctness
6.	Write a Python script that prints prime numbers less than 20.	Write a Python script that prints prime numbers less than 20.	<ul style="list-style-type: none"> • Identify 20 prime numbers • Edit and save the program • Check for the syntax errors and clear the errors • Run the program and check for the output.
7.	(i) Write simple programs to convert U.S. dollars to Indian rupees. ii) Write simple programs to convert bits to Megabytes, Gigabytes and Terabytes.	Write a Python program to identify arithmetic operators and data type conversion	<ul style="list-style-type: none"> • Identify different arithmetic operators • Build arithmetic expressions • Identify the priorities of operators • Evaluate arithmetic expression • Run the program • Rectify the syntactical errors • Execute the program Check the output for its correctness
8	Write simple programs to calculate the	Write a Python program	<ul style="list-style-type: none"> • Identify different arithmetic

	area and perimeter of the square, and the volume & perimeter of the cone.	to identify arithmetic operator data type conversion	<ul style="list-style-type: none"> operators • Build arithmetic expressions • Identify the priorities of operators • Evaluate arithmetic expression • Run the program • Rectify the syntactical errors • Execute the program Check the output for its correctness
9	Write program to: (i) Determine whether a given number is odd or even. (ii) Find the greatest of the three numbers using conditional operators.	Write a Python program to identify conditional statements in Python.	<ul style="list-style-type: none"> • Build a relational expression • Use the if statement for decision making • Rectify the syntax errors • Check the output for correctness
10	Write a program to: i) Find factorial of a given number. ii) Generate multiplication table up to 10 for numbers 1 to 5.	Write a Python program to identify loops statements in Python.	<ul style="list-style-type: none"> • Build the termination condition for looping • Use while statement with correct syntax • Check whether correct number of iterations are performed by the while loop • Rectify the syntax errors • Debug logical errors
11	Write a python program to find factorial of a number using Recursion	Write a python program for the factorial for a given number using recursion	<ul style="list-style-type: none"> • Build the application using recursion. • Build the terminating condition for recursion. • Rectify the syntax errors • Debug logical errors
12	Write a program to: To print Factors of a given Number.	Write a Python program to make use of function.	<ul style="list-style-type: none"> • Build the termination condition for looping • Use while statement with correct syntax • Check whether correct number of iterations are performed by the while loop • Rectify the syntax errors • Debug logical errors
13	Write a program to: i) Find factorial of a given number. ii) Generate multiplication table up to 10 for numbers 1 to 5 using functions	Write a Python program to using functions	<ul style="list-style-type: none"> • Build the termination condition for looping • Use while statement with correct syntax • Check whether correct number of iterations are performed by the while loop • Rectify the syntax errors

			<ul style="list-style-type: none"> • Debug logical errors
14.	Write a program to: i) Find factorial of a given number using recursion. ii) Generate Fibonacci sequence up to 100 using recursion.	Write a Python program to make use of recursion.	<ul style="list-style-type: none"> • Build the application using recursion. • Build the terminating condition for recursion. • Rectify the syntax errors • Debug logical errors
15.	Write a python program to define a module to find Fibonacci Numbers and import the module to another program	Write a Python program using module and importing the module	<ul style="list-style-type: none"> • Build the application using module. • Develop the logic for Fibonacci series. • Import the module • Rectify the syntax errors • Debug logical errors
16.	Write a python program to define a module and import a specific function in that module to another program	Write a Python program using module and importing the module	<ul style="list-style-type: none"> • Build the application using module. • Develop the logic for Fibonacci series. • Import the module • Rectify the syntax errors • Debug logical errors
17.	Write a program to create, concatenate and print a string and accessing sub-string from a given string	Write a program to create, concatenate and print a string and accessing sub-string from a given string.	<ul style="list-style-type: none"> • Build the application • Develop the logic for string concatenation and substring • Rectify the syntax errors • Debug logical errors
18.	Write a Python class to reverse a string word by word	Write a program to reverse the given string	<ul style="list-style-type: none"> • Build the application • Develop the logic for string concatenation and substring • Rectify the syntax errors • Debug logical errors
19.	Write a program to: Create a list, add element to list, delete element from the lists.	Write a Python program to identify various lists and list manipulation methods in Python.	<ul style="list-style-type: none"> • Create a one list with correct syntax • Create a list • Read elements from list • Add elements to list • Delete elements • Rectify the syntax errors • Debug logical errors • Check for the correctness of output for the given input
20.	Write a program to: Sort the list, reverse the list and counting elements in a list.	Write a Python program to identify various lists and list manipulation methods in Python.	<ul style="list-style-type: none"> • Create a one list with correct syntax • Create a list • Read elements from list • Add elements to list • Delete elements • Rectify the syntax errors • Debug logical errors • Check for the

			correctness of output for the given input
21	Write a program to demonstrate working with tuples in python	Write a Python program to identify various tuples and manipulate	<ul style="list-style-type: none"> • Create a tuple with correct syntax • Create a tuple • Read elements from tuple • Add elements to tuple • Delete elements • Rectify the syntax errors • Debug logical errors • Check for the correctness of output for the given input
22.	Write a program to: Create dictionary, add element to dictionary, delete element from the dictionary.	Write a Python program to identify various dictionary and dictionary manipulation methods in Python.	<ul style="list-style-type: none"> • Create a one dictionary with correct syntax • Create a dictionary • Read elements from list • Add elements to dictionary • Delete elements from dictionary • Rectify the syntax errors • Debug logical errors • Check for the correctness of output for the given input
23	Write a program to: To calculate average, mean, median, and standard deviation of numbers in a list.	Write a Python program to identify various statistical functions.	<ul style="list-style-type: none"> • Create a list • add elements to list • perform statistical functions on that list
24.	File Input/output: Write a program to: i) To create simple file and write "Hello World" in it. ii) To open a file in write mode and append Hello world at the end of a file.	Write a Python program to identify the steps to create a file and append to file.	<ul style="list-style-type: none"> • Create a Python file • Add contents to file
25	Write a program to: i) To open a file in read mode and write its contents to another file but replace every occurrence of character 'h' ii) To open a file in read mode and print the number of occurrences of a character 'a'.	Write a Python program to identify the steps to open a file in read/write mode.	<ul style="list-style-type: none"> • Open a Python file in write mode • Add contents to the file • Open a Python file in Read mode • Print the file
26.	Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order	Write a Python program to identify the steps to open a file in read/write mode.	<ul style="list-style-type: none"> • Open a Python file in write mode • Add contents to the file • Open a Python file in Read mode • Develop the logic to find unique words • Print the unique words
27.	Write a Program to: Add two complex number using classes and objects.	Write a Python program to identify the steps to create class and create an object in Python.	<ul style="list-style-type: none"> • Create a class using Python • Create an object in

			Python <ul style="list-style-type: none"> • Debug the python program • Check the correctness
28	Write a Program to: Subtract two complex number using classes and objects	Write a Python program to identify the steps to create class and create an object in Python.	<ul style="list-style-type: none"> • Create a class using Python • Create an object in Python • Debug the python program Check the correctness
29	Write a pandas program to load the CSV into a dataframe and perform arithmetic operations on the data loaded	Write a Python program using the pandas library to perform the task	<ul style="list-style-type: none"> • Import the pandas python library • Write the python code to load the CSV into dataframe • Perform the arithmetic operations • Debug the python program • Check the correctness
30.	Write a program to create a 5 * 5 Numpy array with random integers between 1 and 100	Write a Python program using the Numpy library to perform the task	<ul style="list-style-type: none"> • Import the Numpy python library • Write the python code to create an array of size 5 *5 • Generate the random integers between 1 and 100 • Debug the python program • Check the correctness

Table specifying the scope of syllabus to be covered for unit tests

Unit Test	Learning outcomes to be covered
Unit test-1	From 1 to 10
Unit test-2	From 11 to 20
Unit test-3	From 21 to 30

COMPUTER HARDWARE LAB

Course Code	Course title	No of periods/ week	Total no of periods	Marks for FA	Marks for SA	Credits
26CI108L	Computer Hardware Lab	4	120	40	60	3

TIME SCHEDULE:

S No	Chapter/ Unit Title	No. of Periods	COs Mapped
1.	Computer Hardware Basics	24	CO1
2.	Mother Board Basics	24	CO2
3.	Hard Disk Basics	24	CO3
4	Operating System Basics	28	CO4
5	Troubleshooting Basics	20	CO5
	Total	120	

Course Objectives:

COURSE OBJECTIVES	<ol style="list-style-type: none"> 1. Identify all the components of Computer. 2. Identify all the components of mother board. 3. Identify Different Types of Connectors & Pins on mother board. 4. Know Various options in CMOS setup 5. Assemble & Dis-Assemble a computer 6. Install RAM, CPU, HDD 7. Partition & format hard drive 8. Install system software's & printers 9. Identify all the settings of control panel 10. Identify the voltages in SMPS with color coding 11. Troubleshoot hardware issues
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Course Outcomes

Course Outcomes	CO1	CI108L.1	Identify and Assemble the PC with suitable components.
	CO2	CI108L.2	Identify the components, connectors & pins on a Motherboard
	CO3	CI108L.3	Install and partition the Hard disk
	CO4	CI108L.4	Install operating system and printers
	CO5	CI108L.5	Troubleshoot hardware devices

Learning Outcomes: Computer Hardware Basics

1. Identification of various Hardware components of Computer
2. Using various options of CMOS setup
3. Installing and removing of Motherboard from computer
4. Printing the summary of your system Hardware and verify for correctness
5. Assembling of a PC
6. De-Assembling of a PC

Mother Board Basics

7. Identification of various components of Motherboard
8. Identification of various back panel connectors of Motherboard
9. Identification of various pins & connectors
10. Installing and removing RAM, CPU, HARD DISK
11. Identification of various motherboards based on the form factor such as AT, ATX, micro ATX, mini ATX , Baby AT et
12. Identification on voltage levels of each wire in SMPS based on the standard color of the wire.

Hard Disk basics

13. Familiarity with hard disk interfacing standards like IDE/SCSI /SATA / PATA
14. Practice on Partition of Hard disk
15. Practice on formatting a hard disk in FAT/NTFS Format
16. Calculating Hard Disk Storage Capacity
17. Recovery of lost data on hard drive using Recovery Tools
18. Defragmenting the Hard Disk

Operating system basics

19. Installation of operating system software (Windows 10/11)
20. Installation of device driver software
21. Installation of application software (MS-Office 2007/ 2010)
22. Practice on various options of control panel
23. Installation of printer using control panel
24. Installation of any anti-virus software for protecting pc
25. Practice on changing resolution, color, appearance, screensaver options of the display Setting in pc
26. Knowing the precautions to be taken while troubleshooting the hardware

Trouble shooting Basics

27. Identification of steps in troubleshooting: Visual inspection, Layman checks, measurement of voltage levels, Beep sounds, Error codes and Use of Advanced Diagnostic tools
28. Troubleshooting Keyboard, Printer Problems
29. Troubleshooting no display on monitor Problem
30. Troubleshooting RAM Issues

CO-PO/PSO MATRIX

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CI108L.1	1	0	1	2	1	0	2	3	0	0
CI108L.2	1	0	2	2	1	0	1	3	1	0

CI108L.3	1	0	2	1	0	0	1	2	2	1
CI108L.4	1	0	2	1	0	0	1	2	2	1
CI108L.5	1	0	2	1	0	0	1	2	2	1
Average	1	0	1.8	1.4	0.4	0	1.2	2.4	1.4	0.6

3=strongly mapped, 2=moderately mapped, 1=slightly mapped

S.No.	Name of the experiment	Objectives	Key Competencies
1	Exercise on Identification and familiarization of various components of computer system.	Identification and familiarization of various components of computer system.	<ul style="list-style-type: none"> ❖ Identify and note down mother board, Components and Chips. ❖ Identify various Internal and External slots in the mother board and clean them with blower/ Brush. ❖ Practicing Inserting and Removing RAM with care.
2	Exercise on various operations and modifications required for CMOS setup.	Perform various operations and modifications required for CMOS setup.	<ul style="list-style-type: none"> ❖ Identify location of CMOS battery on mother board. ❖ Know how to replace CMOS battery. ❖ Identify keyboard key for entering BIOS setup. ❖ Setup CMOS settings ❖ Check the status of CMOS settings after replacement.
3	Exercise on Installing and removing of Motherboard from computer	Perform mother board installation, removal and identification	<ul style="list-style-type: none"> ❖ Identify motherboard form factors (ATX, microATX, mini-ITX) ❖ Recognize various motherboard components (CPU socket, RAM slots, chipset, PCIe slots, power connectors) ❖ Demonstrate correct procedure for removing and installing a motherboard ❖ Properly mount the motherboard using standoffs and screws ❖ Align the I/O shield and rear ports correctly
4	Exercise on Print the summary of your system Hardware and verify for correctness	Print the summary of your system Hardware and verify for correctness	<ul style="list-style-type: none"> ❖ Know how to open system summary window ❖ Check whether all the hardware peripherals are working properly or not. ❖ Know how to install device drivers ❖ Know how to enable and disable hardware peripherals. ❖ Print the hardware summary page

5	Assembling a PC	understand the step-by-step process of assembling a personal computer.	<ul style="list-style-type: none"> ❖ Recognize essential hardware components (motherboard, RAM, CPU, HDD, PSU, cabinet, etc.) ❖ Understand the role and placement of each component ❖ Install the motherboard, processor, RAM, and storage devices into the cabinet ❖ Mount and connect the SMPS ❖ Connect cables (SATA, power, front panel I/O, etc.) ❖ Install expansion cards (optional) ❖ Connect and manage power cables safely and efficiently ❖ Organize internal wiring to promote airflow and safety
6	De-Assembling of a PC	To understand the systematic process of disassembling a personal computer.	<ul style="list-style-type: none"> ❖ Identify all major components: motherboard, CPU, RAM, HDD/SSD, SMPS, GPU, etc. ❖ Detach cables and connectors carefully (SATA, power, front panel, etc.) ❖ Use tools like screwdrivers correctly and safely. ❖ Handle delicate components such as RAM and processor without damage. ❖ Follow a correct and logical sequence for disassembling the system. ❖ Place screws and components in organized manner for easy reassembly.
7	Identification of various components of Motherboard	To identify and understand the function of key components on a computer motherboard.	<ul style="list-style-type: none"> ❖ Identify components such as CPU socket, RAM slots, chipset, power connectors, SATA/IDE ports, CMOS battery, etc. ❖ Recognize expansion slots (PCI, PCIe, AGP), and onboard headers (USB, front panel, fan headers). ❖ identify the purpose of each component (e.g., chipset controls data flow, CPU socket holds the processor). ❖ Understand how components work together within the computer system.
8	Identification of various back panel connectors of Motherboard	To identify the different connectors present on the back panel of a motherboard.	<ul style="list-style-type: none"> ❖ Recognize common back panel ports: <ul style="list-style-type: none"> • USB Ports (Type-A, Type-C) • HDMI / VGA / DVI • Ethernet (RJ-45) • Audio Jacks • PS/2 Ports • DisplayPort / Serial / Parallel Ports (if present) ❖ identify the use of each connector for devices like monitors, keyboards, mice, network cables, printers,

			<p>speakers, etc.</p> <ul style="list-style-type: none"> ❖ Visually and physically distinguish between similar-looking ports (e.g., USB vs. HDMI).
9	Identification of various pins of connectors in Motherboard	To identify different types of connector pins and headers located on the motherboard.	<ul style="list-style-type: none"> ❖ Recognize key pin headers such as: ❖ Back panel connectors (PS2, USB, HDMI, VGA,DVI,RJ-45,SERIAL,PARALLEL PORTS) ❖ Front panel connector (F_PANEL): power switch, reset switch, power LED, HDD LED ❖ USB headers (USB1, USB2...) ❖ Audio headers (HD_AUDIO, AC'97) ❖ Fan headers (CPU_FAN, SYS_FAN) ❖ Power connectors (24-pin ATX, 4/8-pin CPU power) ❖ SATA ports and M.2 slots ❖ Understand the layout of pins (e.g., +ve, -ve, GND, VCC) for each connector. ❖ Read diagrams and pin out charts to match wires correctly.
10	Installing and removing RAM,CPU,HARD DISK in motherboard	To learn the correct procedure for installing and removing RAM, CPU, and Hard Disk in a computer system.	<ul style="list-style-type: none"> ❖ Properly insert and remove RAM modules from DIMM slots. ❖ Correctly install the CPU into the socket (LGA/PGA) and apply thermal paste if required. ❖ Install and connect SATA/SSD hard disks, including power and data cab
11	Identify various motherboards based on the form factor such as AT,ATX, micro ATX, mini ATX , Baby AT etc	To identify and differentiate various motherboard form factors used in personal computers.	<ul style="list-style-type: none"> ❖ Visually identify the key characteristics of common form factors such as: <ul style="list-style-type: none"> • AT (Advanced Technology) • ATX (Advanced Technology Extended) • Micro ATX • Mini ATX / Mini-ITX • Baby AT ❖ Understand how form factor affects: <ul style="list-style-type: none"> • Cabinet size and type • Power supply connector types • Number of expansion and memory slots • Cooling options

12	Identify voltage levels of each wire in SMPS based on the standard color of the wire	To identify different wires of the SMPS (Switched Mode Power Supply) based on their color codes.	<ul style="list-style-type: none"> ❖ Know the purpose and acceptable range of each voltage rail. ❖ Understand potential issues from overvoltage or under voltage. ❖ Learn how to safely measure voltage from an SMPS using a multimeter. ❖ Follow ESD and electrical safety protocols while dealing with power supply wires. ❖ Match wire voltages to the components they power (e.g., CPU requires 12V, USB uses 5V). ❖ Identify different SMPS connectors (24-pin ATX, 4-pin CPU, SATA, Molex) and their pin/wire color mapping.
13	Familiarize with hard disk interfacing standards like IDE/SCSI /SATA / PATA	To understand various types of hard disk interfaces used in personal computers	<ul style="list-style-type: none"> ❖ Identify and differentiate between IDE, PATA, SATA, and SCSI interfaces by their connectors and cables. ❖ Understand the technical specifications (speed, number of pins, data transfer type) of each interface standard. ❖ Recognize compatible hard disks and motherboards for each interface type. ❖ Understand the historical development and obsolescence of older standards (IDE, PATA) and the adoption of newer ones (SATA).
14	Practice on Partition of Hard disk	To understand the concept and purpose of hard disk partitioning	<ul style="list-style-type: none"> ❖ Grasp how a hard disk can be divided into multiple partitions for better data management. ❖ Use system tools like Windows Disk Management or diskpart (command line) for partitioning tasks. ❖ Choose appropriate file systems (e.g., NTFS for Windows) during formatting. ❖ Apply logical planning to create partitions based on user/system needs (e.g., OS, data, backup)
15	Practice on formatting a hard disk FAT/NTFS Format	To understand the concept and purpose of formatting a hard disk	<ul style="list-style-type: none"> ❖ Distinguish between FAT32 and NTFS in terms of features, limitations, and usage scenarios. ❖ Format a hard drive or partition using both graphical and command-line tools (e.g., format, diskpart). ❖ Select the appropriate file system based on the system requirement (e.g., NTFS for Windows, FAT32 for external drives). ❖ Configure volume labels and choose cluster sizes based on the type of usage.

16	Calculating Hard Disk Storage Capacity	To understand the components that determine a hard disk's storage capacity	<ul style="list-style-type: none"> ❖ Understand disk structure: number of platters, tracks, sectors, bytes per sector, etc. ❖ Convert between different units of storage (e.g., 1 GB = 1024 MB, etc.) ❖ Interpret technical specs of a hard drive (e.g., from a product label or manual) to estimate usable capacity. ❖ Understand why usable space is less than labeled capacity (e.g., due to formatting, file system overhead, 1 GB = 1000 MB marketing vs. 1024 MB actual).
17	How to recover lost data on hard drive using Recovery Tools	How to recover lost data on hard drive.	<ul style="list-style-type: none"> ❖ Verify the available recovery tools of Operating system. ❖ Know how to recover lost data on Hard drive using Restore point. ❖ Know how to recover lost data on Hard drive using Recovery Image.
18	Defragmenting the Hard Disk	To understand the concept of disk fragmentation and how it affects system performance.	<ul style="list-style-type: none"> ❖ Identify how data gets fragmented on traditional hard drives and its impact on read/write speed. ❖ Use built-in tools like Windows Defragment and Optimize Drives. ❖ Analyze disk drives for fragmentation percentage before initiating defragmentation. ❖ Perform defragmentation safely without interrupting other operations. ❖ Observe changes in performance post-defragmentation. ❖ Set up scheduled defragmentation for regular maintenance.
19	Installation of operating system software (Windows 10 / 11)	To understand the step-by-step procedure of installing a Windows operating system.	<ul style="list-style-type: none"> ❖ Prepare a PC for OS installation (bootable media, BIOS settings, partitioning) ❖ Carry out a complete and clean installation of Windows 10 or Windows 11. ❖ Set and modify the boot device priority in BIOS/UEFI settings. ❖ Create, delete, and format partitions during installation as needed. ❖ Choose correct file system (e.g., NTFS) for Windows installation ❖ Install required drivers post-OS installation for full hardware support.

20	Installation of device driver software	To understand the role and importance of device drivers in a computer system.	<ul style="list-style-type: none"> ❖ Recognize which devices require drivers (e.g., graphics card, audio, LAN, chipset). ❖ Use Windows Device Manager to view device status, update, install, or uninstall drivers. ❖ Install drivers from CDs, USBs, or downloaded packages. ❖ Fix common issues such as "driver not recognized," "yellow warning sign," or "code 10 error." ❖ Match correct driver versions to operating systems and hardware models. ❖ Test devices after driver installation to ensure proper working (e.g., sound output, network connectivity).
21	Installation of application software (MS-Office 2007/ 2010)	To install Microsoft Office 2007 / 2010 suite including Word, Excel, PowerPoint, and other components.	<ul style="list-style-type: none"> ❖ Perform installation from CD/DVD, USB, or downloaded setup file. ❖ Choose between typical, custom, or complete installations depending on user needs. ❖ Check system compatibility (OS, RAM, storage) before installation ❖ Enter product key and complete activation process for licensed software. ❖ Choose and manage installation paths or directories during setup. ❖ Confirm installation by launching Office applications and checking version details.
22	Practice on various options of control panel	To explore and understand the purpose of various tools and settings available in the Windows Control Panel.	<ul style="list-style-type: none"> ❖ Navigate through Control Panel efficiently in both Category and Classic views. ❖ Adjust screen resolution, theme, desktop background, and screen saver. ❖ Create, delete, and manage user accounts and passwords. ❖ Add and remove hardware devices; access printer settings. ❖ View and change adapter settings, connect to Wi-Fi, and set up local networks. ❖ Set system date/time, region, and language preferences. ❖ Install/uninstall programs, manage default apps, and check installed updates.

23	Installation of printer using control panel	To understand how to install a printer manually using the Control Panel in Windows	<ul style="list-style-type: none"> ❖ Add a new printer through Control Panel using "Devices and Printers" > "Add a printer" option. ❖ Select or install appropriate drivers for USB, network, or wireless printers. ❖ Choose correct ports (USB, LPT1, TCP/IP) during manual installation. ❖ Set the installed printer as the default printer and configure preferences ❖ Identify and fix installation errors like "printer not found" or "driver unavailable." ❖ Perform a successful test print to verify installation.
24	Installation of any anti-virus software for protecting pc	To understand the need for anti-virus software in protecting a computer from malware and other threats.	<ul style="list-style-type: none"> ❖ Install anti-virus software from a setup file or online installer (e.g., Avast, Quick Heal, AVG, etc.). ❖ Grant necessary permissions during installation and accept license agreements. ❖ Run full system scans, quick scans, or custom scans and interpret the results. ❖ Identify threats, view quarantine folder, and restore or delete infected files. ❖ Ensure virus definitions are up to date and software is working effectively. ❖ Confirm background protection is active and responding to potential threats.
25	Practice on changing resolution, color, appearance, screensaver options of the display setting of pc	To understand how to access and modify display settings in a Windows PC.	<ul style="list-style-type: none"> ❖ Access the Display Settings through the desktop or Control Panel. ❖ Change the resolution to optimize screen display based on monitor capability. ❖ Modify screen layout (landscape/portrait) as required. ❖ Choose appropriate color schemes and Windows themes for better visibility and aesthetics. ❖ Select, preview, and set timers for screensavers; configure password protection on resume. ❖ Use high contrast modes or larger text options for improved accessibility. ❖ Personalize display options according to user needs or preferences.

26	Know the precautions to be taken while troubleshooting the hardware	To understand the importance of safety and preventive measures during hardware troubleshooting.	<ul style="list-style-type: none"> ❖ Recognize the dangers of working with powered devices and exposed circuitry. ❖ Use of anti-static wrist straps, mats, and ESD-safe tools to prevent component damage. ❖ Ensure power is disconnected before opening the cabinet or removing parts. ❖ Select and use appropriate tools like screwdrivers, tweezers, and testers correctly. ❖ Maintain a clean, dry, and well-lit workspace free from conductive materials. ❖ Avoid touching circuit traces or connectors with bare hands; handle by edges.
27	Identify the systematic steps in troubleshooting: Visual inspection, Layman checks, measurement of voltage levels, Beep sounds, Error codes and Use of Advanced Diagnostic tools	To understand the step-by-step process of hardware troubleshooting.	<ul style="list-style-type: none"> ❖ Identify burnt components, loose wires, broken connectors, or dust accumulation. ❖ Perform basic checks like verifying power supply, monitor connection, and cable tightness. ❖ Use a multimeter to measure voltage levels from the SMPS to motherboard and components (e.g., +12V, +5V, +3.3V lines). ❖ Interpret BIOS beep codes to identify faults in RAM, CPU, GPU, or motherboard ❖ Read and understand on-screen or LED error codes shown during POST. ❖ Use hardware diagnostic software (like Hiren’s Boot CD, MemTest86, etc.) and built-in Windows tools for checking hardware health.
28	Trouble shooting Keyboard, Printer problems	To identify and diagnose common hardware and connectivity issues in keyboards and printers.	<ul style="list-style-type: none"> ❖ Recognize issues like non-responsive keys, stuck keys, or full keyboard failure. ❖ Verify USB/PS2 port connection, wireless keyboard pairing, and power supply (for wireless). ❖ Access and update keyboard drivers using Device Manager or Control Panel. ❖ Replace with a known working keyboard to verify device-level failure. ❖ Verify cables, network/Wi-Fi connectivity, and power status of the printer. ❖ Clear print queue, restart the print spooler, and reinstall printer software. ❖ Install or update appropriate printer

			<p>drivers.</p> <ul style="list-style-type: none"> ❖ Detect and resolve issues like paper jams, low ink/toner, or incorrect paper tray selection. ❖ Check printer settings in Control Panel or Settings and configure defaults properly. ❖ Use printer self-test or built-in diagnostic tools for hardware faults.
29	Trouble shooting no display on monitor	To understand the possible causes behind a blank or no-display monitor issue.	<ul style="list-style-type: none"> ❖ Detect loose cables, damaged connectors, or physically broken monitor parts. ❖ Check VGA/HDMI/DisplayPort/DVI cables, power supply, and monitor input source selection. ❖ Confirm monitor power using power LED indicators or multimeter readings. ❖ Interpret beep codes indicating RAM or graphics card issues. ❖ Remove and re-seat RAM and GPU; test with alternate RAM/monitor where possible. ❖ Connect the system to a different monitor to isolate the issue (monitor vs. system).
30	Troubleshooting RAM Issues	To understand the symptoms and causes of RAM-related problems in a computer system.	<ul style="list-style-type: none"> ❖ Identify RAM issues through signs like continuous beeping, blue screen errors, system freezing, or failure to boot. ❖ Detect physical damage, dust, or improper installation of RAM modules. ❖ Use BIOS/UEFI beep codes to identify RAM-related errors during POST (Power-On Self-Test). ❖ Safely remove, clean, and re-insert RAM sticks into the motherboard slots. ❖ Use tools like MemTest86, Windows Memory Diagnostic, or other bootable utilities to check RAM health. ❖ Test each RAM stick in different slots to identify faulty RAM or slot.

Table specifying the scope of syllabus to be covered for unit tests

Unit Test	Learning outcomes to be covered
Unit test-1	From 1 to 10
Unit test-2	From 11 to 20
Unit test-3	From 20 to 30

PHYSICS & CHEMISTRY LAB

Course Code	Course title	No. of Periods/week	Total no of periods	Marks For FA	Marks For SA	Credits
26CI109L	Physics & Chemistry Lab	3	45	20	30	3

PHYSICS LAB

Course Code	Course title	No. of Periods/week	Total no of periods	Marks For FA	Marks For SA
26CI109L	Physics Lab	3	45	20	30

TIME SCHEDULE

S. No	List of experiments	No. of Periods	COs
1.	Vernier calipers	03	CO1
2.	Micrometer (Screw gauge)	03	
3.	Verification of Lami's theorem using concurrent forces	03	
	Revision	03	
4.	Determination of 'g' using simple pendulum	03	CO2
5.	Focal length and focal power of convex lens by distant object method and U-V method	03	
6.	Verification of Boyle's law using Quill tube	03	
	Revision	03	
7.	Drawing of magnetic lines of force	03	CO3
8.	Resonance apparatus–Determination of velocity of sound in air	03	
9.	Refractive index of a solid using travelling microscope	03	
	Revision	03	
	Experiments for demonstration		
10	Meter bridge–Determination of resistance and specific resistance of material of given wire	03	CO4
11	Projectile motion- study the range of a projectile for different launch angles	03	
12	Generation of Beats using water columns	03	
	Total:	45	

COURSE OBJECTIVES

Upon completion of the course the student shall be able to

(1)	Apply practical physics principles to operate, troubleshoot, and optimize engineering devices.
(2)	Develop scientific skills through designing, conducting, and evaluating industry-relevant experiments to enhance technical proficiency.

COURSE OUTCOMES

CO1	CI109 .1	Apply measurement techniques to improve accuracy; Explain forces maintaining equilibrium in physical systems.
CO2	CI109 .2	Determine acceleration due to gravity experimentally; Investigate refraction of light at curved surfaces; Relate the gas pressure to volume variations at constant temperature.
CO3	CI109 .3	Analyze the combined effect of magnetic fields (Earth and artificial magnet); Determine velocity of sound in air using resonance; Demonstrate U-V method to understand the refraction of light at curved surfaces.
CO4	CI109 .4	Apply Kirchhoff's laws to compute the resistivity of a wire; Examine the projectile motion parameters; Observe and Interpret beat generation phenomenon.

LEARNING OUTCOMES

Upon completion of the course the student shall be able to

1. Apply measurement techniques using Vernier Calipers to determine the volumes of a cylinder and a sphere.
2. Use a screw gauge to measure and determine the thickness of a glass plate and the cross-sectional area of a wire.
3. Verify Lami's Theorem by analyzing a system of concurrent forces.
4. Conduct simple pendulum experiment to calculate the acceleration due to gravity (g) and interpret the result through an $L-T^2$ graph.
5. Determine the focal length and power of a convex lens using distant object method and U-V method, and compare the results.
6. Verify Boyle's Law using a Quill tube by noting pressure (P) and length of air column(L).
7. Illustrate the behaviour of lines of magnetic field around a bar magnet using magnetic compass.

8. Determine the velocity of sound in air at room temperature and at 0°C using resonance apparatus.
9. Determine the refractive index of a solid by using the measurements taken with a travelling microscope.
10. Demonstrate the use of a meter bridge to determine the resistance and specific resistance of a given wire.
11. Simulate projectile motion and observe the range of the projectile for different launch angles using appropriate experimental setup.
12. Demonstrate the phenomenon of beats by creating beat patterns using water columns.

CO-PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	1	1	1	1	1	1
CO2	3	1	1	1	1	1	1
CO3	3	1	1	1	1		1
CO4	3	1	1	2	1		1

3 = strongly mapped, 2 = moderately mapped, 1 = slightly mapped

CO-PO MAPPING STRENGTH

Common-CI109	Physics Lab				No of periods: 90	
POs	Mapped with CO No	CO periods addressing PO in Column 1		Level 1,2,3	Remarks	
		No	%			
PO1	CO1,CO2,CO3,CO4	15	33.3%	2		>40% level 3 (highly addressed) 25% to 40% level 2 (moderately addressed) 5% to 25% level 1 (Low addressed) <5% (not addressed)
PO2	CO1,CO2,CO3,CO4	6	13.3%	1		
PO3	CO1,CO2,CO3,CO4	5	11.1%	1		
PO4	CO1,CO2,CO3,CO4	6	13.3%	1		
PO5	CO1,CO2,CO3,CO4	5	11.1%	1		
PO6	CO1,CO2	3	6.7%	1		
PO7	CO1,CO2,CO3,CO4	5	11.1%	1		

3 = strongly mapped, 2 = moderately mapped, 1 = slightly mapped

Note: The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following.

(i) Seminars (ii) Viva-voce (iii) Assignments (iv) Quiz competitions (v) Industrial visits (vi) Tech fest (vii) Mini project (viii) Group discussions (ix) Virtual labs (x) Library visit for e-books

COURSE CONTENT

Name of the Experiment	Competencies (Revised Bloom's Taxonomy)	Key Competencies (Revised Bloom's Taxonomy)
1. Practice on Vernier Calipers	<ul style="list-style-type: none"> • Determine the least count • Place the object in accurate position. • Interpret scale readings • Calculate volume of cylinder and sphere 	<ul style="list-style-type: none"> • Interpret Vernier readings • Compute volume using appropriate formulae • Apply measurement data to calculate physical quantities
2. Practice on Screw Gauge	<ul style="list-style-type: none"> • Determine the least count and zero error • Place the object in accurate position. • Interpret scale readings • Calculate thickness and cross-sectional area 	<ul style="list-style-type: none"> • Analyze scale readings for zero error • Compute thickness and area from measurements • Apply micrometer data to solve practical problems
3. Verification of Lami's Theorem	<ul style="list-style-type: none"> • Setup experimental arrangement • Apply appropriate weights • Measure angles between forces • Analyze data to verify theorem 	<ul style="list-style-type: none"> • Interpret directions and angles of forces • Evaluate force relationships • Validate Lami's Theorem using experimental data
4. Simple Pendulum	<ul style="list-style-type: none"> • Arrange the pendulum properly • Measure the time taken for 20 oscillations • Compute time period and acceleration due to gravity • Plot $L-T^2$ graph 	<ul style="list-style-type: none"> • Measure oscillation intervals accurately • Calculate g using experimental data • Interpret $L-T^2$ graph to confirm relationship
5. Focal Length and Power of Convex Lens	<ul style="list-style-type: none"> • Place the object and convex lens in proper positions. • Measure image distance • Compute focal length and power 	<ul style="list-style-type: none"> • Determine focal length using both methods • Validate optical formulae using experiment
6. Boyle's Law Verification	<ul style="list-style-type: none"> • Record atmospheric pressure • Measure air column length and calculate the enclosed pressure 	<ul style="list-style-type: none"> • Setup quill tube in different positions for multiple readings • Interpret pressure-length data

	<ul style="list-style-type: none"> Analyze data for PxL consistency 	
7. Drawing of Magnetic Lines of force	<ul style="list-style-type: none"> Draw meridian and set magnet orientation Sketch the lines of magnetic field using compass. 	<ul style="list-style-type: none"> Visualize field pattern accurately Analyze field symmetry
8. Velocity of Sound – Resonance Method	<ul style="list-style-type: none"> Assemble apparatus and adjust reservoir Identify resonating lengths Calculate velocity of sound at room temperature and at 0°C. 	<ul style="list-style-type: none"> Detect resonance points Compute velocity using resonance data Extrapolate to standard temperature
9. Refractive Index of a solid using Traveling Microscope	<ul style="list-style-type: none"> Determine least count Measure real and apparent thickness Calculate refractive index 	<ul style="list-style-type: none"> Analyze scale readings Apply refraction formula Interpret refractive index of a solid.
10. Meter Bridge	<ul style="list-style-type: none"> Connect circuit properly Measure balancing length, radius of given wire Compute resistance and specific resistance 	<ul style="list-style-type: none"> Analyze circuit behavior Calculate unknown resistance Interpret experimental values for resistivity
11. Projectile motion- study the range of a projectile for different launch angles	<ul style="list-style-type: none"> Setup and align launcher Adjust launch angles Measure range 	<ul style="list-style-type: none"> Observe the variations in horizontal range for different angles of projection. Evaluate trajectory data
12. Generation of Beats using water columns	<ul style="list-style-type: none"> Setup beat source using glasses or online tone generator Generate close frequencies Detect and analyze beat pattern 	<ul style="list-style-type: none"> Observe frequency interference Interpret beat frequency data Analyze patterns using mobile sensors/ software

SCHEME OF VALUATION FOR END PRACTICAL EXAMINATION

Activity	Marks
Aim, Apparatus, Formulae	6
Tabulations and Readings	12
Calculations	4

Precautions, Results	3
Viva-voce	5
Total marks	30

CHEMISTRY LAB

Course code	Course title	No. Of periods/week	Total No. of periods	Marks for FA	Marks for SA	Credits
26CI109L	CHEMISTRY LAB	3	45	20	30	2

TIME SCHEDULE

S. No.	Name of the Experiment	No. of Periods	COs Mapped
1.	Introduction to Fundamentals of Analytical Chemistry.	03	CO1
2.	Chemical Recognition by Sensory Cues.	03	CO1
3.	Preparation of Standard Na ₂ CO ₃ Solution.	03	CO1
4.	Estimation of HCl Using Standard NaOH Solution.	03	CO2
5.	Determination of Alkalinity of Water Sample.	03	CO2
6.	Estimation of Mohr's Salt Using Standard KMnO ₄ Solution.	03	CO3
7.	Determination of Total Hardness of Water Using Standard EDTA Solution.	03	CO4
8.	Estimation of Chlorides Present in Water Sample Using Standard AgNO ₃ Solution.	03	CO4
9.	Analyzing pH of Common Compounds Using Visual and Instrumental Methods.	03	CO5
10.	Estimation of Copper Deposited on an Object by Using Electrolysis Process.	03	CO5
	Demonstration Experiments		
11.	Determination of Turbidity of Water Sample by Using Nephelometer.	03	CO5
12.	Construction and Working of Galvanic Cell.	03	CO5
13.	Preparation of a Polymer (Bakelite).	03	CO5
14.	Open Ended Experiments/Micro Projects – I.	03	CO5
15.	Open Ended Experiments/Micro Projects – II.	03	CO5
	TOTAL	45	

COURSE OBJECTIVES

Upon completion of the course the shall be able to:	
(i)	To Perform fundamental analytical chemistry techniques, identify chemical substances using sensory cues and accurately prepare standard solutions.
(ii)	To Evaluate and judge the neutralization point in acid base titration.
(iii)	To Evaluate the endpoint of reduction and oxidation reaction.
(iv)	To Judge the stable end point of complex formation, stable precipitation.
(v)	To Determine the pH of compounds, estimate copper using electrolysis, measure water turbidity, demonstrate the working of a galvanic cell and prepare a polymer.

COURSE OUTCOMES

CO1	CI109.1	Perform fundamental analytical chemistry techniques, identify chemical substances using sensory cues and accurately prepare standard solutions.
CO2	CI109.2	Evaluate and judge the neutralization point in acid base titration.
CO3	CI109.3	Evaluate the endpoint of reduction and oxidation reaction.
CO4	CI109.4	Judge the stable end point of complex formation, stable precipitation.
CO5	CI109.5	Determine the pH of compounds, estimate copper using electrolysis, measure water turbidity, demonstrate the working of a galvanic cell and prepare a polymer.

LEARNING OUTCOMES:

Upon completion of the course the student shall be able to:

- 1.0 Practice volumetric measurements (using pipettes, measuring jars, volumetric flask, burettes) and gravimetric measurements (using different types of balances), making dilutions, etc.
- 2.0 Identify the chemical compounds and solutions by senses.
- 3.0 Practice making standard Na_2CO_3 solutions.
- 4.0 Conduct titrations adopting standard procedures and using standard NaOH solution for estimation of HCl .
- 5.0 Conduct titrations adopting standard procedures to determine the alkalinity of given samples of water (one ground water and one surface / tap water) using standard H_2SO_4 solution.
- 6.0 Conduct titrations adopting standard procedures and using standard KMnO_4 solution for estimation of Mohr's Salt.
- 7.0 Conduct titrations adopting standard procedures to determine the total hardness of given samples of water (one ground water and one surface / tap water) using standard EDTA solution.
- 8.0 Conduct titrations adopting standard procedures to determine the chlorides present in the given samples of water (one ground water and one surface / tap water) and waste water by using standard AgNO_3 solution.
- 9.0 Conduct the test on given samples of water / solutions (like soft drinks, sewage etc.) to determine their pH using pH paper, Universal indicator, digital pH meter.
- 10.0 Carry out the electrolysis process to estimate the amount of Copper deposited on an object.
- 11.0 Conduct the test on given samples of solutions (coloured and non-coloured) to determine their turbidity in NTU.
- 12.0 Understand the construction and working principle of a Galvanic cell and identify how chemical energy is converted into electrical energy through redox reactions.
- 13.0 Understand the process of polymerization by preparing Bakelite, a thermosetting polymer and study its formation through a condensation reaction.
- 14.0 Collect water sample from nearby water body and test for any two parameters.
- 15.0 Collect water sample from nearby sewage/industrial effluent and test for any two parameters.

[Note: Parameters – Alkalinity, Hardness, Chloride and pH]

CO – PO/PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2		1			1			
CO2	3	2		1						
CO3	3	2		1						
CO4	3	2		1	1					
CO5	3	2	1	1	1		1			

Average	3	2	1	1	1		1			
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3 = Strongly Mapped

2 = Moderately Mapped

1 = Slightly Mapped

Note:

The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:

- (i). Assignments, (ii). Tutorials, (iii). Guest Lectures, (iv). Seminars, (v). Quiz Competitions, (vi). Industrial Visit, (vii). Tech Fest, (viii). Mini Projects, (ix). Group Discussions, (x). Virtual Classes and (xi). Library Visits.

COMPETENCIES AND KEY COMPETENCIES TO BE ACHIEVED BY THE STUDENT:

Name of the Experiment (No of Periods)	Competencies	Key Competencies
Introduction to Fundamentals of Analytical Chemistry. (03)	<ul style="list-style-type: none"> Develop a foundational understanding of analytical chemistry principles and demonstrate proficiency in basic laboratory techniques, data analysis, and safety protocols. 	<ul style="list-style-type: none"> Students will master the foundational principles and laboratory techniques of analytical chemistry.
Chemical Recognition by Sensory Cues. (03)	<ul style="list-style-type: none"> Develop skills in conducting simple tests and making accurate observations. Interpret results to draw conclusions about the nature of chemical 	<ul style="list-style-type: none"> Develop skills in conducting simple tests and making accurate observations. Interpret results to

	compounds.	draw conclusions about the nature of chemical compounds.
Preparation of Standard Na_2CO_3 Solution. (03)	<ul style="list-style-type: none"> • Weighing the salt to the accuracy of 0.01mg • Measuring the water with volumetric flask, measuring jar, volumetric pipette and graduated pipette. 	<ul style="list-style-type: none"> • Weighing the salt to the accuracy of 0.01 mg. • Measuring the water with volumetric flask, measuring jar, volumetric pipette and graduated pipette.
Estimation of HCl Solution Using Standard NaOH	<ul style="list-style-type: none"> • Cleaning the glass ware and rinsing with appropriate solutions. • Making standard solutions • Measuring accurately the standard solutions and titrants. • Filling the burette with titrant. • Fixing the burette to the stand • Effectively Controlling the flow of the titrant. • Identifying the endpoint. • Making accurate observations. • Calculating the results. 	<ul style="list-style-type: none"> • Making standard solutions. • Measuring accurately the standard solutions and titrants. • Effectively Controlling the flow of the titrant. • Identifying the endpoint. • Making accurate observations.
Determination of Alkalinity of Water		
Estimation of Mohr's Salt Using Standard KMnO_4 Solution. (03)		
Determination of Total Hardness of Water Using Standard EDTA		
Estimation of Chlorides Present in Water Sample by Using Standard AgNO_3 Solution. (03)		

<p>Analyzing pH of Common Compounds Using Visual and Instrumental Methods. (03)</p>	<ul style="list-style-type: none"> • Know pH range (0 – 14) and classify substances as acidic, neutral and basic. • Accurately measure pH using pH paper and universal indicator. • Note color changes and interpret pH values correctly. • Perform precise pH tests to ensure reliable results. • Record pH data and observations clearly. • Connect pH results to real-world contexts. • Familiarize with instrument. • Choose appropriate 'Mode' / 'Unit'. • Prepare standard solutions / buffers, etc. • Standardize the instrument with appropriate standard solutions. • Make measurements accurately. 	<ul style="list-style-type: none"> • Accurately measure pH using pH paper and universal indicator. • Perform precise pH tests to ensure reliable results. • Prepare standard solutions/buffers, etc. • Standardize the instrument with appropriate standard solutions. • Make measurements accurately.
<p>Estimation of Amount of Copper Deposited on an Object by Using Electrolysis.</p>	<ul style="list-style-type: none"> • Prepare standard solutions. • Selection of electrodes. • Set up and perform an electrolysis experiment accurately and safely. 	<ul style="list-style-type: none"> • Set up and perform an electrolysis experiment accurately and safely. • Analyze

<p>Determination of Turbidity of Water Sample by Using Nephelometer. (03)</p>	<ul style="list-style-type: none"> • Familiarize with instrument. • Choose appropriate 'Mode' / 'Unit'. • Prepare standard solutions / buffers, etc. • Standardize the instrument with 	<ul style="list-style-type: none"> • Prepare standard solutions etc. • Standardize the instrument with appropriate standard solutions. • Make measurements accurately
<p>Construction and Working of Galvanic Cell. (03)</p>	<ul style="list-style-type: none"> • Prepare standard solutions. • Selection of electrodes. • Making of salt bridge. • Construct a simple galvanic cell using appropriate electrodes and electrolyte solutions. • Explain the working principle of a galvanic cell, 	<ul style="list-style-type: none"> • Construct a simple galvanic cell using appropriate electrodes and electrolyte solutions. • Explain the working principle of a galvanic cell, including electron flow, redox reactions, and the function of the salt
<p>Preparation of a Polymer (Bakelite). (03)</p>	<ul style="list-style-type: none"> • Identify and handle the raw materials (phenol and formaldehyde) used in Bakelite preparation safely. • Perform the polymerization reaction under controlled conditions. • Observe and describe the physical changes during polymer formation. • Develop laboratory skills related to synthesis and handling of polymers. 	<ul style="list-style-type: none"> • Perform the polymerization reaction under controlled conditions. • Develop laboratory skills related to synthesis and handling of polymers.

<p>Open Ended Experiments/ Micro Projects – I. (03)</p>	<ul style="list-style-type: none"> • Identifies a relevant chemical problem or question based on prior knowledge. • Demonstrates proficiency in basic chemistry lab techniques (e.g., titration, preparation). • Prepares solutions accurately (molarity, dilutions, standardizations). 	<ul style="list-style-type: none"> • Prepares solutions accurately (molarity, dilutions, standardizations).
<p>Open Ended Experiments/ Micro Projects – II. (03)</p>	<ul style="list-style-type: none"> • Handles chemicals safely following MSDS guidelines and standard lab practices. • Uses instruments relevant to the experiment (e.g., pH meter, nephelometer and digital balance) correctly. • Calibrates and maintains instruments when needed. • Interprets instrumental output with understanding of underlying chemical principles. • Makes accurate, timely and detailed observations of chemical reactions (e.g., color changes, precipitate formation). • Records quantitative and qualitative data systematically. • Maintains an organized and complete lab notebook. • Works effectively in pairs or groups; shares 	<ul style="list-style-type: none"> • Uses instruments relevant to the experiment (e.g., pH meter, nephelometer and digital balance) correctly. • Calibrates and maintains instruments when needed. • Makes accurate, timely and detailed observations of chemical reactions (e.g., color changes, precipitate formation).

	<p>responsibilities and discusses findings collaboratively.</p> <ul style="list-style-type: none"> • Presents results through oral discussion, lab reports, or visual presentations using proper chemical terminology. 	
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REFERENCE BOOKS

1. **VOGEL's Textbook of Quantitative Analysis, Sixth Edition, Pearson Education Limited.**
2. **VOGEL's Textbook of Qualitative Analysis, Seventh Edition, Pearson Education Limited.**
3. **Y. Bharathi Kumari & Jyotsna Cherukuri - Laboratory Manual of Engineering Chemistry for Engineering Students of JNT Universities.**
4. **Instrumental Methods of Chemical Analysis.**
5. **NCERT Chemistry Laboratory Manual for Class XII.**
6. **Practical Chemistry by the Royal Society of Chemistry Education.**

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR
UNIT TEST – I & UNIT TEST – II

Unit Test	Learning Outcomes to be Covered
Unit Test – 1	From Experiment 1 to 5
Unit Test – 2	From Experiment 6 to 10

COMPUTER & DIGITAL SKILLS LAB

Course code	Course Title	No. of Periods / Week	Total No. of periods	Marks for FA	Marks for SA	Credits
26CI110L	COMPUTER & DIGITAL SKILLS LAB	3	90	40	60	3

Time schedule

Chapter No.	Chapter / Unit Title	No. of sessions (3 periods per session)	No. of Periods	CO's Mapped
1.	Computer hardware and Software Basics	1	3	CO1
2.	Windows Operating System	1	3	CO1
3.	MS Word	6	18	CO2
4.	MS Excel	7	21	CO3
5.	MS PowerPoint	6	18	CO4
6	AI, ML & Quantum computing Tools	9	27	CO5
Total periods		30	90	

COURSE OBJECTIVES

COURSE OBJECTIVES	i) To familiarize with basics of Computer Hardware and Software ii) To familiarize with operating systems iii) To familiarize with Microsoft word iv) To familiarize with Microsoft Excel v) To familiarize with Microsoft PowerPoint vi) To familiarize with AI, ML, Quantum Computing Tools
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Course outcomes

Course Outcomes	At the end of the course students will be able to		
	CO1	CM110L.1	Identify hardware and software components
	CO2	CI110L.2	Prepare documents with given specifications using word processing software
	CO3	CI110L.3	Use Spread sheet software to make calculations and to draw various graphs / charts.
	CO4	CI110L.4	Use Power point software to develop effective presentation for a given theme or topic.
	CO5	CI110L.5	To use basic AI, ML & Quantum Computing Tools

Learning Outcomes:

I. Computer Hardware and Software Basics

1. a). To get familiarized with Computer system and hardware connections
b). To start and Shut down Computer correctly
c). To explore Windows Desktop
2. To check the software details of the computer
3. To check the hardware present in your computer

II. Windows's operating system

4. To work with Files and Folders
5. To use Windows Accessories: Calculator – Notepad – WordPad – MS Paint

III. MS-WORD

6. To get familiarized with Ribbon layout of MS Word.
7. To perform basic word processing
8. To use basic formatting techniques
9. To insert a table of required number of rows and columns
10. To insert Objects, Clipart and Hyperlinks
11. To use Mail Merge feature of MS Word
12. To use Equations and symbols features

IV. MS-EXCEL

13. To get familiarized with MS-EXCEL ribbon layout
14. To access and enter data in the cells
15. To edit a spread sheet- Copy, Cut, Paste, and selecting Cells
16. To use built in functions and Data Formatting
17. To create Excel Functions, use autofill feature
18. To enter a Formula for automatic calculations
19. To sort and filter data in sheet.
20. To present data using Excel Graphs and Charts.
21. To format a Worksheet in Excel for printing using Page layout
22. To develop lab report formats of respective discipline.

V. Practice with MS-POWERPOINT

23. To get familiarized with Ribbon layout features of PowerPoint.
24. To create a simple PowerPoint Presentation
25. To set up a Master Slide in PowerPoint
26. To insert Text and Objects
27. To insert Flow Charts
28. To insert Tables
29. To insert Charts/Graphs
30. To insert video, audio & hyperlinks
31. To animate text, objects and slides.
32. To Review Presentations

VI. AI, ML & Quantum Computing Tools

33. To get familiarized with AI Tools
34. To get familiarized with working of ChatGPT
35. Identify Objects using AI Tools based on CNN, YOLO, SSD, R-CNN
36. To paraphrase text using AI Tools (PEGASUS, GPT, T5)
37. To use text-to-Image Generation AI Tools (DALL-E, MIDJOURNEY)
38. To use voice command simulation AI Tools (SPEECH-TO-TEXT)
39. To get familiarized with ML Tools
40. To get familiarized with Quantum Computing Tools
41. To familiarize with quantum bits (qubits) using Dirac notation
42. To familiarize the behaviour of single and multiple qubit gates.
43. To familiarize with Qubit as a Coin / Spin Analogy

CO-PO/PSO MATRIX

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	2	1	1	2	1	2	3	1	1
CO2	2	2	3	3	2	1	2	3	1	1
CO3	2	2	3	3	2	1	2	3	3	3
CO4	2	2	3	3	2	1	2	3	2	1
CO5	3	3	2	3	3	3	3	3	3	3
Average	2	2.2	2.4	2.6	2.2	1.4	2.2	3	2	1.8

3=Strongly mapped, 2=moderately mapped, 1=slightly mapped

Key competencies:

Exp /Task/Ex No	Name of Experiment /Task /Exercise	Objectives	Key competencies

1 (a).	To get familiarized with Computer system and hardware connections	a. Connect cables to external hardware and operate the computer	a. Identify the parts of a computer system: i). CPU ii). Mother Board iii) Monitor iv) CD/DVD Drive v) Power Switch vi) Start Button vii) Reset Button viii) RAM ix) SSD /HDD b. Identify and connect various peripherals c. Identify and connect the cables used with computer system d. Identify various ports on CPU cabinet and connect Keyboard, Mouse and peripherals
1 (b).	Start and Shut down Computer correctly	a. Login and logout as per the standard procedure b. Operate mouse & Key Board	a. Log in using the password b. Start and shut down the computer c. Use Mouse and Key Board
1 (c).	Explore Windows Desktop	a. Access application programs using Start menu b. Use taskbar and Task manager	a. Familiarity with Start Menu, Taskbar, Icons and Shortcuts b. Access application programs using Start menu, Task manager c. Use Help support
2.	Check the software details of the computer System	a. Access the properties of computer and to find the details	a. Finding the details of operating system being used b. Finding the details of edition/version ServicePack installed
3.	Check the hardware present in your computer	a. Access device manager and to find details b. Type /Navigate the correct path and Select icon related to the details required	a. Finding the CPU name and clock speed b. Finding the details of RAM and hard disk present c. Accessing Device manager using Control Panel and check the status of devices like mouse and key board d. Using My Computer to check the details of Hard drives and partitions
4.	Working with Files and Folders	a. Create files and folders b. Rename, arrange and search for the required folder/file c. Restore deleted files from Recycle bin	a. Create folders and organize files in different folders b. Use cut, copy and paste commands to organize files and folders c. Arrange icons by name, size, type and Modified d. Search for a file or folder and find its path e. Create shortcut to files and folders (in other folders) on Desktop f. Familiarity with the use of My Documents g. Familiarity with the use of Recycle Bin
5.	Use Windows Accessories like Calculator – Notepad – WordPad – MS Paint	a. Use windows accessories and select correct text editor based on the situation. b. Use MS paint to create /Edit pictures and save in	a. Access Calculator using Run command b. Familiarity with the use of Calculator c. Create Text Files using Notepad, WordPad and observe the difference in file sizes

		the required format	d. Use MS paint to create .jpeg, .bmp files
6.	Get familiarized with Ribbon layout of MS word.	a. Create a Document and name appropriately and save it b. Set paper size and print options	a. Create/Open a document b. Use Save and Save as features c. Work on two Word documents simultaneously d. Choose correct Paper size and Printing options
7.	Perform basic Word Processing	a. Use key board and mouse to enter/edit text in the document. b. Use shortcuts c. use Spell / Grammar Check features for auto corrections	a. Typing text b. Keyboard usage c. Mouse Usage (Left click / Rightclick / Scroll) d. Using Keyboard shortcuts e. Using Find and Replace features in MS- word f. Use Undo and Redo Features g. Use spell check to correct Spellings and Grammar
8.	Use basic formatting techniques	a. Format Text and paragraphs and using various text styles. b. Use bullets and numbers to create lists. c. Use Templates /Themes d. Insert page numbers, date, headers and footers	a. Formatting Text b. Formatting Paragraphs c. Setting Tabs d. Formatting Pages e. Use various Font Styles f. Insert bullets and numbers g. Using Themes and Templates h. Insert page numbers, header and footer
9.	Insert a table of required number of rows and columns	a. Insert table in the word document and edit b. Use sort option for arranging data.	a. Editing the table by adding the fields, deleting rows and columns, inserting sub table, marking borders. Merging and splitting of cells in a Table b. Changing the background color of the table c. Using table design tools d. Using auto fit – fixed row/ column height/length – Even distribution of rows / columns feature e. Converting Text to table and Table to Text f. Use Sort feature of the Table to arrange data in ascending/ descending order
10.	Insert objects, clipart and Hyperlinks	a. Insert hyperlinks & Bookmarks b. Create organization charts/flow charts	a. Creating a 2-page document and Insert hyperlinks and Bookmarks. b. Creating an organization chart c. Preparing an Examination schedule notice with a hyperlink to Exam schedule table.
11.	Use Mail merge feature of MS Word	Using Mail merge feature	a. Using mail merge to prepare individually addressed letters b. Using mail merge to print envelopes.

12.	Use Equations and symbols features.	Enter Mathematical symbols and Equations in the worddocument	<ul style="list-style-type: none"> a. Exploring various symbols available b. Inserting a symbol in the text c. Inserting mathematical equations in the document
13.	Get familiarized with MS Excel Ribbon layout	<ul style="list-style-type: none"> a. Get familiarized with excel layout b. Use various features available in toolbar 	<ul style="list-style-type: none"> a. Open /create an MS Excel spread sheet and familiarity with MS Excel layout b. Use Quick Access Toolbar, Title Bar, Worksheets, Formula Bar, Status Bar
14.	Access and Enter data in the cells	<ul style="list-style-type: none"> a. Access and select the required cells by various addressing methods b. Enter and edit data 	<ul style="list-style-type: none"> a. Moving around a Worksheets using Quick access toolbar b. Selecting Cells, Entering Data-Editing a Cell, Wrapping of Text-Deleting a Cell Entry, Saving a File, Closing Excel
15.	Edit spread sheetselect, Copy, Cut, Paste	Format the excel sheet	<ul style="list-style-type: none"> a. Inserting and Deleting Columns and Rows b. Creating Borders c. Merging and aligning center d. Adding background Color Changing the Font, Font Size, and Font Color e. Formatting text with Bold, Italicize, and Underline f. Working with Long Text, Change a Column's Width
16.	Use built in functions and Format Data	Use built in functions in Excel	<ul style="list-style-type: none"> a. Performing Mathematical Calculations b. Verification AutoSum c. Perform Automatic Calculations d. Aligning Cell Entries
17.	Create Excel Functions, Fill Cells	<ul style="list-style-type: none"> a. To Create Excel sheets involving cross references and equations b. Using the advanced functions for conditional calculations 	<ul style="list-style-type: none"> a. Using Reference Operators b. Working with sum, Sum if , Count and CountIf Functions c. Filling Cells Automatically
18.	Enter a Formula for automatic calculations	Enter formula for automatic calculations	<ul style="list-style-type: none"> a. Entering formulae b. Using Cell References in Formulae c. Using Automatic updating function of Excel Formulae d. Using Mathematical Operatorsin Formulae e. Using Excel Error Message andHelp
19.	Sort and filter data in sheet.	<ul style="list-style-type: none"> a. Refine the data in a worksheet and keep it organized. b. Narrow a worksheet by selecting specific choice 	<ul style="list-style-type: none"> a. Sorting data in multiple columns b. Sorting data in a row c. Sorting data using Custom order Filter data in work sheet
20.	Practice Excel Graphs and Charts	<ul style="list-style-type: none"> a. Use data in Excel sheet to Create technical charts and graphs b. Prepare various graphs from data. 	<ul style="list-style-type: none"> a. Using data in sheets for getting charts. b. Producing various charts.

21.	Format a Worksheet in Excel, use page setup and print features	Format Excel sheet, Insert headers & footers and print	<ul style="list-style-type: none"> a. Shading alternate rows of data b. Adding currency and percentage symbols c. Changing height of a row and width of a column d. Changing data alignment e. Inserting Headers and Footers f. Set Print Options and Printing.
22.	Develop lab report formats of respective discipline	Use Headers/Footers/Page Numbers for preparing reports	Creating Lab reports using MS Excel
23.	Get familiarized with Ribbon layout & features of PowerPoint.	Access required options in the tool bar	<p>Explore and use various options in PowerPoint</p> <ul style="list-style-type: none"> a. Home b. Insert c. Design d. Animation e. Slideshow f. View g. Review
24.	Create a simple PowerPoint Presentation	<ul style="list-style-type: none"> a. Create simple PowerPoint presentation with photographs/ClipArt and text boxes b. Use bullets option 	<ul style="list-style-type: none"> a. Inserting a New Slide into PowerPoint b. Changing the Title of a PowerPoint Slide c. Using Bullets in PowerPoint d. Adding an Image to a PowerPoint Slide e. Adding a Textbox to a PowerPoint slide
25.	Set up a Master Slide in PowerPoint and add notes	<ul style="list-style-type: none"> a. Setup Master slide and format b. Add notes to master slide. 	<ul style="list-style-type: none"> a. Creating a PowerPoint Design Template b. Modifying themes c. Switching between Slide master view and Normal view d. Formatting a Design Template for Master Slide e. Adding a Title Slide to a Design Template f. Using the Slide Show g. Adding Notes to a PowerPoint Presentation slide
26.	Insert Text and Objects	<ul style="list-style-type: none"> a. Insert Text and Objects. b. Use 3d features 	<ul style="list-style-type: none"> a. Inserting Text and objects b. Setting Indents and line spacing c. Inserting pictures/ clipart d. Formatting pictures e. Inserting shapes and word art f. Using 3d features to

			Arrange objects
27.	Create Flow Charts / Organizational Charts	Create organizational charts and flow charts using smart art	<ul style="list-style-type: none"> a. Creating a Flow Chart in PowerPoint b. Grouping and Ungrouping Shapes c. Use smart art
28.	Insert Tables	Insert tables and format	<ul style="list-style-type: none"> a. Using Tables in PowerPoint b. Formatting the Table Data c. Changing Table Background
29.	Insert Charts/Graphs	Create charts and Bar graphs, Pie Charts and format.	<ul style="list-style-type: none"> a. Creating 3D Bar Graphs in PowerPoint b. Working with the PowerPoint Datasheet c. Formatting a PowerPoint ChartAxis d. Formatting the Bars of a Chart e. Creating PowerPoint Pie Charts f. Using Pie Chart Segments g. Creating 2D Bar Charts in PowerPoint h. Formatting the 2D Chart i. Formatting a Chart Background
30.	Insert audio & video, Hyperlinks in a slide and Add narration to the slide	<ul style="list-style-type: none"> a. Insert Sounds and Video in appropriate format. b. Add narration to the slide. c. Use hyperlinks to switch to different slides and files 	<ul style="list-style-type: none"> a. Inserting sounds in the slide and hide the audio symbol b. Adjusting the volume in the settings c. Inserting video file in the format supported by PowerPoint in a slide d. Using automatic and on click options e. Adding narration to the slide <p>Insert Hyperlinks</p>
31.	Create Animation effects	Add animation effects	<ul style="list-style-type: none"> a. Applying transitions to slides b. Using special animation effects like Entrance, Emphasis, Motion Paths & Exit as per requirement.
32.	Reviewing presentation	<ul style="list-style-type: none"> a. Use Spell and Grammar check feature b. Setup slide show c. Add timing to the slides d. Setup automatic slide show 	<ul style="list-style-type: none"> a. Checking spelling and grammar b. Previewing presentation c. Setting up slide show d. Setting up resolution e. Using Rehearse Timing feature in PowerPoint f. Using PowerPoint Pen Tool during slide show g. Saving h. Printing presentation Slides as Hand- out
33	Familiarizing with AI Tools	<p>Introductions of AI tools and their applications.</p> <p>Understand the basic use cases and functionality of AI tools (like</p>	<ul style="list-style-type: none"> a) Grasping the concept of Artificial Intelligence and how tools mimic human thinking or behavior. b) Identifying and interacting with AI tools

		ChatGPT, Google Gemini, Teachable Machine, etc.).	<p>such as:</p> <p>ChatGPT (natural language processing),</p> <p>Google Teachable Machine (image/audio classification),</p> <p>DALL•E / Bing Image Creator (AI art),</p> <p>Grammarly / Quillbot (AI-based writing assistants).</p>
34	Usage of ChatGPT	<p>a) Introduction to ChatGPT, an AI-powered conversational assistant.</p> <p>b) To explore ChatGPT’s capabilities in answering questions, generating content, and solving problems.</p>	<p>a) Operating the ChatGPT interface (web or app), input prompts, and interpret outputs.</p> <p>b) Using ChatGPT to generate summaries, ideas, code snippets, explanations, emails, etc.</p> <p>c) Evaluating the relevance and accuracy of ChatGPT's responses.</p>
35	Object identification using AI Tools based on CNN, YOLO, SSD, R-CNN	<p>a. Get awareness about object detection techniques using AI.</p> <p>b. To explore how AI tools based on CNN, YOLO, SSD, and R-CNN detect and classify objects in images/videos.</p>	<p>a) Differentiating object detection from image classification.</p> <p>b) Using web-based AI tools or platforms that demonstrate object detection (e.g., Teachable Machine, Roboflow, Edge Impulse, Hugging Face Demos).</p> <p>c) Observing and comparing the speed, accuracy, and bounding box behavior of different models.</p>
36	Paraphrase text using AI Tools(PEGASUS,GPT,T5)	<p>a. Get awareness about AI-powered text paraphrasing techniques.</p> <p>b. To explore the usage and functioning of transformer-based models like PEGASUS, GPT, and T5</p>	<p>a) Recognizing of Natural Language Processing (NLP) tasks and how transformer models like PEGASUS, GPT, and T5 can be used.</p> <p>b) Using AI tools to generate reworded versions of sentences or paragraphs while retaining the original meaning.</p> <p>c) Interacting with user-friendly interfaces like:</p> <ul style="list-style-type: none"> • Hugging Face demos • ChatGPT • Quillbot • Parrot.ai
37	Text-to-Image Generation using AI Tools (DALL-E, MIDJOURNEY)	<p>a) Get awareness about text-to-image generation using advanced AI models.</p> <p>b) To explore the usage of tools like DALL•E and Mid</p>	<p>a. Learning usage of how AI models generate visual content from natural language prompts.</p> <p>b. Formulating effective, clear, and creative text prompts to generate meaningful</p>

		journey convert text prompts into realistic or artistic images.	<p>images.</p> <p>c. Enhancing creative thinking by translating ideas into visual representations using AI.</p> <p>d. Analyzing and comparing output quality, style, and relevance between DALL-E and Midjourney.</p>
38	Voice Command Simulation using AI Tools (SPEECH-TO-TEXT)	Get awareness about Speech-to-Text (STT) technology and its role in AI-powered voice recognition systems.	<p>a. Using AI tools to generate text from speech.</p> <p>b. Reading prompts and commands to analyze how accurately the tool transcribes voice.</p> <p>c. Using voice to simulate commands such as opening files, dictating emails, or interacting with virtual assistants.</p>
39	Usage of ML Tools	<p>a) To use ML tools for suitable real-world applications</p> <p>b) To use popular ML tools and platforms through simple, hands-on demonstrations.</p>	<p>a. Understanding key ML terms like dataset, training, testing, classification, prediction, and accuracy.</p> <p>b. Learning to use beginner-friendly ML tools such as:</p> <ul style="list-style-type: none"> • Teachable Machine by Google (image/audio recognition) • Microsoft Lobe (no-code image classification) • Weka (GUI-based ML toolkit) • IBM Watson Studio (visual data workflows)
40	Usage of Quantum Computing Tools	To explore and interact with quantum computing simulation tools and platforms.	<p>a. Understanding key terms: Qubit, Superposition, Entanglement, Quantum Gate, Quantum Circuit.</p> <p>b. Navigate and use beginner-friendly quantum computing tools:</p> <ul style="list-style-type: none"> • IBM Quantum Experience (IBM Q / Qiskit) • Microsoft Quantum Development Kit • Quirk (online quantum circuit simulator) • Quantum Playground by Google
41	To familiarize with quantum bits (qubits) using Dirac notation	<p>a) To introduce the concept of a qubit as the fundamental unit of quantum information.</p> <p>b) To understand the representation of qubits using Dirac (bra-ket) notation.</p>	<ul style="list-style-type: none"> • Identify and interpret the basic qubit states: <ul style="list-style-type: none"> • $0\rangle = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$ • $1\rangle = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$ • Understand that a qubit can exist in a superposition: <ul style="list-style-type: none"> • $\psi\rangle = \alpha 0\rangle + \beta 1\rangle$, where α and β are complex numbers and $\alpha ^2 + \beta ^2 = 1$ <p>a) Learn how to write and read quantum states using the ket (\rangle) and bra (\langle)</p>

			<p>notations.</p> <p>b) Understand the purpose of $\langle \psi$ and how it represents a dual vector in quantum mechanics.</p>
42	To familiarize the behavior of single and multiple qubit gates.	To understand the concept of quantum gates and their role in quantum circuits.	<p>a) Recognize the function and matrix representation of:</p> <ul style="list-style-type: none"> • Single-qubit gates: <ul style="list-style-type: none"> ○ Pauli-X (NOT): flips $0\rangle \leftrightarrow 1\rangle$ ○ Hadamard (H): creates superposition ○ Pauli-Z: applies a phase flip • Multi-qubit gates: <ul style="list-style-type: none"> ○ CNOT: flips target qubit based on control ○ Toffoli (CCNOT): controlled-controlled NOT ○ SWAP: exchanges the states of two qubits
43	To familiarize with Qubit as a Coin / Spin Analogy	<p>a) To introduce the concept of a qubit using intuitive physical analogies.</p> <p>b) To help students understand quantum superposition through the coin toss or spin-$\frac{1}{2}$ particle analogy.</p>	<p>a. Relate a qubit in superposition to a coin spinning in the air:</p> <ul style="list-style-type: none"> • Classical coin: heads (0) or tails (1) • Spinning coin: both until observed ($0\rangle$ and $1\rangle$ at once) <p>b. Use spin analogy: a particle with spin "up" ($0\rangle$) or "down" ($1\rangle$), or in between (superposition)</p>

Table specifying the scope of syllabus to be covered for unit tests

Unit Test	Learning outcomes to be covered
Unit test-1	From 1 to 12
Unit test-2	From 13 to 32
Unit test-3	From 33 to 43

III SEMESTER

ELECTRONIC COMPONENTS AND DEVICES

Course code	Course Title	No. of Periods/Weeks	Total No. of periods	Marks for FA	Marks for SA	credits
26CI301T	ELECTRONIC COMPONENTS AND DEVICES	6	90	30	70	4

TIME SCHEDULE

S. No	Chapter/Unit Title	No. of Periods	Weightage of Marks	No. of Short Answer Questions	No. of Essay Questions	CO's Mapped
1	Passive Components	20	14	2	1	CO1
2	Switches ,Connectors, Relays and PCBs	15	11	1	1	CO2
3	Semiconductor Physics and semiconductor diode	20	33	3	3	CO3
4	BJT and Field effect Transistor	20	25	3	2	CO4
5	DC power supplies	15	11	1	1	CO5
	Total	90	94	10	8	

COURSE OBJECTIVES

Upon on completion of the course the student shall be able to	
(i)	To learn the principles of passive components
(ii)	To learn the principles of passive components

(iii)	To learn switches, Connectors, relays and PCB.
(iv)	To Understand the formation of semiconductor materials and the working of semiconductor diode.
(v)	To understand the working of BJT and FET circuits
(vi)	To understand different rectifier circuits and regulated power supplies

COURSE OUTCOMES

CO1	CI301.1	Ability to understand different passive components
CO2	CI301.2	Ability to understand switches ,relays, PCB manufacturing Techniques and soldering methods
CO3	CI301.3	Ability to Analyse the formation of Extrinsic semiconductors and the working of semiconductor diode.
CO4	CI301.4	Ability to Analyse the working of BJT , FET
CO5	CI301.5	Design DC power supplies.

LEARNING OUTCOMES

1.0 Passive Components

- 1.1
 - i) Define the term resistance
 - i) Define the term resistor & classify resistors
 - ii) Draw the circuit symbols of fixed and variable resistors
 - iii) List the specifications of a resistor
- 1.2 State the physical factors that affect the value of a resistor and calculate resistance value by using colour Code.
- 1.3 Compare the features of carbon and wire wound potentiometers
- 1.4 Describe the working of rheostat and mention its applications.
- 1.5 Define temperature co-efficient of resistance and explain the effects of temperature on resistance
- 1.6 Describe the working of thermistor and sensistor and mention their applications.

- 1.7
 - i) Define the term inductance
 - i) Define the term inductor & classify inductors
 - ii) Draw the circuit symbols of different types of inductors
 - iii) List the specifications of an inductor
 - iv) Explain the term Stray inductance
- 1.8 List various core materials used in the construction of inductors
- 1.9 Explain the use of Ferrites in the construction of high frequency inductors
- 1.10 List the applications of A.F. and R.F chokes.
- 1.11
 - i) Define the term capacitance.
 - i) Define the term capacitor & classify capacitors.

- ii) Draw the circuit symbols of fixed and variable capacitors.
- iii) List the specifications of a capacitor
- iv) Explain the term Stray capacitance
- 1.12 State the factors affecting the capacitance of a capacitor.
- 1.13 Define Di-electric constant and Di-electric strength of a material.
- 1.14 State different types of variable capacitors and mention their applications.

2.0 Switches, Connectors, Relays and PCBs

- 2.1 Classify switches according to poles and throws (SPST, SPDT, DPST, DPDT, Multi-pole multi- throw)
- 2.2 Sketch the I.S.I symbols of various switches.
- 2.3 State the need of fuse in electronic equipment.
- 2.4 Mention different types of fuses.
- 2.5 Explain the necessity of connectors in electronic circuits.
- 2.6 List different types of connectors.
- 2.7 Mention the use of MCB.
- 2.8 Define a relay.
- 2.9 Classify different relays based on principle of operation, polarization and application.
- 2.10 List the specifications and applications of relays.
- 2.11 Explain the working of general purpose electromagnetic relay.
- 2.12 Explain the need of PCB in electronic equipment.
- 2.13 Classify PCBs and list the types of laminates used in PCBs.
- 2.14 List the methods of transferring layout on to the copper clad sheet.
- 2.15 List the materials used in screen-printing.
- 2.16 List the steps involved in screen-printing for making PCBs.
- 2.17 Describe the methods of etching, cleaning and drilling of PCB.
- 2.18 Explain Surface Mount Technology and its uses.
- 2.19 List the materials used in soldering.
- 2.20 List the soldering methods of PCBs.

3.0 Semiconductor Physics and semiconductor diode

- 3.1 Explain the terms conductivity and resistivity, and give their equations
- 3.2 Describe Energy Level and Energy Band diagrams
- 3.3 Compare conductors, semiconductors and Insulators
- 3.4 Explain Valance band, Conduction band and Forbidden energy gap
- 3.5 Explain Semiconductor materials using Energy Band diagrams
- 3.6 Describe Intrinsic Semiconductors and Fermi level
- 3.7 Describe extrinsic Semiconductors, and their EBDs by using Fermi level
- 3.8 Distinguish between intrinsic and extrinsic semiconductors
- 3.9 Explain the formation of P type and N type semiconductors
- 3.10 Compare P-type and N-type semiconductors
- 3.11 Explain Drift and Diffusion currents
- 3.12 Explain the formation of PN junction diode.
- 3.13 Describe the working of PN junction Diode with forward & reverse biasing.
- 3.14 Sketch the forward and Reverse Bias VI characteristics of a diode.
- 3.15 Explain diode equation
- 3.16 Mention the applications of diode
- 3.17 Explain reverse breakdown phenomenon
- 3.18 Distinguish between Avalanche & Zener breakdowns

- 3.19 Describe the construction and working of Zener diode.
- 3.20 Draw the forward & reverse bias characteristics of Zener diode
- 3.21 Mention the applications of zener diode

4.0 BJT and Field Effect Transistor

- 4.1 Explain the formation of transistor
- 4.2 Draw the circuit symbol of transistor.
- 4.3 Explain the construction of PNP and NPN transistors
- 4.4 Explain the working of PNP and NPN Transistors.
- 4.5 Draw the different transistor configurations.
- 4.6 Sketch the input/output characteristics of CB, CE and CC configurations.
- 4.7 Identify the cut off, saturation and active regions in output characteristics of CB, CE and CC configurations
- 4.8 Define alpha, beta and gamma Factors.
- 4.9 Relate alpha, beta and gamma Factors.
- 4.10 Compare the performance characteristics of CB, CE and CC configurations
- 4.11 Classify Field Effect Transistors
- 4.12 Describe the construction and principle of operation of n channel JFET
- 4.13 Draw and explain the drain characteristics of JFET
- 4.14 List the advantages of JFET over BJT
- 4.15 Explain the construction & working of N channel Enhancement type MOSFET
- 4.16 Explain the construction & working of N channel Depletion type MOSFET
- 4.17 Compare JFET and MOSFET

5.0 DC Power Supplies

- 5.1. Explain the necessity of D.C. power supply for Electronic circuits
- 5.2 Describe the working of Half wave rectifier, Full Wave centre tapped rectifier and Bridge rectifier circuits with wave forms
- 5.3 Give the equations for RMS value and average value(DC value) voltages and currents for above rectifiers
- 5.4 Define ripple factor and efficiency for the above circuits
- 5.5 Give the formulae for ripple factor and efficiency
- 5.6 Compare HW, FW Centre tapped and Bridge Rectifiers
- 5.7 Explain the need for a filter circuit in power supplies
- 5.8 Explain the working of a RC, CRC, CLC filters for a full wave rectifier output
- 5.9 State the need for a regulated power supply
- 5.10 Define Voltage Regulation
- 5.11 Explain the working of a simple Zener regulator
- 5.12 List the different 3-pin fixed Positive (78xx), fixed negative (79xx) and variable (LM317) IC regulators

CO-PO/PSO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	2			2	3	1	1
CO2	3	3	2	2			2	3	1	1
CO3	3	3	2		2		2	3	1	1
CO4	3	3	2				2	3	1	
CO5	3	3	2				2	3	1	
Average	3	3	2	2	2	0	2	3	1	1

3=strongly mapped, 2=moderately mapped, 1=slightly mapped

NOTE:

The gap in CO and PO mapping will be met by one or more appropriate activities from the following:

- (i) Assignments (ii) Tutorial (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizes
(vii) Industrial Visits (viii) Techfests (ix) Mini Projects (x) Library visits etc.,

COURSE CONTENTS

1. Passive components

Resistors: Resistance, resistor-Classification- Circuit symbols-Specifications-Physical factors- -Colour code-Carbon and wire wound potentiometers – Rheostat – Applications – Temperature coefficient of resistance - Effect of temperature on resistance – Thermistors, sensistors– Applications Inductors: Inductance, Inductor-Classification - Circuit symbols – Specifications- Stray inductance - Core materials – Ferrites - AF and RF Chokes Capacitors: Capacitance, Capacitor-Classification - Circuit symbols – Specifications –Stray Capacitance–Factors affecting capacitance-Dielectric constant - Dielectric strength – Variable capacitors - Applications

2. Switches, Connectors, Relays and PCBs:

Switch- Classification – ISI symbols – Fuse – Types – Necessity of connectors – Types – MCB – Relay – Classification – Specifications – Applications – General purpose electromagnetic relay
PCBs: PCB – Classification – Methods of layout preparation - Methods of transferring layout – Screen printing materials- Steps – Etching, cleaning and drilling - Steps-SMT and its uses-Materials used in soldering – Soldering methods

3. Semiconductor Physics:

Energy level, Energy Band Diagrams compare conductors , semiconductors and insulators - Valance band, Conduction band and Forbidden energy gap – Semiconductor Materials – Intrinsic Semiconductors - Extrinsic Semiconductors - P type & N type semiconductors- Drift and diffusion currents- **Semiconductor Diodes:** PN junction diode – Working - VI characteristics - Diode equation –

Applications - Breakdown phenomenon – Avalanche and Zener breakdowns -
Zener diode construction, working – Reverse bias characteristics – Applications.

4. **BJT:**

Transistor formation – PNP & NPN transistors- symbols - Construction – Working - CB, CE and CC configurations - I/p & O/p characteristics - Active, Cut-off and saturation regions – Alpha(α), Beta(β), Gamma (γ) factors- Relation- Comparison of CB, CE, CC **Field Effect Transistor:** Classification –N channel JFET Construction, Principle of operation – Drain characteristics –Advantages of JFET over BJT –N Channel enhancement MOSFET – Construction, working- N Channel depletion MOSFET – Construction, working - Comparison of JFET and MOSFET.

5. **DC Power Supplies:**

Necessity of DC power supply- Half wave, Full wave and Bridge rectifiers – Working , Wave forms, RMS value, Average value of voltages and currents
- Ripple factor and efficiency – Comparison of HW, FW Centre tapped, and bridge rectifiers – Need for filters – Working of RC, CRC, and CLC — Need for regulated power supply – Voltage regulation – Zener regulator.

REFERENCE BOOKS

- 1) G.K.Mithal, Electronic Devices and Circuits, 23rd Edition- Khanna Publication-1988
- 2) B. Somanathan, Electronic devices and applications, 2nd Edition- PHI.
- 3) Dr.K.Padmanabham, P.Swaminathan, Electronic components, 2nd Edition,-Laxmi Publications (P) Ltd
- 4) Walter c bosshard, Printed circuit boards: design and technology -TMH
- 5) Bernard Grob, Basic Electronics, 4th edition- TMH-1977
- 6) Millman & Halkias, Electronic devices & Circuits, 4th edition- TMH

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TEST –I &UNIT TEST-II

Unit Test	Learning outcomes to be covered
Unit test-1	From 1.1 to 3.12
Unit test-2	From 3.13 to 5.12

DBMS

Course code	Course Title	No. of Periods/Weeks	Total No. of periods	Marks for FA	Marks for SA	Credits
26CI302T	DBMS	6	90	30	70	4

TIME SCHEDULE:

S.No.	Chapter/Unit Title	No.of Periods	Weightage of Marks	No.Of Short Questions	No.Of Essay Questions	CO ' s Mapped
1.	Concepts of DBMS & RDBMS	20	22	2	2	CO1
2.	Concepts of SQL	20	22	2	2	CO2
3.	Basics of PL/ SQL	20	22	2	2	CO3
4.	Advance PL/SQL	15	14	2	1	CO4
5.	Concepts of NoSQL & Mongo DB.	15	14	2	1	CO5
Total Periods		90	94	10	08	

COURSE OBJECTIVES

Upon on completion of the course the student shall be able to	
(i)	To know the fundamentals of DBMS
(ii)	To familiarize insert, retrieve, update, delete data in database
(iii)	To familiarize programming skills for insert, retrieve, update, delete data in database

COURSE OUTCOMES:

CO1	CI302.1	Describe fundamentals, types and Overall structure of DBMS
CO2	CI302.2	Apply SQL commands to create, retrieve, update, delete data from the Relational data bases.
CO3	CI302.3	Describe PL/SQL programming constructs, control statements and sub programs.
CO4	CI302.4	Apply cursors, triggers and Exception handling concepts
CO5	CI302.5	Use NOSQL database concepts and MongoDB data base concepts in designing database Schema.

LEARNING OUTCOMES:

1.0 Concepts of DBMS &RDBMS

- 1.1 Define Database Management System(DBMS)
- 1.2 List the advantages of DBMS
- 1.3 Explain Database Abstraction, Data Independence
- 1.4 Define Instances and Schemas
- 1.5 Explain Data Models.
- 1.6 Define Database languages DDL, DML, TCL
- 1.7 Explain Database Administrator, Users and Database System Architecture with diagram.
- 1.8 Define Entity, Entity sets, Relationship, Relationship sets, Super Key , Candidate Key and Primary Key, Foreign Key
- 1.9 Explain Mapping Cardinalities.
- 1.10 List the symbols used in ER model.
- 1.11 Know The Entity-Relationship Model.
- 1.12 Reduce the ER-diagrams to tables
- 1.13 Explain Generalization, Specialization & Aggregation.
- 1.14 Explain Functional Dependencies, Normalizations– 1 NF, 2 NF and 3NF

2.0 Concepts of SQL

- 2.1 Explain SQL and benefits of SQL.
- 2.2 Explain literals & different data types like character, number, long, date, raw and long raw etc.
- 2.3 Illustrate the comments within SQL Statement
- 2.4 Explain SQL Operators
- 2.5 Describe Data Definition Language commands CREATE, ALTER and DROP.
- 2.6 Explain integrity constraints through creating a table and altering table.
- 2.7 Describe Data Manipulation Language commands INSERT, UPDATE and DELETE
- 2.8 Explain SELECT statement with WHERE, ORDER BY, GROUP BY and HAVING clauses with examples
- 2.9 List and explain single row(Number, character, date and conversion) functions
- 2.10 List and Explain group functions
- 2.11 Explain Transaction Control Commands COMMIT, SAVEPOINT, ROLLBACK, GRANT, and REVOKE.
- 2.12 Explain Subqueries with examples
- 2.13 Explain Joins (Equi Join, Non-Equi Joins, Inner Join, Outer Join, cross join and Self join) with syntax and examples.

3.0 PL/SQL

- 3.1 Explain PL/SQL Block structure.
- 3.2 List the features of PL/SQL
- 3.3 Explain the data types of PL/SQL
- 3.4 Declaration of variables
- 3.5 Explain PL/SQL tables and user defined records.
- 3.6 Explain Input/Output statements
- 3.7 Explain decision making statements and illustrate
- 3.8 Explain looping statements and illustrate
- 3.9 Define procedure and function
- 3.10 Describe the advantages of subprograms.

- 3.11 Explain handling procedures and functions with example programs.
- 3.12 Explain the parameter modes in PL/SQL with examples (in , out and in out)

4.0 Advanced PL/SQL and Exception Handling

- 4.1 Define cursor.
- 4.2 Classify cursors
- 4.3 Explain implicit cursor with example
- 4.4 Explain explicit cursors with example
- 4.5 Define trigger
- 4.6 List Advantages of triggers
- 4.7 Explain database triggers.
- 4.8 Define the term Exception handling
- 4.9 List the advantages of Exception handling
- 4.10 List various types of Exception handling
- 4.11 Illustrate built-in Exceptions
- 4.12 Illustrate User defined Exceptions

5.0 Concepts of NoSQL & MongoDB.

- 5.1 No SQL
 - 5.1.1 List features of NOSQL
 - 5.1.2 Compare RDBMS and NoSQL
 - 5.1.3 List the Advantages and Disadvantages of NoSQL
 - 5.1.4 Know about the ACID and BASE system.
 - 5.1.5 Compare ACID and BASE properties
 - 5.1.6 NoSQL
 - 5.1.6.1 Key-value stores,
 - 5.1.6.2 Column-oriented,
 - 5.1.6.3 Graph oriented Databases
 - 5.1.6.4 Document oriented Databases.
- 5.2 MongoDB
 - 5.2.1 What is MongoDB
 - 5.2.2 List the advantages of MongoDB
 - 5.2.3 Explain the Creation, Dropping of Collection in MongoDB
 - 5.2.4 Explain the creation and Dropping of Database in MongoDB
 - 5.2.5 Explain the Datatypes of MongoDB.
 - 5.2.6 Explain Inserting Document, Query Document, Update Document, Deleting Document & Sorting Document.

CO-PO/PSO MAPPING:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	3	2	2	3	1
CO2	2	3	3	3	3	3	3	2	1	2
CO3	3	2	2	2	1	3	2	2	3	1
CO4	1	3	3	2	2	3	3		3	3
CO5	3	1	3	1	3	3	2	2	2	3
Average	2.4	2.2	2.6	2	2.2	3	2.8	2	2	2

3=Strongly mapped , 2=moderately mapped, 1=slightly mapped

NOTE:

The gap in CO and PO mapping will be met by one or more appropriate activities from the following:

- (i) Assignments (ii) Tutorial (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizes
(vii) Industrial Visits (viii) Techfests (ix) Mini Projects (x) Library visits etc.,

COURSE CONTENT

1. Concepts of DBMS & RDBMS

Define DBMS –Advantages of DBMS - Data Abstraction – Data Models – Instances and Schemas – Data Independence – Data Definition Language - Data Manipulation Language – Database Administrator - Database Users – Database system Structure.

Entities – Relationships and Relationship sets – Mapping constraints – Entity – Relationship Diagram – Super key , Candidate key and Primary key - Reducing E- R Diagrams to tables – Generalization and Specialization – Aggregation – Functional Dependencies - Normal forms 1NF , 2 NF , 3 NF

2. Concepts of SQL

Benefits of SQL Literals – Text –Integer – Number – Data types – Character data types – Number data type – Long data type –Raw and Long Raw data types – comments within SQL statements SQL Operators –DDL Commands – Integrity Constraints – DML Commands - functions – single row functions – numeric functions – character functions – date functions – conversion functions – other functions- Group functions. Transaction control commands-Sub queries - Joins.

3. Basics of PL/SQL

SQL features –SQL Block architecture – Data types – Declaration - PL/SQL tables – user defined records.

Conditional control- IF statement --Loop Statements sub programs-Advantages of sub programs – procedures – Functions RETURN statement – parameter modes

4. Advanced PL/SQL

Cursors – Implicit cursor – Explicit cursor – Triggers – Advantages - creating trigger – raising trigger – Data base triggers

5. NoSQL& Basics of MongoDB

Introduction to NoSQL - Features – Comparison of RDBMS and NoSQL- Advantages and Disadvantages of NoSQL - BASE system – ACID System – Comparison of ACID and BASE properties – Classification of NoSQL as Key-value stores, Column-oriented, Graph and Document oriented Databases

Introduction to MongoDB - advantages of MongoDB - MongoDB - Installation of MongoDB - Creation of Database - Dropping of Database - Creation of Collection - Dropping of Collection - Data types of MongoDB -- Inserting Document - Query Document - Updating Document – Deleting Documents - Sorting Documents

REFERENCE BOOKS

1. Database System Concepts -- Silberschatz, Henry F. Korth, S. Sudarshan
2. Oracle Database 11g :The Complete Reference - Kevin Loney
3. Understanding ORACLE -- James T. Peary & Joseph G. Laseer.
4. RDBMS with ORACLE -- Rolland.
5. ORACLE series books of ORACLE Press – TMH.
6. Starting out with Oracle – Covering Databases- John Day & Craig Van
7. PL/SQL, Developer Tools & DBA -- Slyke, Dreamtech
8. www.nosql-database.org
9. www.mongodb.org
10. <https://www.guru99.com/nosql-tutorial.html#5>

Table specifying the scope of syllabus to be covered for Unit Test-I & Unit Test-II

Unit Test	Learning outcomes to be covered
Unit test-1	From 1.1 to 3.5
Unit test-2	From 3.6 to 5.2.5

IOT ARCHITECTURE AND PROTOCOLS

Course Code	Course title	No of periods/week	Total no of periods	Marks for FA	Marks for SA	Credits
26CI303T	IoT Architecture and Protocols	06	90	30	70	4

TIME SCHEDULE

S. No	Chapter/Unit Title	No. of Periods	Weightage of Marks	No. of Short Answer Questions	No. of Essay Questions	COs Mapped
1	Introduction to Industry 4.0 and Internet of Things	18	22	2	2	CO1
2	IoT Architecture	16	14	2	1	CO2
3	IoT Protocols: Network Layer	16	14	2	1	CO3
4	IoT Protocols: Application Layer	20	22	2	2	CO4
5	Elements of IoT & IoT case studies	20	22	2	2	CO5
	Total	90	94	10	8	

COURSE OBJECTIVES

Upon on completion of the course the student shall be able to	
(i)	To Introduce Industry 4.0 and Internet of Things
(ii)	To familiarise with IoT Architecture & Network layer and Application layer Protocols
(iii)	To familiarise with the elements of IoT and to explore case IoT case studies

COURSE OUTCOMES

CO1	CI303.1	Introduce Industry 4.0 and Internet of Things
CO2	CI303.2	Get acquaint with the Architecture of IoT
CO3	CI303.3	Get acquaint with the Network layer protocols of IoT
CO4	CI303.4	Get acquaint with the Application layer protocols of IoT
CO5	CI303.5	Explore Elements of IoT & IoT Case Studies

LEARNING OUTCOMES

1.0 Introduction to Industry 4.0 and Internet of Things

- 1.1 Explain the concept of Industry 4.0 and its benefits.
- 1.2 Explain the components of futuristic industrial plant in industry 4.0 with a block diagram
- 1.3 Define IoT and state its role in Industry 4.0
- 1.4 List the goals of industry 4.0
- 1.5 List the advantages of industry 4.0
- 1.6 Explain what technologies are driving industry 4.0
- 1.7 Explain about various challenges in industry 4.0
- 1.8 State the impact of IoT on businesses and society
- 1.9 List the applications of IoT in different industries.
- 1.10 State the characteristics of IoT
- 1.11 Explain the concepts of different IoT enabling Technologies such as: i) Wireless Sensor networks ii) Cloud Computing iii) Big Data Analytics iv) Communication Protocols iv) Embedded Systems
- 1.12 Explain the concepts of different IoT Levels (IoT Level-1 to Level-5) and Development Templates
- 1.13 Explain M2M and IoT Technology Fundamentals such as: i) Devices and Gateways ii) Data Management iii) Business Process in IoT iv) Everything as a Service (XaaS)
- 1.14 State the role of cloud in IoT
- 1.15 State the Security aspects of IoT

2.0 IoT Architecture

- 2.1 Draw the 5-layer model of IoT Architecture and list different layers
- 2.2 Explain about the functions of Perception layer (or Object layer)
- 2.3 Explain about the functions of Data Transmission layer (or Network Layer)
- 2.4 Explain about the functions of Middleware layer (or Information Processing Layer)
- 2.5 Explain about the functions of Application Layer
- 2.6 Explain about the functions of Business Layer
- 2.7 State the need of sensors in the perception layer
- 2.8 State the need of communication technologies used in the data transmission layer
- 2.9 List different communication technologies
- 2.10 State the need of middleware technologies in the information processing layer
- 2.11 List different middleware technologies used in IoT
- 2.12 State the need of application layer technologies
- 2.13 List different application layer technologies used in IoT
- 2.14 State the need of business layer technologies
- 2.15 List different business layer technologies used in IoT

3.0 0 IoT Protocols: Network Layer

- 3.1 Classify network layer protocols of IoT into:
 - 3.1.1 Short Range Communication, Low Data Rate, Low Power (Ex: Bluetooth, Zigbee,)
 - 3.1.2 Short Range Communication, High Data Rate (Ex: WiFi)
 - 3.1.3 Long Range Communication, High Data Rate, Low power (Ex: LoRaWAN, LTE-M)
 - 3.1.4 Long Range, Low Data Rate, Low Power Consumption (Ex: Sigfox)
 - 3.1.5 Long Range, Low Data Rate, High Power Consumption (Ex: Cellular: 2G,3G,4G,5G)
- 3.2 State the features of 6LoWPAN
- 3.3 Explain and Compare Bluetooth, Zigbee and 6LoWPAN based on : i) frequency of operation
 ii) Data rate iii) Mobility iv) Security v) power consumption vi) coverage range vii) applications
- 3.4 State the features of NFC (Near Field Communication) and List its applications
- 3.5 State the features of WiFi (Wireless LAN) and List its applications
- 3.6 Differentiate between NFC and WiFi technologies
- 3.7 State the features of LoRaWAN and list its applications.
- 3.8 State the features of Sigfox and list its applications.
- 3.9 State the features of Z-Wave and list its applications
- 3.10 State the features of Mobile IoT Technologies – LTE-M, NB-IoT, and EC-GSM-IoT and list their applications

4.0 0 IoT Protocols: Application Layer

- 4.1 State the need of application layer protocols in IoT
- 4.2 List different common application layer protocols in IoT such as i) MQTT ii) HTTP
 iii) AMQP iv) LwM2M v) XMPP vi) DDS vii) USSD viii) SSI
- 4.3 Explain about the features and functions of MQTT (Message Queueing Telemetry Transport) protocol
- 4.4 Explain about the features and functions of HTTP (Hyper Text Transfer Protocol)
- 4.5 Explain about the features and functions of AMQP (Advanced Message Queuing Protocol)
- 4.6 Explain about the features and functions of LwM2M (Lightweight Machine-to-Machine) protocol
- 4.7 Explain about the features and functions of XMPP (Extensive Messaging and Presence Protocol)
- 4.8 Explain about the features and functions of DDS(Data Distribution Service) protocol
- 4.9 Explain about the features and functions of USSD (Unstructured Supplementary

Service Data) protocol

4.10 Explain about the features and functions of SSI (Simple Sensor Interface) Protocol

5.0 Elements of IoT & IoT Case Studies

- 5.1 Draw the general block diagram of IoT based system consisting of the elements such as: i) Sensors & Actuators ii) Edge Gateway iii) Communication Protocols iv) computing hardware v) Software components and explain.
- 5.2 Classify sensors used in IoT based on i) Passive & Active ii) Analog & digital iii) Scalar & vector and give examples
- 5.3 List the common actuators used in IoT
- 5.4 State the role of edge gateway in IoT
- 5.5 State the function of computing hardware in IoT
- 5.6 State the purpose of communication technologies used in IoT
- 5.7 List different software components used in IoT
- 5.8 Explain the functions of Sensors & actuators in IoT
- 5.9 Explain the function of software components in data storage and data analytics in IoT
- 5.10 Explain the IoT based system for Home Automation with block diagram
- 5.11 Explain the IoT based system for Smart lighting with block diagram
- 5.12 Explain the IoT based system for Home intrusion detection with block diagram
- 5.13 Explain the IoT based system for Air pollution monitoring system with block diagram
- 5.14 Explain the IoT based system for Smart irrigation with block diagram
- 5.15 Explain the IoT based system for Healthcare with block diagram

CO-PO/PSO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3				1			3		1
CO2	3	2	1		2			3	1	
CO3	3	1	1		1			3		1
CO4	3	3	2	1	2			3		2
CO5	3	3	1	2	3		1	3	1	2
Average	3	2.25	1.25	1.5	1.8		1	3	1	1.5

3=strongly mapped, 2=moderately mapped, 1=slightly mapped

NOTE:

The gap in CO and PO mapping will be met by one or more appropriate activities from the following:
(i) Assignments (ii) Tutorial (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizes
(vii) Industrial Visits (viii) Techfests (ix) Mini Projects (x) Library visits etc.,

COURSE CONTENT:

1. Introduction to Industry 4.0 and Internet of Things:

Concept of Industry 4.0 and its benefits- components of futuristic industrial plant in industry 4.0
Define IoT and state its role in Industry 4.0-List the goals of industry 4.0- advantages of industry 4.0-
technologies driving industry 4.0- various challenges in industry 4.0- the impact of IoT on businesses and

society- applications of IoT in different industries- the concepts of different IoT enabling Technologies - M2M and IoT Technology Fundamentals -role of cloud in IoT - the Security aspects of IoT

2. IoT Architecture:

Five layer model of IoT Architecture -Explain about the functions of Perception layer (or Object layer), Data Transmission layer (or Network Layer), Middleware layer (or Information Processing Layer), Application Layer and Business Layer- need of sensors -Classify the sensors – need of communication technologies used in the data transmission layer-different communication technologies - need of middleware technologies - Different middleware technologies used in IoT- need of application layer technologies-List different application layer technologies used in IoT- need of business layer technologies-List different business layer technologies used in IoT

3. IoT Protocols Network Layer:

Classify network layer protocols of IoT - features of Bluetooth, Bluetooth, Zigbee and 6LoWPAN -Explain and Compare Bluetooth, Bluetooth, Zigbee and 6LoWPAN -State the features of NFC (Near Field Communication) and List its applications-State the features of WiFi (Wireless LAN) and List its applications-Differentiate between NFC and WiFi technologies-State the features of LoRaWAN and list its applications-State the features of Sigfox and list its applications-State the features of Z-Wave and list its applications-State the features of Mobile IoT Technologies – LTE- M, NB-IoT, and EC-GSM-IoT and list their applications

4. IoT Protocols Application Layer:

State the use of Standard Wireless Access connecting technologies such as i) WiFi ii) 2G, 3G and standard LTE, 5G in IoT-State the use of Private Long Range – LoRA based platform, Zigbee, and SigFox. -State the use of Mobile IoT Technologies – LTE-M, NB-IoT, and EC-GSM-IoT-State the specifications (coverage range, data rate) and IoT specific applications of the following connecting technologies: i) WiFi ii) 2G iii) 3G iv) 4G v) 5G vi) LoRA based platform vii) Zigbee viii) SigFox-What is NFC (Near Field Communication) and List its applications-Differences between NFC and Bluetooth and WiFi technologies-List the typical specifications and applications of i) WiFi ii) Bluetooth iii) Zigbee iv) GSM v) GPS modules designed for Arduino, Raspberry Pi hardware platforms-Explain the use of Computing Hardware (Arduino, Raspberry Pi) in IoT

5. Elements of IoT & IoT Case Studies:

Draw the general block diagram of IoT based system-Classify sensors-List the common actuators used in IoT- role of edge gateway in IoT- function of computing hardware in IoT -purpose of communication technologies used in IoT-List different software components used in IoT-Explain the functions of Sensors &

actuators in IoT-Explain the function of software components in data storage and data analytics in IoT- Explain the IoT based system for Home Automation with block diagram-Explain the IoT based system for Smart lighting with block diagram-Explain the IoT based system for Home intrusion detection with block diagram-Explain the IoT based system for Air pollution monitoring system with block diagram-Explain the IoT based system for Smart irrigation with block diagram-Explain the IoT based system for Healthcare with block diagram-Explain the following IoT Case Studies with block diagrams -i) Home Automation-ii)Smart lighting - iii)Home intrusion detection -iv) Air pollution monitoring system -v) Smart irrigation -vi)Healthcare

REFERENCE BOOKS:

- 1 Vijay Madiseti, ArshdeepBahga, Internet of Things, “A Hands on Approach”, University Press
- 2 Dr. SRN Reddy, RachitThukral and Manasi Mishra, “Introduction to Internet of Things: A practical Approach”, ETI Labs
- 3 Pethuru Raj and Anupama C. Raman, “The Internet of Things: Enabling Technologies, Platforms, and Use Cases”, CRC Press
- 4 Jeeva Jose, “Internet of Things”, Khanna Publishing House, Delhi
- 5 Adrian McEwen, “Designing the Internet of Things”, Wiley
- 6 Raj Kamal, “Internet of Things: Architecture and Design”, McGraw Hill
- 7 Cuno Pfister, “Getting Started with the Internet of Things”, O Reilly Medi
- 8 Internet of Things Reference Architecture – Whitepaper – CISCO
- 9 IoT and Edge Computing for Architects: Implementing edge and IoT systems from sensors to clouds with communication systems, analytics, and security, 2nd Edition – Perry Lea, Packt Publishing Limited, ISBN-10: 189214805
- 10 IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, Cisco Press, 2017
- 11 The Internet of Things – Key applications and Protocols, Olivier Hersent, David Boswarthick, Omar Elloumi and Wiley, 2012 (for Unit 2).
- 12 “From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence”, Jan Ho” ller, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle and Elsevier, 2014.
- 13 Architecting the Internet of Things, Dieter Uckelmann, Mark Harrison, Michahelles and Florian (Eds), Springer, 2011

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TEST –I &UNIT TEST-II

Unit Test	Learning outcomes to be covered
Unit Test-I	From 1.1 to 3.5
Unit Test-II	From 3.6 to 5.15

ENGINEERING MATHEMATICS-II

Course Code	Course title	No of periods/week	Total no of periods	Marks for FA	Marks for SA	Credits
26CI304E	Engineering Mathematics-II	3	45	30	70	3

TIME SCHEDULE

S.No.	Chapter/Unit title	No. of Periods	Marks Allotted	No. of Short Questions	No. of Essay Questions	COs mapped
Unit – I: Applications of Definite Integrals						
1	Area of curves	4	7	1	½	CO1
2	Volumes of Solids of Revolution	3	4	0	½	CO1
3	Mean and RMS values	4	11	1	1	CO1
4	Numerical Integration	4	8	0	1	CO1
Unit – II: Differential Equations						
5	Introduction to Differential Equations	4	6	2	0	CO2
6	Solution of first order differential equations	6	14	2	1	CO2
7	Solution of second order homogeneous and non-homogeneous linear differential equations	5	11	1	1	CO2
Unit – III: Probability and Statistics						
8	Probability	5	11	1	1	CO3
9	Measures of Dispersion	6	14	2	1	CO3
10	Correlation	4	8	0	1	CO3
	Total	45	94	10	8	
			Marks	30	64	

COURSE OBJECTIVES

Upon on completion of the course the student shall be able to	
(i)	To apply integral techniques to solve various engineering problems.
(ii)	To solve first-order and first-degree differential equations and second-order homogeneous and non-homogeneous linear differential equations.
(iii)	To analyse data using the concepts of probability and statistical techniques.

COURSE OUTCOMES

CO1	CI303.1	Apply definite integrals in engineering applications.
CO2	CI303.2	Solve first-order and first-degree differential equations and second-order homogeneous and non-homogeneous linear differential equations.
CO3	CI303.3	Apply various probability and statistical techniques for data analysis.

LEARNING OUTCOMES

Unit-I

1 Apply definite integrals in engineering applications.

- 1.1 Find the area bounded by a curve and axes.
- 1.2 Determine the volumes of solids of revolution along the x-axis.
- 1.3 Obtain the Mean and R.M.S values of simple functions.
- 1.4 Solve the problems of areas using Numerical Integration.

Unit-II

2 Solve first-order and first- degree differential equations and second-order homogeneous and non-homogeneous linear differential equations.

- 2.1 Define a Differential equation, its order and degree.
- 2.2 Find order and degree of a given differential equation.

- 2.3 Form a differential equation by eliminating arbitrary constants.
- 2.4 Solve the first order and first degree differential equations by variables separable method.
- 2.5 Solve linear differential equation of the form $\frac{dy}{dx} + Py = Q$, where P and Q are functions of x only or constants.
- 2.6 Solve Differential equations of the type $(aD^2 + bD + c)y = 0$ where $a (\neq 0)$, b, and c are real numbers.
- 2.7 Define complementary function, particular integral and general solution of a non-homogeneous linear differential equation of second order with constant coefficients.
- 2.8 Describe the method of solving $f(D)y = e^{ax}$, where $f(D)$ is a polynomial of second order.

Unit-III

3 Apply various probability and statistical techniques for data analysis.

- 3.1 Recall the basic probability principles.
- 3.2 State addition theorem of probability for two mutually exclusive and exhaustive events.
- 3.3 Solve simple problems on addition theorem.
- 3.4 Explain conditional event and conditional probability.
- 3.5 Solve simple problems on conditional probability.
- 3.6 Explain dependent, independent events and state multiplication theorem.
- 3.7 Solve simple problems on multiplication theorem.
- 3.8 Recall the measures of central tendency.
- 3.9 Explain the significance of measures of dispersion to determine the degree of heterogeneity of the data.
- 3.10 Find the measures of dispersion, Range, Mean Deviation and Standard Deviation for ungrouped data.
- 3.11 Explain the merits and demerits of these measures of dispersion.
- 3.12 Explain bivariate data.
- 3.13 Explain the concept of covariance and correlation between two variables.
- 3.14 Find Spearman's rank correlation coefficient.

CO-PO/PSO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	3	3				3	3	1
CO2	3	1	1	1				3	1	1
CO3	3	3	3	3				3	3	3
Average	3	2.33	2.33	2.33				3	2.33	1.66

3=strongly mapped, 2=moderately mapped, 1=slightly mapped

Note:

The gaps in CO/PO mapping can be met with appropriate activities as follows:

For PO5:

Appropriate quiz programmes may be conducted at intervals and duration as decided by concerned faculty.

For PO6:

Seminars on applications of mathematics in various engineering disciplines are to be planned and conducted

For PO7:

Plan activities in such a way that students can visit the Library to refer standard books on Mathematics and access the latest updates in reputed national and international journals. Additionally, encourage them to attend seminars and learn mathematical software tools.

COURSE CONTENTS

Unit-I: Applications of Definite Integrals

Area bounded by a curve and axes. Volume of Solids of Revolutions. Mean and RMS values of a function on a given interval. Numerical Integration.

Unit -II: Differential Equations

Definition of a differential equation, Order and degree of a differential equation, Formation of differential equations. Solutions of differential equations of first order and first degree using variables separable method and linear differential equation of the type $\frac{dy}{dx} + Py = Q$. Solutions of homogenous and non-homogeneous linear differential equations of second order with constant coefficients.

Unit III: Probability & Statistics

Addition theorem of probability, conditional probability, dependent and independent events with multiplication theorem. Measures of dispersion, range, mean deviation and standard deviation of ungrouped data, merits and demerits. Bivariate data, correlation, Spearman's rank correlation coefficient.

TEXT BOOK

Engineering Mathematics-II, a textbook for second year third semester diploma courses, prepared & prescribed by SBTET, AP.

REFERENCE BOOKS

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Schaum's Outlines Differential Equations, Richard Bronson & Gabriel B. Costa
3. Schaum's Outline: Introduction to Probability and Statistics, Seymour Lipschutz & John J. Schiller.
4. M.Vygodsky, Mathematical Handbook: Higher Mathematics, Mir Publishers, Moscow.

SUGGESTED E-LEARNING REFERENCES

1. <https://www.khanacademy.org/>
2. <https://www.wolframalpha.com/>
3. <https://onlinecourses.nptel.ac.in/>
4. <http://tutorial.math.lamar.edu/>

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TEST –I &UNIT TEST-II

Unit Test	Learning outcomes to be covered
Unit Test-I	From 1.1 to 2.5
Unit Test-II	From 2.6 to 3.14

DIGITAL ELECTRONICS

Course code	Course Title	No. of Periods/ Weeks	Total No of periods	Marks for FA	Marks for SA	Credits
26CM305E	Digital Electronics	3	45	30	70	2

TIME SCHEDULE

S. No.	Chapter/Unit Title	No. of Periods	Weightage of marks	No. of Short Answer Questions	No. of Essay Questions	CO's Mapped
1.	Number systems	10	14	2	1	CO1
2.	Logic Gates ,Boolean Algebra and Basic Combinational	10	22	2	2	CO2
3.	Flip-Flops	10	22	2	2	CO3
4.	Counters and registers	10	22	2	2	CO4
5.	Additional Combinational circuits	5	14	2	1	CO5
	Total Periods	45	94	10	8	

COURSE OBJECTIVES

On completion of the course the student shall be able to	
(i)	i)To acquire the basic knowledge of digital logic levels and apply of knowledge to understand digital logic circuits.
(ii)	ii)To prepare students to perform the analysis and design of various digital electronic circuits.

CO1	CM-305.1	Explain the structure of various number systems.
CO2	CM-305.2	Describe fundamental concepts and techniques used in digital electronics, the switching algebra theorems and logicgates and apply them to design logic circuits using K-Maps
CO3	CM-305.3	Explain operation of flip flops
CO4	CM-305.4	Design the counting circuits, Registers using flipflop operations.
CO5	CM-305.5	Explain design and implement various sequential circuits, combinational circuits

LEARNING OUTCOMES

1. Number systems

- 1.1 List the various number systems used in digital Computer.
- 1.2 Explain Decimal number system
- 1.3 Explain Binary number system
- 1.4 Explain octal number system
- 1.5 Explain Hexadecimal number system
- 1.6 Convert decimal number to other base conversion.
 - 1.6.1 Decimal to Binary
 - 1.6.2 Decimal to Octal
 - 1.6.3 Decimal to Hexadecimal
- 1.7 Convert binary number to other base conversion.
 - 1.7.1 Binary to Decimal
 - 1.7.2 Binary to octal
 - 1.7.3 Binary to Hexadecimal
- 1.8 Convert octal number to other base conversion.

- 1.8.1 Octal to Decimal
- 1.8.2 Octal to Binary
- 1.8.3 Octal to Hexadecimal
- 1.9 Convert hexadecimal other base conversion.
- 1.9.1 Hexadecimal to Decimal
- 1.9.2 Hexadecimal to Binary
- 1.9.3 Hexadecimal to Octal
- 1.10 Binary numbers representation.
- 1.10.1 Define Binary numbers representation.
- 1.10.2 List the types of Binary numbers representation.
- 1.10.3 Explain Unsigned binary number representation.
- 1.10.4 Explain Signed binary number representation.
- 1.11 Binary arithmetic.
- 1.11.1 Illustrate addition of two signed binary numbers.
- 1.11.2 Illustrate subtraction of two signed binary numbers.
- 1.11.3 Illustrate binary multiplication.
- 1.11.4 Illustrate Binary division.
- 1.12 Binary coded decimal (BCD) coding scheme.
- 1.12.1 Define Binary coded decimal (BCD) coding scheme.
- 1.12.2 List the types of Binary coded decimal (BCD)
- 1.12.3 Draw and explain 8421 code.
- 1.12.4 Draw and explain 2421 code.
- 1.12.5 Draw and explain 8 4-2-1 code.
- 1.13 Character representation
- 1.13.1 List character representation codes
- 1.13.2 Explain the ASCII codingscheme.
- 1.13.3 Explain the EBCDIC codingscheme.

2. Boolean algebra , Logic gates and Basic Combinational Circuits

- 2.1 **Boolean algebra**
- 2.1.1 Define Boolean algebra
- 2.1.2 Explain AND, OR, NOT operations with truth tables.
- 2.1.3 Explain the working of EX-OR and EX-NOR operations with truth tables.
- 2.1.4 List the different postulates in Boolean algebra.
- 2.1.5 State De-Morgan's theorems.
- 2.1.6 Prove De-Morgan's theorems using truth tables.
- 2.1.7 Apply De-Morgan's theorems and other postulates of Boolean algebra to simplify the given Boolean expression.
- 2.1.8 Generate Boolean expression for given truth table.
- 2.1.8.1 Using Sum-Of-Products(SOP) method
- 2.1.8.2 Using Product-Of-Sums(POS)method
- 2.1.9 Use K – map to simplify Boolean expression (up to 4 variables).

- 2.1.9.1 Using Two variable K-Map
- 2.1.9.2 Using Three variable K-Map
- 2.1.9.3 Using Four variable K-Map
- 2.2 **Logic Gates**
- 2.2.1 Define Logic gate
- 2.2.2 List basic gates
- 2.2.3 Define OR gate
- 2.2.4 Explain OR gate with logic symbol and truth table.
- 2.2.5 Define AND gate
- 2.2.6 Explain AND gate with logic symbol and truth table.
- 2.2.7 Define NOT gate
- 2.2.8 Explain NOT gate with logic symbol and truth table.
- 2.2.9 What is universal gate? List universal gates
- 2.2.10 Define NOR gate
- 2.2.11 Explain NOR gate with logic symbol and truth table.
- 2.2.12 Define NAND gate
- 2.2.13 Explain NAND gate with logic symbol and truth table.
- 2.2.14 Define EX-OR and EX-NOR gates
- 2.2.15 Explain the working of EX-OR and EX-NOR gates with truth tables.
- 2.2.16 Implement AND, OR and NOT gates using NAND gates only
- 2.2.17 Implement AND, OR and NOT gates using NOR gate only.

2.3 **Basic Combinational Circuits**

- 2.3.1 Define the Half Adder.
- 2.3.2 Explain the function of Half Adder.
- 2.3.3 Draw Half-Adder circuit using an EX- OR and an AND gate.
- 2.3.4 Define the Full Adder.
- 2.3.5 Explain the function of Full Adder.
- 2.3.6 Construct Full Adder using two Half-Adder and an OR gate
- 2.3.7 Define the parallel Adder
- 2.3.8 Explain the function of parallel Adder using logic symbol.
- 2.3.9 Draw and explain 4-bit parallel adder using full adders.
- 2.3.10 Explain the working of a serial adder with a block diagram.
- 2.3.11 List the advantage and disadvantages of a serial adder
- 2.3.12 List the advantage and disadvantages of a parallel adder.
- 2.3.13 Distinguish between serial adder and parallel adder.
- 2.3.14 Explain the operation of a digital comparator circuit for two 4-bitwords.

3 **Flip-Flops**

- 3.1 List the details of different logic families.
- 3.2 Define positive and negative logic levels.
- 3.3 Define Flip flop
- 3.4 Draw and explain the basic principle of operation of aFlip-flop.

- 3.5 Define Latch.
- 3.6 Explain the working of NAND latch circuit with truth table and Timing diagram
- 3.7 Explain the working of a NOR latch circuit with truth table and Timing diagram
- 3.8 Explain with block diagram, waveforms and truth tables the working of RS Flip-flop.
- 3.9 Explain with block diagram, waveforms and truth tables the working of D Flip-flop.
- 3.10. Explain with block diagram, waveforms and truth tables the working of JK Flip-Flop.
- 3.11 Distinguish between synchronous and asynchronous inputs of a flip-flop
- 3.12. State the need for a Master-Slave Flip-Flop.
- 3.13. Explain the working of a Master-Slave flip-flop using suitable circuit diagram and truth table.

4 Counters and Registers

4.1 Counters

- 4.1.1 Define Counter
- 4.1.2 List the types of counters.
- 4.1.3 Define the terms Synchronous counter, Asynchronous counter
- 4.1.4 Distinguish between asynchronous and synchronous counters.
- 4.1.5 Draw and explain module-8 ripple counter circuit diagram with waveforms and truth tables
- 4.1.6 Draw and explain module-10 (decade) Asynchronous counter circuit diagram with waveforms and truth tables
- 4.1.7 Draw and explain module-8 synchronous counter circuit diagram with waveforms and truth tables
- 4.1.8 List the draw backs of ripple counters.
- 4.1.9 Draw and explain the operation of a 4-bit ring counter.
- 4.1.10 List the applications of counter.

4.2 Register

- 4.2.1 Define Register
- 4.2.2 State the need of Register.
- 4.2.3 List the methods of data transfer in register.
- 4.2.4 List the types of Registers
- 4.2.5 Define Serial in – Serial out register, Serial in – Parallel out register, Parallel in – Serial out register, Parallel in – Parallel out register
- 4.2.6 Explain the working of serial in – serial out register with circuit diagram.
- 4.2.7 Explain the working principle of serial in – parallel out register with circuit diagram.
- 4.2.8 Explain the working principle of shift left Register with circuit diagram.
- 4.2.9 Explain the working of shift right registers with circuit diagram.

5 Additional Combinational Circuits

- 5.1 Define the terms Multiplexer and Demultiplexer

- 5.2 Draw and explain the operation of a 4X1 multiplexer circuit diagram with truth table.
- 5.3 Draw and explain the operation of 1X4 Demultiplexer circuit diagram with truth table.
- 5.4 List the applications of Multiplexers, Demultiplexers.
- 5.5 Define the terms Encoder and Decoder.
- 5.6 Draw and explain the operation of a 4-to-10-linedecoder circuit diagram with truth table.
- 5.7 Draw and explain the operation of a 8 to 3 encoder circuit diagram with truth table.
- 5.8 List applications of Decoders, Encoders.

CO-PO/PSO Matrix:

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CI305.1	3	3	3		2			3	2	3
CI305.2	3	3	3	2	1	1		3	2	2
CI305.3	2	1	1	1			1	1	1	3
CI305.4	2	2	3	1		2	1	2	2	1
CI305.5	2	2	3	1	1	1	2	3		1
Average	2.4	2.2	2.6	2.25	1.3	1.3	1.3	2.4	1.75	2

3=Strongly mapped , 2=moderately mapped, 1=slightly mapped

NOTE:

The gap in CO and PO mapping will be met by one or more appropriate activities from the following:

- (i) Assignments (ii) Tutorial (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizes
- (vii) Industrial Visits (vii) Techfests (ix) Mini Projects (x) Library visits etc.,

COURSE CONTENTS

1. Number Systems: Number Systems, Decimal, Binary, Hexadecimal and Octal codes - Conversion from one number system to another number system - Binary numbers representation - Binary arithmetic - Binary coded decimal (BCD) coding scheme - Character representation codes.

2. Boolean algebra and Logical Gates: Boolean Algebra - AND, OR, NOT ,EX-OR and EX-NOR operations - postulates in Boolean algebra - Boolean theorems, Boolean simplifications of Boolean expressions,

Using De-Morgan's theorems- Simplify the given Boolean expression - Generate Boolean expression for given truth table -Using K – map to simplify Boolean expression–

LOGIC GATES – AND,OR,NOT,EX-OR,EX-NOR,NAND and NOR gates - Implement AND, OR, NOT gates using NAND gates only and NOR gates only –

Basic Combinational Circuits – Half adder – Draw Half-Adder circuit using an exclusive OR and an AND gate -Full Adder – Full Adder using two Half-Adder and an OR gate -Parallel Adder – 4-bit parallel adder using full adders - Serial Adder – Advantages and disadvantages of Parallel adder - Advantages and disadvantages of Parallel adder - Differences between serial adder and parallel adder - digital comparator circuit for two 4-bitwords.

3. FLIP FLOP: Different logic families - positive and negative logic levels - Basic principles of Flip Flop operation- Explanation of NAND Latch, NOR Latch,RS,D,JK and Master Slave JK flip flops with block diagram, truth table and wave forms.

4. Counters: Basics of Asynchronous, Synchronous counters – Explanation of Asynchronous MOD-8 and MOD-10 counters with diagrams and wave forms- Explanation of Synchronous MOD-8 counter with diagrams and wave forms – 4-bit ripple counter and listing its applications

Registers: Basics of registers –definition, need and types of registers -.definition of SISO,SIPO,PISO and PIPO registers – Explanation of SISO and SIPO registers with diagram- Shift Left and Shift right registers.

5.Additional Combinational Circuits:Definitions of Multiplexer,De-Multiplexers – Explanation of 4X1 Multiplexer – Explanation of 1X4 Demultiplexer – Applications of Multiplexers, Demultiplexers – Definitions of encoder,Decoder - Explanation of 4-to-10-line decoder – Explanation of 8 to 3 encoder – Applications of Encoder,Decoders

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2. Digital Electronics.... Bignell – Thomson
3. Modern Digital Electronics.... R.P. JAIN
4. <https://www.electronics-tutorials.ws/binary/binary-coded-decimal.html>
5. <https://learnabout-electronics.org/Digital/dig11.php>
6. <https://www.geeksforgeeks.org/digital-logic/counters-in-digital-logic/>

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TEST –I &UNIT TEST-II

Unit Test	Learning outcomes to be covered
Unit Test-I	From 1.1 to 3.7
Unit Test-II	From 3.8 to 5.8

OPERATING SYSTEMS

Course code	Course Title	No. of Periods/Weeks	Total No. of periods	Marks for FA	Marks for SA	Credits
26CI306E	Operating Systems	3	45	30	70	2

TIME SCHEDULE

Chapter No.	Chapter/Unit Title	No. of Periods	Marks	No. of Short Answer Questions	No. of Essay Type Questions	CO's Mapped
1.	Introduction to Operating system	6	14	2	1	CO1
2.	Process management	12	25	3	2	CO2
3.	Deadlocks	10	19	1	2	CO3
4.	Memory management	12	22	2	2	CO4
5.	Disk scheduling	6	14	2	1	CO5
Total		45	94	10	8	

COURSE OBJECTIVES

Upon on completion of the course the student shall be able to	
(i)	To know about the basics of Operating Systems
(ii)	To familiarize with process management, Scheduling algorithms,

(iii)	To understand deadlock techniques
(iv)	To understand various Memory management techniques
(v)	To familiarize with Disk management

COURSE OUTCOMES

CO1	CI306.1	Explain basic concepts of Operating System
CO2	CI306.2	Explain process scheduling algorithm
CO3	CI306.3	Describe Deadlock handling techniques
CO4	CI306.4	Use memory management techniques and page replacement algorithms
CO5	CI306.5	Describe Disk scheduling algorithms

LEARNING OUTCOMES:

1.0 Introduction to operating systems

- 1.1 Define an operating system
- 1.2 Discuss about various types of operating systems
- 1.3 Define multi programming and timesharing
- 1.4 Describe multi processor systems
- 1.5 Describe the operating system components
- 1.6 Discuss operating system services
- 1.7 Define system call with an example
- 1.8 List and explain different types of system calls

2.0 Process management

- 2.1 Define process and process control block
- 2.2 Explain process state diagram
- 2.3 Define Thread and describe multithreading
- 2.4 Explain scheduling concepts
- 2.5 Explain CPU scheduling and scheduling criteria
- 2.6 Explain various scheduling algorithms
 - 2.6.1 FCFS
 - 2.6.2 SJF
 - 2.6.3 Round Robin
 - 2.6.4 Priority

3.0 Deadlocks

- 3.1 Explain interprocess communication
- 3.2 Define Deadlock
- 3.3 State the necessary conditions for arising deadlocks
- 3.4 State various techniques for deadlock prevention
- 3.5 Discuss Deadlock avoidance and detection

4.0 Memory management

- 4.1 Define Address binding
- 4.2 Explain single partition allocation
- 4.3 Explain multiple partition allocation
- 4.4 Explain the concept of fragmentation
- 4.5 Explain paging concept
- 4.6 Explain how logical address is translated into physical address
- 4.7 Define virtual memory techniques
- 4.8 Describe page replacement
- 4.9 Discuss on page replacement algorithms
 - 4.9.1 FIFO
 - 4.9.2 LRU
 - 4.9.3 Optimal

5.0 Disk scheduling

- 5.1 List out various disk performance parameters

5.2 Disk scheduling policies

5.2.1 FIFO

5.2.2 SSTF

5.2.3 SCAN

CO-PO/PSO Mapping

CONO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO 2	PSO3
CO1	3	2	2	2	3	3	3	3	2	2
CO2	3	3	3	2	2	3	3	2	2	2
CO3	3	3	3	2	3	3	3	3	2	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	3	2	2	2	3	3	3	3	3
Average	3	2.8	2.6	2.2	2.6	3	3	2.8	2.4	2.6

3=Strongly mapped, 2=moderately mapped,1=slightly mapped Learning

NOTE:

The gap in CO and PO mapping will be met by one or more appropriate activities from the following:

- (i) Assignments (ii) Tutorial (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizes
(vii) Industrial Visits (vii) Techfests (ix) Mini Projects (x) Library visits etc.,

COURSE CONTENT

1. Introduction to operating systems

Operating System -Types of Operating Systems - Multi Programming and Time Sharing--
Multi processor systems-Components of Operating Systems - operating System Services -
system Calls

2. Process management

Processes - Process State Diagram - Process Control Block - Threads and Multi Threading
- Scheduling Concepts - Schedulers - CPU scheduling and Scheduling criteria - scheduling
algorithms.

3 Synchronization & Deadlocks

Inter Process Communications- Deadlocks - principal of deadlock - deadlock prevention -
deadlock detection - deadlock avoidance.

4 Memory management

Address binding -memory allocation- fragmentation-paging-Benefits of virtual memory -
virtual memory techniques - demand paging - page replacements - page replacement
algorithms.

5 Disk scheduling

Disk performance parameters - Disk scheduling policies –Introduction to file systems -
File management

REFERENCE BOOKS

1. Operating Systems -- SilberSchatz and Galvin
2. Operating Systems -- William Stallings, PHI
3. Operating Systems -- Dietel and Dietel
4. Operating Systems -- Dhamdhere (TMH)
5. Advanced Operating Systems -- Tanenbaum

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TEST –I & UNIT TEST-II

Unit Test	Learning outcomes to be covered
Unit test-1	From 1.1 to 3.2
Unit test-2	From 3.3 to 5.2

SIMULATION SOFTWARES

Course code	Course Title	No. of Periods/Weeks	Total No. of periods	Marks for FA	Marks for SA	Credits
26CI307A	SIMULATION SOFTWARES	2	30	-	-	-

TIME SCHEDULE

S. No	Chapter/Unit Title	No. of Periods
1	Introduction to Simulation in Engineering	4
2	MATLAB Programming Essentials	6
3	Simulink and Introduction to ThingSpeak	8
4	Tinkercard circuits- Digital and Analog Simulations	6
5	Integrated Systems	6
	Total	30

COURSE OBJECTIVES

Upon on completion of the course the student shall be able to	
(i)	To learn about the purpose of simulation tools
(ii)	To understand about environments for simulation tools
(iii)	To visuvalize data using MATLAB PLOTS
(iv)	To learn about integration of MATLAB/SIMULINK with IOT using Thing speak
(v)	To understand Tinkercard interface and simulation
(vi)	To Build and simulate complete systems and integration using multiple tools

COURSE OUTCOMES

CO1	CI307.1	Explain the purpose of Simulation Tools
CO2	CI307.2	Explain about MATLAB programming essentials
CO3	CI307.3	Explain about SIMULINK blocks and libraries
CO4	CI307.4	Interfacing of SIMULIMK with ThingSpeak
CO5	CI307.5	Simulate Digital and Analog circuits using Tinkercad
CO6	CI307.6	Build and simulate Complete Systems by integration

LEARNING OUTCOMES:

1. Introduction to simulation in Engineering

- 1.1 Define simulation and modeling
- 1.2 List Examples of simulation software

- 1.3 Understand the importance of simulation in Engineering
- 1.4 Installation of
 - 1.4.1 MATLAB
 - 1.4.2 Tinkercard
- 1.5 Create of a free ThingSpeak account
- 1.6 Setup Environments of Simulation Tools
- 2. MATLAB Programming Essentials**
 - 2.1 MATLAB
 - 2.1.1 Environment
 - 2.1.2 Workspace
 - 2.2 Understand about
 - 2.2.1 Datatypes
 - 2.2.2 Variables
 - 2.2.3 operators
 - 2.3 Write
 - 2.3.1 Scripts
 - 2.3.2 Functions
 - 2.4 Understand Working of control structures if and loops
 - 2.5 Plot graphs in MATLAB- Sine wave and bar charts
- 3. SimuLink and Introduction of ThingSpeak**
 - 3.1 To learn about Simulink Blocks and Libraries
 - 3.2 Create models using blocks
 - 3.3 Understand Signal routing, scope and sinks
 - 3.4 To know about acquisition basics
 - 3.5 Interface Simulink with ThingSpeak
 - 3.6 To Send sensor data to cloud using ThingSpeak
- 4. Tinkercad Circuits – Digital and Analog Simulations**
 - 4.1 Understand about Tinkercard interface
 - 4.2 Understand basic electronic components
 - 4.3 Demonstrate digital circuit design-LED,Switch,Buzzer
 - 4.4 Demonstrate analog circuit design-resistors,capacitors,sensors
 - 4.5 Simulate Microcontroller with Arduino UNO
 - 4.6 Simulate LED blinking circuit
 - 4.7 Use potentiometer to control LED brightness
 - 4.8 Simulate temperature sensing using Arduino and serial monitor
- 5. Integrated Systems**
 - 5.1 Design integrated systems using Simulink/ThingSpeak/Tinkercad
 - 5.2 LED-based home automation simulation
 - 5.3 Water level monitor using Arduino and ThingSpeak

CO-PO/PSO Mapping

CONO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO 2	PSO3	PSO4
CO1	3	2	2	3	2	2	3	3	2	2	1
CO2	3	3	2	3	2	2	3	2	3	3	1
CO3	3	3	3	3	2	2	3	2	3	2	1
CO4	3	3	3	3	3	3	3	3	2	2	2
CO5	3	3	3	3	3	3	3	3	2	2	2
CO6	3	3	3	3	3	3	3	3	3	2	2
Average	3	2.8	2.7	3	2.5	2.5	3.0	2.6	2.5	2.2	1.5

3=Strongly mapped, 2=moderately mapped, 1=slightly mapped Learning

COURSE CONTENT

1- Introduction to Simulation in Engineering

Simulation - Modeling - Real-world systems - Computational models - MATLAB - Simulink - Tinkercad - ThingSpeak - Engineering applications - Cost reduction - Time-saving - Safety - Virtual prototyping - MATLAB installation - Tinkercad registration - ThingSpeak account - API key - Channel setup - Simulation tools environment

2- MATLAB Programming Essentials

MATLAB interface - Command Window - Editor - Workspace - Data types - Variables - Scalars - Arrays - Matrices - Operators - Arithmetic - Logical - Relational - Scripts - Functions - Control structures - If - Else - For loop - While loop - Plot - Graph - Sine wave - Bar chart

3- Simulink and ThingSpeak Integration

Simulink blocks - Library browser - Block diagram - Model creation - Signal routing - Scope – Sink blocks - Data acquisition - Sampling - MATLAB function block - HTTP POST - ThingSpeak API - Cloud connection - Sensor data - Real-time simulation - Channel update - Data visualization

4- Tinkercad Circuits – Digital and Analog Simulations

Tinkercad interface - Circuit editor - Breadboard - Electronic components - LED - Switch - Buzzer - Resistor - Capacitor - Sensor - Arduino UNO - Code editor - Serial monitor - LED blink - Delay - Potentiometer - PWM - Brightness control - Temperature sensor - Serial output

5- Integrated Systems

Integrated systems - Simulink - ThingSpeak - Tinkercad - System simulation - Cloud integration - Automation - LED control - Home automation - WiFi module - ESP8266 - Water level sensor - Ultrasonic sensor - Data logging - IoT dashboard - Real-time monitoring

REFERENCE BOOKS AND LINKS

1. Simulation Modeling and Analysis – Averill M. Law
2. A Practical Introduction to Programming and Problem Solving – Stormy Attaway
3. MATLAB Modeling with Simulink – Devendra K. Chaturvedi
4. Getting Started with Arduino – Massimo Banzi & Michael Shiloh
5. Internet of Things: Principles and Paradigms – Rajkumar Buyya, Amir Vahid Dastjerdi
6. <https://www.mathworks.com/learn/tutorials.html>
7. <https://www.tinkercad.com/learn/circuits>
8. <https://thingspeak.com>
9. <https://www.arduino.cc/en/Tutorial/HomePage>
10. <https://randomnerdtutorials.co>

BASIC ELECTRONICS AND IOT LAB

Course Code	Course title	No of periods/week	Total no of periods	Marks for FA	Marks for SA	Credits
26CI308L	Basic Electronics and IOT Lab	06	90	40	60	1.5

TIME SCHEDULE

S No	Unit Title	No. of Periods	COs Mapped
1	Identifying different electronic components, Soldering practice, Study and use of Electronic equipment	15	CO1
2	Testing of electronic devices, Measurement of electrical parameters using CRO	12	CO2
3	Rectifiers, Power supplies and batteries	18	CO3
4	a) Familiarization with Arduino Uno Board b) Basic I/O interfacing using Arduino	33	CO4
5	Interfacing with basic sensors and actuators	12	CO5
	Total	90	

COURSE OBJECTIVES

Upon on completion of the course the student shall be able to	
(i)	To have hands on practice on Soldering, de-soldering of circuits, preparation of PCB for given circuits, to get acquainted with the usage of electronic equipment
(ii)	To test electronic devices and obtain their characteristics

(iii)	To construct and measure various parameters of rectifiers.
(iv)	To Familiarization with Arduino Uno Board and to interface basic I/O using Arduino
(v)	To learn the practical importance of basic sensors and actuators using Arduino

COURSE OUTCOMES

CO1	CI308.1	Practice on Soldering, de-soldering of circuits, preparation of Pcb for given circuits
CO2	CI308.2	Operating different electronic equipment, Plot the characteristics of electronic devices
CO3	CI308.3	Construct the rectifiers and obtain different parameters
CO4	CI308.4	Describe the usage of Arduino Uno board and Apply I/O Interfacing using Arduino
CO5	CI308.5	Build basic prototype with sensors and actuator using Arduino

LEARNING OUTCOMES:

1.0 Identify different Electronic Components and devices, Soldering practice, Study and use of Electronic equipment

- a) Identify the components, its terminals, and test :
 - i) colour coded resistors, different fixed and variable type resistors, different Inductors- different types of capacitors: ceramic, disc, paper, mica, gang etc.
 - ii) different SMD resistors, SMD inductors, SMD capacitors
 - iii) Diodes, Transistors, JFETs, MOSFETs
 - iv) Relays, Switches –SPST,SPDT,DPST,DPDT- Toggle-Push button –Rotary-Slider –Thumb Wheel
 - v) Diode, transistor & IC's SMD packages (SOT,PLCC),
 - vi) Different LEDs-Red LED, Blue LED, Green LED, Bi colour LED, Infrared LED, different sizes and forms, their specifications
- b) Soldering components on to general purpose PCB as per the given circuit diagram
- c) Study of AC/DC voltmeter, AC/DC ammeter, ohm meter, Analogy multimeter, Digital Multi meter.
- d) Study of RPS unit, CRO, Function Generator using their manuals and familiarise with the operation of each equipment.
- e) i) Measure Resistance using multimeter and compare with the calculated

value using the colour code.

ii) Measure L and C using digital LCR meter and compare with the calculated value using the code.

2.0 Testing of electronic devices, Measurement of electrical parameters using CRO

- a) Identify and test PN junction diode, Zener diode, LED, BJT and FET using multi meter
- b) Control a load using relay
 - i) Turn On and Off DC load (LED/Buzzer/DC motor)
 - ii) Turn On and Off AC load (Bulb/Tube light/Fan)
- c) Measure DC voltage using CRO
- d) Measure amplitude and Time period of a sinusoidal signal using CRO.

3.0 Rectifiers, Power supplies and batteries

- a) Obtain output waveforms and measure DC o/p voltage, ripple voltage of a Bridge rectifier with/ without filter at different loads and compare with that of theoretical values
- b) Construct and test the regulated power supply for any given DC voltage using 78XX/79XX
- c) DC to DC (Ex: 12V to 5V) converter as a device
- d) Identify the given batteries/ cells and test whether they are in good condition or not
- e) Connect the given two batteries in series and measure the voltage across the series connection.
- f) Connect the given two batteries in parallel and measure the voltage across the parallel connection.

IOT LAB

IV. Familiarization with Arduino Board, Basic I/O interfacing using Arduino

1. Familiarize with Arduino Uno/Nano/Mega Boards,
2. Familiarize with Arduino IDE (or equivalent software)
3. Install the Arduino IDE and write a program using Arduino IDE to blink LED
4. Interface LED and buzzer with Arduino to buzz for a period of time
5. Interface push button with Arduino to switch ON/OFF the LED
6. Interface push button with Arduino to activate the buzzer
7. Interface 4x3 Keypad using Arduino and Display the status of the keys on LCD display
8. Interface LCD with Arduino and write a program to display given Text message on LCD
9. Interface LDR using Arduino to Vary the Light Intensity of LED
10. Interfacing a seven segment display with Arduino mega and learn to display a count down from nine with a delay of a second, on seven segment display.
11. Interfacing LED bar with Arduino and turns on a series of LEDs based on the value of analog sensor

V. Interfacing with basic sensors and actuators

1. Interface **temperature sensor** with Arduino and turn on the fan when temperature exceeds the threshold level

2. Interface a **LDR** to the Arduino board and write a program to turn ON the AC LAMP when it is dark and turn OFF the AC LAMP when there is light on the sensor.
3. Design and write the program of an Arduino based **DC motor speed control** using a potentiometer
4. Interface a **heat sensor** to the Arduino board and display its reading on an LCD

CO-PO/PSO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	2	2		2	3	2	2
CO2	3	2	2	3				3	2	
CO3	3	2	2	1	1	2		3	1	2
CO4	3	3	3	3	3		3	3	3	3
CO5	3	3	3	3	3	2	3	3	3	3
Average	3	2.4	2.4	2.4	2.25	2	2.67	3	2.2	2.5

3=strongly mapped 2=moderately mapped 1=slightly mapped

DBMS LAB

Course Code	Course Title	No. of periods/week	Total No. of periods	Marks for FA	Marks for SA	Credits
26CM309L	DBMS Lab	6	90	40	60	2

TIME SCHEDULE

S.No	CHAPTER/UNIT TITLE	NO. OF PERIODS	CO'S
1	Concepts of DBMS & RDBMS	12	CO1
2	Concepts of SQL	24	CO2
3	Basics of PL/ SQL	24	CO3
4	Advance PL/SQL	18	CO4
5	Concepts of NoSQL & Mongo DB.	12	CO5
	TOTAL	90	

COURSE OBJECTIVES

Upon completion of the course the student shall able to learn	
(i)	Insert, update, delete and select data into/from Relation Database Develop PL/SQL programs Insert, update, delete and select data from Mongo DB

COURSE OUTCOMES:

CO1	CI309.1	Develop SQL Queries to Create, modify and drop tables and Queries to Insert, update, delete data from tables.
CO2	CI309.2	Execute SQL Queries to display data on different conditions from different tables

CO3	CI309.3	Execute PL/SQL Programs
CO4	CI309.4	Demonstrate the usage of cursors and triggers
CO5	CI309.5	Execute commands to Insert, update, delete and select data in NOSQL and Mongo DB databases

LEARNING OUTCOMES

- 1 Know installation of Oracle
- 2 Exercise on creating tables.
- 3 Exercise on inserting records
- 4 Exercise on updating records
- 5 Exercise on modifying the structure of the table
- 6 Exercise on Select command
- 7 Exercise on querying the table using clauses like WHERE, ORDER BY, IN, AND, OR, NOT, IS NULL
- 8 Exercise on GROUP BY, HAVING
- 9 Exercise on Number functions, character functions, conversion functions and date functions, group functions
- 10 Exercise on set operators
- 11 Exercise on sub queries
- 12 Exercise on Joins
- 13 Exercise on various date and number format models
- 14 Exercise on creating tables with integrity constraints
- 15 Write programs using PL/SQL control statements
- 16 Exercise on Procedures
- 17 Exercise on Functions
- 18 Exercise on pre-defined exception
- 19 Exercise on user-defined exception
- 20 Exercise on Cursors
- 21 Exercise on Triggers
- 22 Exercise on Installation of MongoDB
- 23 Exercise on Creation and Dropping of Database
- 24 Exercise on Creation and Dropping of Collections.
- 25 Exercise on Commands of MongoDB- Insert, update , find, delete and sorting of Documents.

Mini Project : Student has to develop a Mini project applying the skills acquired from the learning outcomes of this course.

CO-PO/PSO Mapping

CO No	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2		3			2	3	3	2	
CO2	2	2	1			2			2	
CO3	2		1					2		2
CO4	2	2	3	3	3	3		2	2	2
CO5	2	3		3		3	3	2	2	
Average	2	2.3	2	3	3	2.6	3	2.3	2	2

3=strongly mapped, 2=moderately mapped, 1=slightly mapped

KEY COMPETENCIES

S. No	Name of the Experiment	Objectives	Key Competencies
1	Know installation of Oracle	Perform the following: <ol style="list-style-type: none"> i. To identify the version of Oracle being installed ii. To understand the RAM and HDD requirements for Oracle installation iii. To comprehend the installation steps correctly iv. Setting up of Oracle Administrative Password v. Configuring the Oracle database after post-installation steps of Oracle viz configuring administrative rights for performing vi. To login to Oracle as administrator account and Oracle user account 	<ul style="list-style-type: none"> ❖ Observe Oracle version being installed ❖ Observe the RAM & HDD requirements ❖ Rectify for any Oracle installation errors ❖ Able to login as Administrator and as Oracle user account
2	Exercise on creating tables.	Perform the following: <ol style="list-style-type: none"> i. To login with Oracle user account ii. To give correct syntax for table creation iii. To give correct data type for the required fields with appropriate size iv. To display the structure of the table 	<ul style="list-style-type: none"> ❖ Correct Table creation syntax errors ❖ Correct the wrong data types and inappropriate sizes for the respective fields ❖ Check for displaying the structure of the table

Sl.No	Name of the Experiment	Objectives	Key Competencies
3	Exercise on inserting records	Perform the following: i. Check for the required table present already ii. To insert the records correctly iii. To display the records correctly	<ul style="list-style-type: none"> ❖ Correct syntax errors for Insertion of record ❖ Check for insertion of proper values for the required fields ❖ Verify the correct values pertaining to the record are inserted in the required table ❖ Check for displaying of the records correctly
4	Exercise on updating records	Perform the following: i. Check for the required table present already ii. To update the records correctly iii. To display the updated records	<ul style="list-style-type: none"> ❖ Correct syntax errors for updation of record ❖ Check for updation of record ❖ Check for displaying of the updated records correctly
5	Exercise on modifying the structure of the table	Perform the following i. To identify the required table present in the system already ii. To add new column iii. To display the records correctly	<ul style="list-style-type: none"> ❖ Correct syntax errors in modifying the structure of the table ❖ Check whether required field is newly added to the existing table ❖ Check for displaying of the modified table correctly
6	Exercise on SELECT command	Perform the following i. To identify the required table present already ii. To display the records in the required table	<ul style="list-style-type: none"> ❖ Check for syntax error in usage of Select command ❖ Check whether Select command is given correctly to display all the records

Sl.No	Name of the Experiment	Objectives	Key Competencies
7	Exercise on querying the table using clauses like WHERE, ORDER, IN,AND, OR,NOT, IS NULL	Perform the following: <ol style="list-style-type: none"> i. To use the Select command ii. To use the clauses WHERE, ORDER, IN,AND, OR, NOT, IS NULL along with Select command on the given records in the table 	<ul style="list-style-type: none"> ❖ Check for syntax error in usage of Select command with appropriate clauses ❖ Check whether Select command along with appropriate clause is given correctly for the required condition ❖ Check the usage of clauses WHERE, ORDER, IN,AND, OR, NOT along with Select command appropriately
8	Exercise on GROUP BY, HAVING	Perform the following: <ol style="list-style-type: none"> i. To use the Select command To use the clauses GROUP BY, HAVING along with Select command on the given records in the table 	<ul style="list-style-type: none"> ❖ Check for syntax error in the usage GROUP BY, HAVING ❖ Check for usage of GROUP BY, HAVING ❖ Verify output values based on certain condition on few records
9	Exercise on Number functions, character functions, conversion functions and date functions, group functions	Perform the following <ol style="list-style-type: none"> i. To use functions ii. To use set command along with WHERE condition, GROUP BY, HAVING 	<ul style="list-style-type: none"> ❖ Check for syntax error of various functions ❖ Check for usage of various functions ❖ Verify output values based on certain condition on few records
10	Exercise on SET operators	Perform the following <ol style="list-style-type: none"> iii. To use set command iv. To use set command along with WHERE condition 	<ul style="list-style-type: none"> ❖ Check for syntax error in the usage of SET command ❖ Check for usage of SET command for updating values based on certain condition on few records

Sl.No	Name of the Experiment	Objectives	Key Competencies
11	Exercise on sub queries	Perform the following i. To use Select command ii. To use appropriate Operators IN	<ul style="list-style-type: none"> ❖ Check for the syntax error in usage of sub queries ❖ Check for the correctness of the usage of appropriate operators used
12	Exercise on Joins	Perform the following i. To create two tables ii. To use the common field if two tables are joined iii. To know different types of Join	<ul style="list-style-type: none"> ❖ Check for the correctness of the syntax used for joining ❖ Check if the join is created between two tables ❖ Check if self join is created
13	Exercise on various date and number format models	Perform the following: i. To use date formats correctly ii. To use number formats correctly	<ul style="list-style-type: none"> ❖ Check for the syntax of the date formats ❖ Check for the syntax of the number formats
14	Exercise on creating tables with integrity constraints	Perform the following i. Create Primary key ii. Create Foreign key or referential integrity constraint iii. Create NOT NULL constraint iv. Create UNIQUE Key constraint v. Create CHECK constraint	<ul style="list-style-type: none"> ❖ Check for the syntax errors in usage of all types of Integrity constraints ❖ Check whether different types of Integrity constraints are used

S. No	Name of the Experiment	Objectives	Key Competencies
15	Write programs using PL/SQL control statements	Perform the following i. To use IF .. ELSE statements ii. To use iterative statements – Simple loop, While Loop, For Loop	<ul style="list-style-type: none"> ❖ Check for the syntax of IF.. ELSE statements ❖ Check for the syntax of all iterative statements
16	Exercise on Procedures	Perform the following i. To know the concept ii. To declare procedures iii. The type of parameters IN,IN OUT,OUT iv. To call procedures from other procedures	<ul style="list-style-type: none"> ❖ Check for proper declaration of procedures ❖ Check for syntax of procedures ❖ Check for proper calling of procedures
17	Exercise on Functions	Perform the following i. To know the concept ii. To declare function with return data iii. To call functions from other functions	<ul style="list-style-type: none"> ❖ Check for proper declaration of function ❖ Check for syntax of parameters and its data type ❖ Check for proper return data type from the functions ❖ Check for variable assignment to get the returned value from the function
18	Exercise on pre defined exception	Perform the following i. To know the concept ii. To write programs with exception section	<ul style="list-style-type: none"> ❖ Check for proper declaration Exception section ❖ Check for syntax of Exception section

S. No	Name of the Experiment	Objectives	Key Competencies
19	Exercise on user defined exception	Perform the following i. To know the concept ii. To write programs with exception section	❖ Check for proper declaration Exception section ❖ Check for syntax of Exception section
20	Exercise on Cursors	Perform the following i. To know the concept cursors ii. To know the fetch data from database	❖ Check for the syntax of cursor ❖ Check for open cursor, fetch data, close cursor ❖ Check for the result
21	Exercise on Triggers	Perform the following i. To know the concept of triggers ii. Validation before and after insert, before and after update and , before and after delete data	❖ Check for the syntax of trigger ❖ Write a trigger which raises before insert data ❖ Raise trigger ❖ Repeat the procedure for remaining ❖ Check for the result
22	Exercise on Installation of Mongo DB	Perform the following i. To download and install Mongo DB	❖ Observe MongoDB version being installed ❖ Observe the RAM & HDD requirements ❖ Rectify for any Mongo DB installation errors Able to login as Administrator

S. No	Name of the Experiment	Objectives	Key Competencies
23	Exercise on Creation and Dropping of Database	Perform the following i. Create the Database ii. Drop the Database	<ul style="list-style-type: none"> ❖ Know the use of create Database() and dropDatabase() ❖ Correct Database creation syntax errors ❖ Check for displaying the database name
24	Exercise on Creation and Dropping of Collections	Perform the following i. Create the Collection ii. Drop the Collection	<ul style="list-style-type: none"> ❖ Know the use of create Collection() and drop() ❖ Correct Database creation syntax errors ❖ Check for collection name ❖ Check for the collection dropped
25	Exercises on commands of Mongo DB	Execute the following commands of Mongo DB i. Insert the Document ii. update the Document iii. find the Document iv. Delete the Document v. sort the Documents	<ul style="list-style-type: none"> ❖ Know the syntax of insert(), update(), find(), remove(), sort() functions. ❖ Correct syntax errors. ❖ Check out for different input values.

LINUX PRACTICALS

Course code	Course Title	No. of Periods/Weeks	Total No. of periods	Marks for FA	Marks for SA	Credits
26CI310L	Linux Practicals	4	60	40	60	2

TIME SCHEDULE

S.No.	Chapter/Unit Title	No. of Periods	CO's Mapped
1.	Linux Installation and user management	8	CO1
2.	LINUX commands	24	CO2
3.	LINUX editors	4	CO3
4	LINUX Shell Programs	24	CO4
TOTAL		60	

COURSE OBJECTIVES

Upon completion of the course the student shall be able to	
(i)	To know the basics of linux installation and user management.
(ii)	To use and execute linux commands.
(iii)	To know the usage of different Linux editors.
(iv)	To know about the shell programming and execute shell programs.

COURSE OUTCOMES

CO1	CI310.1	Demonstrate Linux installation and user management
CO2	CI310.2	Demonstrate Linux commands and Linux Editors
CO3	CI310.3	Execute shell programs using expressions, operators

CO4	CI310.4	Execute shell programs on control statements and conditional statements, Files, Functions and string manipulations
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LEARNING OUTCOMES:(PRACTICUM SUBJECT)

S.No	LEARNING OUT COMES	THEORY (explained using PPT,useful videos from youtube etc.,)	PRACTICAL (Key competencies table enclosed)
1	Installation of Linux	Explanation of Linux installation like ubuntu,kali,centos	Demonstration of Insallation of various Linux distributions like Ubuntu, kali,Centos etc.,
2	Creating and managing user accounts in LINUX	Explanation of Creating and managing user accounts in LINUX	Demonstration of Creating and managing user accounts in LINUX
3	Exercise on Basic Commands	Listing and explaining basic Linux Commands	Demonstration on Basic Linux commands
4	Exercise on Linux File Directory Management commands	Listing and explaining of Linux File Directory Management commands	Demonstration of Linux File Directory Management commands
5	Exercise on Linux Permissions and Ownership commands	Listing and explaining of Linux Permissions and Ownership commands	Demonstration of Linux Permissions and Ownership commands
6	Exercise on Linux Archiving and Compression commands	Listing and explaining of Linux Archiving and Compression commands	Demonstration of Linux Archiving and Compression commands
7	Exercise on Linux System Monitoring and Management commands	Listing and explaining of Linux System Monitoring and Management commands	Demonstration of Linux System Monitoring and Management commands

8	Exercise on Linux Miscellaneous and Utility Commands	Listing and explaining of Linux Miscellaneous and Utility commands	Demonstration of Linux Miscellaneous and Utility commands
9	Exercise on Linux Disk and Memory Management commands	Listing and explaining of Linux Disk and Memory Management commands	Demonstration of Linux Disk and Memory Management commands
10	Exercise on Linux filters commands	Listing and explaining of on Linux filters commands	Demonstration of on Linux filters commands
11	Exercise on Linux Text editors	Explanation of Linux editors like vi,vim etc.,	Demonstration of Linux editors like vi,vim
12	Exercise on shell script using expressions, operators	NA	Execution of shell script
13	Exercise on Shell Script on control statements.	NA	Execution of shell script
14	Exercise on Shell script on conditional statements.	NA	Execution of shell script
15	Exercise on Shell script on LOOP statements	NA	Execution of shell script
16	Exercise on shell script on string manipulations.	NA	Execution of shell script
17	Exercise on Shell script on FUNCTIONS	NA	Execution of shell script
18	Exercise on Shell script on FILES	NA	Execution of shell script

CO-PO/PSO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	2	3	1	1	2	1	3	2	1
CO2	1	3	2	1	3	2	2	3	2
CO3	1	2	2	2	2	1	2	3	2
CO4	1	3	3	2	3	2	3	3	3
Average	1.25	2.75	2	1.5	2.5	1.5	2.5	2.75	2

KEY COMPETENCIES

S. No	Name of the Experiment	Objectives	Key Competencies
1.	Installation of Linux	Installation on Linux distributions like Ubuntu, kali, Centos etc.,	<ol style="list-style-type: none"> 1. Choose method to install 2. Choose a Linux distribution 3. Check for the syntax errors and clear the errors 4. Follow install method instructions
2.	Creating and managing user accounts in LINUX	Creating and managing user accounts in Linux	<ol style="list-style-type: none"> 1. Create user account 2. Modify user accounts 3. Delete user accounts 4. Remove user accounts
3.	Exercise on Basic Commands	To Run Linux shell basic commands	<ol style="list-style-type: none"> 1. Open Linux OS 2. Open shell 3. Run basic shell commands 4. Observe output of command
4.	Exercise on Linux File Directory Management commands	To Run Linux File Directory Management commands	<ol style="list-style-type: none"> 1. Open Linux OS 2. Open shell 3. Run various File directory and management commands in the shell 4. Observe output of command

5.	Exercise on Linux Permissions and Ownership commands	To Run Linux Permissions and Ownership commands	<ol style="list-style-type: none"> 1. Open Linux OS 2. Open shell 3. Run various Permissions and Ownership command in the shell 4. Observe output of command
6.	Exercise on Linux Archiving and Compression commands	To Run Linux Archiving and Compression commands	<ol style="list-style-type: none"> 1. Open Linux OS 2. Open shell 3. Run various Archiving and Compression command in the shell 4. Observe output of command
7.	Exercise on Linux System Monitoring and Management commands	To Run System Monitoring and Management commands	<ol style="list-style-type: none"> 1. Open Linux OS 2. Open shell 3. Run various System Monitoring and Management commands in the shell 4. Observe output of command
8.	Exercise on Linux Miscellaneous and Utility Commands	To Run Miscellaneous and Utility Commands	<ol style="list-style-type: none"> 1. Open Linux OS 2. Open shell 3. Run various Miscellaneous and Utility Commands in the shell 4. Observe output of command
9.	Exercise on Linux Disk and Memory Management commands	To Run Disk and Memory Management commands	<ol style="list-style-type: none"> 1. Open Linux OS 2. Open shell 3. Run various Disk and Memory Management Commands in the shell 4. Observe output of command

10.	Exercise on Linux filters commands	To Run Linux filters commands	<ol style="list-style-type: none"> 1. Open Linux OS 2. Open shell 3. Run various Filtering Commands in the shell 4. Observe output of command
11.	Exercise on Linux Text editors	Working on Linux text editors like vi	<ol style="list-style-type: none"> 1. Opening/Creating a File 2. Editing Modes (for modal editors like Vim) 3. Text Input and Manipulation 4. Saving Changes 5. Exiting editor
12.	Exercise on shell script using expressions, operators	Write a shell script program on expressions and operators to demonstrate various operators and expression in Linux shell script	<ol style="list-style-type: none"> 1. Create the Shell Script File with operators and expressions 2. Add the Shebang Line 3. Implement the expressions and operators 4. Check for the correctness of output for the given input 5. Save script 6. Make the Script Executable by granting execute permissions 7. Run the Script 8. Verify and Debug
13.	Exercise on Shell Script on control statements.	Write a shell script program on control statements to demonstrate various control statements in Linux shell script	<ol style="list-style-type: none"> 1. Create the Shell Script File with control statements 2. Add the Shebang Line 3. Implement the expressions and operators 4. Check for the correctness of output for the given input 5. Save script 6. Make the Script Executable by granting execute permissions 7. Run the Script 8. Verify and Debug

14	Exercise on Shell script on conditional statements.	Write a shell script program on conditional statements to demonstrate various conditional statements in Linux shell script	<ol style="list-style-type: none"> 1. Create the Shell Script File with conditional statements 2. Add the Shebang Line 3. Implement the expressions and operators 4. Check for the correctness of output for the given input 5. Save script 6. Make the Script Executable by granting execute permissions 7. Run the Script 8. Verify and Debug
15.	Exercise on Shell script on LOOP statements	Write a shell script program on Loop statements to demonstrate various loop statements in Linux shell script	<ol style="list-style-type: none"> 1. Create the Shell Script File with loop statements 2. Add the Shebang Line 3. Implement the expressions and operators 4. Check for the correctness of output for the given input 5. Save script 6. Make the Script Executable by granting execute permissions 7. Run the Script 8. Verify and Debug file
16	Exercise on shell script on string manipulations.	Write a shell script program on string manipulation commands to demonstrate string manipulation commands in Linux shell script	<ol style="list-style-type: none"> 1. Create the Shell Script File with string commands 2. Add the Shebang Line 3. Implement the expressions and operators 4. Check for the correctness of output for the given input 5. Save script 6. Make the Script Executable by granting execute permissions 7. Run the Script 8. Verify and Debug file

17.	Exercise on Shell script on FUNCTIONS	Write a shell script program on functions to demonstrate functions in Linux shell script	<ol style="list-style-type: none"> 1. Create the Shell Script File with functions 2. Add the Shebang Line 3. Implement the expressions and operators 4. Check for the correctness of output for the given input 5. Save script 6. Make the Script Executable by granting execute permissions 7. Run the Script 8. Verify and Debug file
18.	Exercise on Shell script on FILES	Write a shell script program on files to demonstrate files in Linux shell script	<ol style="list-style-type: none"> 1. Create the Shell Script File 2. Add the Shebang Line 3. Implement the expressions and operators 4. Check for the correctness of output for the given input 5. Save script 6. Make the Script Executable by granting execute permissions 7. Run the Script 8. Verify and Debug file

**TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR
UNIT TEST-I & UNIT TEST-II**

Unit Test	Key Competencies to be Covered
Unit Test – 1	From 1 to 9
Unit Test – 2	From 10 to 18

IV SEMESTER

MICROCONTROLLERS AND INTERFACING

Course Code	Course title	No of periods/week	Total no of periods	Marks for FA	Marks for SA	Credits
26CI401T	Microcontrollers and Interfacing	06	90	30	70	3

TIME SCHEDULE

S.No	Unit Title	No. of Periods	Weightage of Marks	No.of Short Answer Questions	No. of Essay Questions	COs Mapped
1	Architecture of Microcontroller 8051	20	22	2	2	CO1
2	Instruction set of 8051 microcontrollers	15	22	2	2	CO2
3	8051 Programming Concepts	20	22	2	2	CO3
4	Interfacing Simple I/O Devices	20	14	2	1	CO4
5	Programming in Embedded C	15	14	2	1	CO5
	Total	90	94	10	8	

COURSE OBJECTIVES

Upon completion of the course, the student shall be able to	
(i)	To familiarize with various microcontrollers
(ii)	To understand the programming and applications of 8051 microcontrollers
(iii)	To learn the practical importance and applications of Microcontrollers.

COURSE OUTCOMES

CO1	CI401.1	Describe the Architecture of 8051 microcontroller
CO2	CI401.2	Explain the instruction set of 8051 microcontrollers
CO3	CI401.3	Analyse 8051 programming for Arithmetic and Logical operations
CO4	CI401.4	Describe the Interfacing techniques of I/O devices with 8051 microcontrollers.
CO5	CI401.5	Analyse 8051 programming using Embedded C.

LEARNING OUTCOMES:

1.0 Architecture of Microcontroller 8051

- 1.1 List the features of microcontrollers.
- 1.2 Compare microprocessors and microcontrollers
- 1.3 State the details of 8051 microcontroller family chips
- 1.4 Draw the functional block diagram of 8051 microcontroller and state the function of each block
- 1.5 Draw the pin diagram of 8051 microcontroller and specify the purpose of each pin
- 1.6 Explain the internal memory organization of 8051 with suitable diagram
- 1.7 Explain the external memory organization of 8051
- 1.8 List various special function registers of 8051 and state their functions
- 1.9 Explain PSW register of 8051
- 1.10 Explain the SFRs associated with timer/counters of 8051
- 1.11 Explain the modes of operations of counters & timers in 8051
- 1.12 List the interrupts of 8051
- 1.13 Explain the SFRs associated with interrupts of 8051
- 1.14 Explain the SFRs associated with serial communication of 8051
- 1.15 List the modes of operation of serial communication with 8051
- 1.16 Describe various I/O ports of 8051

2.0 Instruction set of 8051 micro controllers

- 2.1 State the need for an instruction set
- 2.2 Mention the instruction format of 8051
- 2.3 State the terms operation code, operand and illustrate these terms by writing an instruction
- 2.4 Define fetch cycle, execution cycle and instruction cycle.
- 2.5 Distinguish between machine cycle and T-state.
- 2.6 Define the terms machine language, assembly language, and mnemonics.
- 2.7 Classify the 8051 instructions into one byte, two byte and three-byte instructions
- 2.8 Classify the 8051 instructions based on their function
- 2.9 List the various addressing modes of 8051 and explain them with examples.
- 2.10 Explain various data transfer group of instructions of 8051 with examples
- 2.11 Explain various arithmetic instructions of 8051
- 2.12 State the effect of arithmetic operations on flags of 8051 with examples
- 2.13 Explain the logic instructions and recognize the flags that are set or reset for given data conditions
- 2.14 List various bit manipulation instructions of 8051 and illustrate with examples
- 2.15 Explain unconditional jump instructions of 8051
- 2.16 Explain conditional jump instructions of 8051
- 2.17 Explain CALL and RET instructions of 8051
- 2.18 State the use of NOP instruction of 8051

3.0 8051 Programming Concepts using assembly language

- 3.1 List the various symbols used in drawing flow charts
- 3.2 Write programs in 8051 assembly language to illustrate the application of data copy instructions
- 3.3 Write programs in 8051 assembly language to perform single byte and double byte addition and subtraction.
- 3.4 Write programs in 8051 assembly language which use jump instructions
- 3.5 Write a delay subroutine to introduce time delay of given time period (in milliseconds) without using 8051 internal timers.
- 3.6 Write a program to introduce time delay of given time period (in milliseconds) using 8051 internal timer.

- 3.7 Define a subroutine and state its use.
- 3.8 Explain the sequence of program when subroutine is called and executed.
- 3.9 Explain information exchange between the program counter and the stack and identification of stack pointer register when a subroutine is called and executed.
- 3.10 Illustrate PUSH, POP instructions with an example.
- 3.11 Define the term debugging a program
- 3.12 Explain the principles of single step and break point debugging techniques

4.0 Interfacing Simple I/O devices

- 4.1 Explain the Interfacing concepts of push button switches and LEDs with 8051
- 4.2 Draw a diagram to connect an LED to a port pin and write an 8051-assembly language program to blink it with a given time delay.
- 4.3 Interface a common cathode/anode seven segment display with 8051 and write a program to display a given decimal number
- 4.4 List reasons for the popularity of LCDs
- 4.5 State the functions of pins of 16x2 LCD module
- 4.6 List the instruction command codes for programming 16x2 LCD module
- 4.7 Explain Interfacing of 16x2 LCD module to 8051
- 4.8 Write an 8051 ALP to display a given message on 16x2 LCD module
- 4.9 Describe key bouncing problem and de-bouncing solutions
- 4.10 Explain the Interfacing concepts of a 4x4 Matrix Key Board with 8051 with diagram
- 4.11 Explain the interfacing concepts of stepper motor with 8051 and write a program to run the motor continuously
- 4.12 Interface 8051 with Relay to drive a lamp

5.0 Programming using Embedded C

- 5.1 List the differences between C and Embedded C
- 5.2 List the reasons for writing programs in Embedded C
- 5.3 Explain the C data types for 8051
- 5.4 Write an 8051 C program to store the data in the accumulator
- 5.5 Write a program to load three numbers into Accumulator and send them to port 1
- 5.6 Write an 8051 C program to send values 00 – FF to port P1
- 5.7 Write an 8051 C program to toggle all the bits of P1 continuously.
- 5.8 Write an 8051 C program to toggle bits of P1 ports continuously with 250 ms.
- 5.9 Write a C program for 8051 to transfer the letter “A” serially at 9600 baud continuously. Use 8-bit data and 1 stop bit.
- 5.10 Write an 8051 C program to toggle all the bits of port P1 continuously with some delay in between. Use Timer 0, 16-bit mode to generate the delay.

CO-PO/PSO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3							3		
CO2	3	3						3		
CO3	3	3	3		3			3	3	3
CO4	3	3	3		3		2	3	3	3
CO5	3	3	3		3		3	3	3	3
Average	3	3	3		3		2.5	3	3	3

3=strongly mapped 2=moderately mapped 1=slightly mapped

Note:

The gaps in CO and PO mapping will be met by one or more appropriate activities from the following:

- (i) Assignments, (ii) Tutorials, (iii) Seminars, (iv) Guest Lectures, (v) Group Discussions, (vi) Quizzes,
(vii) Industrial visits, (viii) Tech Fests, (ix) Mini projects, (x) Library visits etc.

COURSE CONTENTS:

1. Architecture of Microcontroller 8051

Features of micro controllers, Compare Microprocessors and Microcontrollers, block diagram of 8051 microcontroller, pin diagram of 8051 microcontroller, internal memory & external memory organizations, various special function registers, PSW, SFRs, counters & timers, interrupts in 8051, Serial communication of 8051, I/O ports of 8051,

2. Instruction set of 8051 micro controllers

Need for an instruction set, instruction format of 8051, opcode, operand, machine cycle and T state, major groups in the instruction set, various addressing modes of 8051, data transfer, arithmetic, logical, branching and Boolean instructions, one byte, two byte and three byte instructions, unconditional and conditional jump instructions, CALL and RET instructions, NOP instruction

3. 8051 Programming Concepts

Various symbols used in drawing flow charts, programs in mnemonics to illustrate the application of data copy instructions, programs to perform single byte, double byte and multi byte addition and subtraction, the application of jump instruction in the program, program using delay subroutines, subroutine and its use, PUSH, POP instructions, single step and break point debugging techniques.

4. Interfacing Simple I/O devices

Interfacing of push button switches and LEDs, seven segment display interface, functions of pins of LCD, Interfacing 16x2 LCD to 8051, Program LCD in assembly language, Interfacing of a 4x4 Matrix Key Board, key bouncing problem and de-bouncing solutions

5. Programming using Embedded C

Introduction to Embedded C, Compare C and Embedded C, Data types, Embedded C Programs

REFERENCE BOOKS:

1. Mazidi and Mazidi, The 8051 Microcontroller and Embedded Systems Using Assembly and C, 2nd edition Pearson
2. Kenneth J. Ayala, 8051 Microcontroller
3. MykePredko , Programming customizing the 8051 Microcontroller, TMH
4. Ajay V Deshmukh , Microcontrollers (theory and applications)
5. Subratha Ghospal, 8051 Microcontroller (Instruction, programme & interfacing), PEARSON
6. Kenneth Ayalla, The 8051 Microcontroller, 3rd Edition, CENGAGE learning India Edition
7. Dr. Rajiv Kapadia, 8051 Microcontroller Embedded systems, Jico student Edition

Table specifying the scope of syllabus to be covered for Unit Test-I & Unit Test-II

Unit Test	Learning outcomes to be covered
Unit Test-I	From 1.1 to 2.18
Unit Test-II	From 3.1 to 5.14

OOP THROUGH JAVA

Course code	Course Title	No. of Periods/Weeks	Total No. of periods	Marks for FA	Marks for SA	Credits
26CI402T	OOP through Java	6	90	30	70	3

TIME SCHEDULE

S.No.	Chapter/Unit Title	No.of Periods	Marks	No of Short Answer Questions	No of Assay type Questions	CO's Mapped
1.	Object oriented programming concepts and Basics of java, Overloading	17	14	2	1	CO1, CO2
2.	Concepts of inheritance, overriding, Interfaces, Packages and I/O streams.	17	22	2	2	CO2
3.	Collectionn Classes and Exception handling	16	18	2	1.5	CO3
4.	Multi-threaded programming. Fundamentals of AWT	18	18	2	1.5	CO4
5.	Event Handling and Swings	22	22	2	2	CO5
Total		90	94	10	8	

COURSE OBJECTIVES

Upon completion of the course, the student shall be able to	
(i)	To know applying object-oriented programming paradigm in problem solving.
(ii)	Able to design multi-tasking application with the knowledge of multi threading.
(iii)	Able to design data structures concepts in java with collection classes.
(iv)	Familiarized to develop graphical user interface with event handling mechanism using Swings.

COURSE OUTCOMES

CO1	CI402.1	Know the object oriented programming concepts in problem solving. Use syntax's and semantics of object oriented paradigm.
CO2	CI402.2	Design optimized definition for an application with re-usability features and packages in project development.
CO3	CI402.3	Knows the usage of utilities in real time data structures.
CO4	CI402.4	Demonstrate multi-threading concepts to implement multitasking and multi programming applications.
CO5	CI402.5	Demonstrate to design effective dynamic user interface for any front end applications using Swings and events.

LEARNING OUTCOMES:

1.0 Object oriented programming concepts and Basics of java and over loading

- 1.1 Know about object-oriented programming
- 1.2 Compare procedure-oriented programming and object-oriented programming
- 1.3 List and explain features of object-oriented programming
- 1.4 Importance of Java in Internet programming.
- 1.5 Explain features of Java. Define Byte codes of Java, JVM.
- 1.6 Explain data types, scope and life time of variables, comment statements in Java.
- 1.7 Describe conversion and casting features.
- 1.8 Apply one-dimensional and two-dimensional arrays give example programs.
- 1.9 Illustrates usage of conditional and iteration statements of Java with an example program.
- 1.10 Describe usage of jump statements, break, and continue statements.
- 1.11 Describe how to create classes and objects.
- 1.12 Demonstrate Usage of new operator and methods.
- 1.13 Explain usage of constructors with an example programs.
- 1.14 Apply method overloading and construction overloading in applications.
- 1.15 Describe usage of 'this' pointer with example.
- 1.16 Usage of command-line arguments.

2.0 Concepts of inheritance, overriding, Interfaces, Packages and I/O Streams

- 2.1 Explain about string class with methods.
- 2.2 Explain implementation of inheritance with an example program.
- 2.3 Illustrate how to implement multilevel inheritance with an example program.
- 2.4 Explain method overriding and usage of super keyword.
- 2.5 Describe concept of Interfaces.
- 2.6 Define an Interface. Differences between abstract classes and interface.
- 2.7 Explain how to implement interfaces with sample program.
- 2.8 Define a package. Explain the concept of class path.
- 2.9 Describe concept of Access protection.

- 2.10 Illustrate the mechanism of importing packages.
- 2.11 Give simple application to design packages with sample programs.
- 2.12 List different types of I/O streams.
- 2.13 Explain how to read and write data through console input and output streams.
- 2.14 Explain DataInputStream and DataOutputStreams with example.
- 2.15 Explain various file access operation by using File-streams.
- 2.16 Explain sample programs on above streams.

3.0 Collection classes and Exception Handling.

- 3.1 What is collection frame work and Hierarchy of collection frame work.
- 3.2 List Collection Interfaces and explain the following with examples
 - 3.2.1 List
 - 3.2.2 Set
 - 3.2.3Queue
- 3.3 List Collection classes and explain the following with examples
 - 3.3.1ArrayList
 - 3.3.2LinkedList
 - 3.3.3HashSet
- 3.4 How to access a Collection via an Iterator?
- 3.5 Describe sources of errors. Types of exceptions Checked & Unchecked.
- 3.6 Apply following key words to handling exceptions through sample programs
 - 3.6.1 Try
 - 3.6.2 Catch
 - 3.6.3 Finally
- 3.7 Explain concept of multi-catch statements with example.
- 3.8 Explain how to write nested try in exception handling with example.

4.0 Multi-threaded programming and Fundamentals of AWT.

- 4.1 Describe multi-threading.
- 4.2 Explain Thread life cycle and states
- 4.3 Explain how to Creating single thread with example program
- 4.4 Explain how to Creating multi thread with example program.
- 4.5 Illustrate thread priorities in multiple threads with an example.
- 4.6 Describe the concept of synchronization with example program.
- 4.7 Describe AWT classes. Component class methods
- 4.8 Working with Color Font classes

5.0 Event Handling and Swings.

- 5.1 Describe Types of Events and Demonstrate event handling mechanism
- 5.2 List and explain different event classes.
- 5.3 List and explain event listener interfaces
- 5.4 Swing Hierarchy
- 5.5 MVC (Model-View-Controller) pattern in Swing
- 5.6 Explain following Containers in swings with example programs JFrame, JPanel, JDialog
- 5.7 Explain following Controls with example programs: JButton, JLabel, JTextField, JPasswordField , JCheckBox, JRadioButton, JComboBox, JList
- 5.8 Design simple application programs using multiple controls.

CO-PO/PSO MaPPING:

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	1	1	2	2	2	1	2	2	2
CO2	1	3	3	3	1	3	1	1	3	1
CO3	3	2	3	2	2	3	1	1	3	3
CO4	1	1	3	2	2	3	2	2	3	2
CO5	3	3	3	3	2	3	2	2	3	3
Average	2	2	2.6	2.4	1.8	2.8	1.4	1.6	2.8	2.2

3=Strongly mapped , 2=moderately mapped, 1=slightly mapped

Note:

The gaps in CO and PO mapping will be met by one or more appropriate activities from the following:

- (i) Assignments, (ii) Tutorials, (iii) Seminars, (iv) Guest Lectures, (v) Group Discussions, (vi) Quizzes,
- (vii) Industrial visits, (viii) Tech Fests, (ix) Mini projects, (x) Library visits etc.

COURSE CONTENTS

1. Basics of java and overloading: object oriented programming -Importance of Java to Internet – Byte codes. Features of Java: OOPS concepts –Data types –type conversions – casting – Arrays. Usage of classes – objects – new – methods – constructors – method overloading, string classes – command line arguments-static members-this pointer

2. Concepts Inheritance Overriding Interfaces and Package:-Usages of Inheritance: inheritance super class, sub classes – Multi level inheritance – super keyword -overriding –Abstract classes- Interfaces-Packages.- I/O streams-Accessing data through console input and output

3. Collections, Exception Handling: -Collection Frame work- Collection Interfaces – Collection Classes-Iterator - Exception handling: Source of errors – error handling – Exception handling-Multi catch statements.

4. and Multi threading: -- Define thread – life cycle of thread - Multi threading –Synchronization- – Thread properties.-AWT Classes-Color Font classes- Working with Graphics-color-fonts

5.Applets, AWT and Event Handling: Event classes-Listener interfaces- Swing Hierarchy-MVC (Model-View-Controller) pattern in Swing-Swing Containers- JFrame, JPanel,, JDialog-Swaing Controls-Like JButton - JTextField – JRadioButton- JComboBox

REFERENCE BOOKS

- 1. The complete reference Java -- Patrick Naughten, Herbert Schildt
TMH Company Limited, New Delhi.
- 2. Programming in JAVA -- P. Radhakrishna, University Press
- 3. Programming in Java -- Muthu - Thomson
- 4. Java Foundations of Programming – NIIT, PHI

Table specifying the scope of syllabus to be covered for Unit Test-I & Unit Test-II

Unit Test	Learning outcomes to be covered
Unit test-1	From 1.1 to 3.4
Unit test-2	From 3.5 to 5.8

DATA COMMUNICATIONS AND COMPUTER NETWORKS

Course Code	Course title	No of periods/week	Total no of periods	Marks for FA	Marks for SA	Credits
26CI403T	Data Communications and Computer Networks	06	90	30	70	4

TIME SCHEDULE

S No	Unit Title	No. of Periods	Weightage of Marks	No. of Short Answer Questions	No. of Essay Questions	COs Mapped
1	Basics of Data communication and OSI Reference Model	15	14	2	1	CO1
2	Physical Layer and Data Link Layer	20	17	3	1	CO2
3	Network Layer, Transport Layer and Application Layer	25	30	2	3	CO3
4	Wireless Network Protocols	20	19	1	2	CO4
5	Cyber Security	10	14	2	1	CO5
	Total	90	94	10	8	

COURSE OBJECTIVES

Upon completion of the course, the student shall be able to	
(i)	To familiarize with Basics of Data Communication and the layers of OSI Model
(ii)	To analyze various wireless network protocols
(iii)	To analyze wireless Security protocols

COURSE OUTCOMES

CO1	CI403.1	Describe data communication and OSI model
CO2	CI403.2	Describe Physical and data link layers
CO3	CI403.3	Analyze network layers
CO4	CI403.4	Describe Wireless Network Protocols
CO5	CI403.5	Describe Cyber Security

LEARNING OUTCOMES:

1.0 Basics of Data communication and OSI Reference Model

- 1.1 Define data and information
- 1.2 Define data communication
- 1.3 State the characteristics of data communication
- 1.4 State the components of data communication
- 1.5 Explain briefly about data representation of numbers, text, images, audio and video
- 1.6 Define the different modes of data flow (simplex, half duplex and full duplex)
- 1.7 Distinguish between serial communication and parallel communication
- 1.8 Define computer network and state its use
- 1.9 State the need for data communication networking.
- 1.10 Define network topology
- 1.11 List different network topologies
- 1.12 Explain Bus, Star, Ring network topologies
- 1.13 Compare the performances of the above three topologies.
- 1.14 Draw the ISO: OSI 7-layer architecture and State the functions of each layer.
- 1.15 Draw TCP/IP reference model and State the functions of each layer
- 1.16 Compare ISO: OSI7-layer model with TCP/IP reference model

2.0 Physical Layer and Data Link Layer

a) Physical Layer:

- 2.1 List the different types of physical transmission media used in networking
- 2.2 Explain the cross-sectional diagrams of UTP, STP, Coaxial and Fiber optic cables and their use in networking.
- 2.3 List the three types of switching techniques used in networking
- 2.4 Explain circuit switching and packet switching
- 2.5 Define virtual circuit and datagram approaches in packet switching
- 2.6 State the use of repeater/ hub

b) Data Link Layer:

- 2.7 Define the word protocol used in computer networks
- 2.8 State the need for protocols in computer networks.
- 2.9 Explain CSMA/CD, CSMA/CA
- 2.10 Explain Ethernet LAN
- 2.11 Give the frame format for Ethernet and State the different fields in it.
- 2.12 Explain the working of token ring network

3.0 Network Layer, Transport Layer and Application Layer

a) Network Layer:

- 3.1 Define the terms Internet and Intranet.
- 3.2 Explain classful addressing in IPv4.
- 3.3 Explain classless addressing (CIDR) in IPv4.
- 3.4 State the use of routers in networking
- 3.5 Explain the concept of routers and routing packets in computer networks
- 3.6 Distinguish among cut through, store-and-forward and adaptive switch mechanisms.
- 3.7 Explain the packet transfer mechanism using routers and IP address.

b) Transport Layer

- 3.8 List the features of Transmission Control Protocol (TCP)
- 3.9 Explain the flow control in TCP
- 3.10 Explain error control in TCP

- 3.11 Explain the connectivity of systems using TCP (Three-way hand shake)
- 3.12 Explain end-to-end connectivity in TCP using ports and sockets.
- 3.13 Describe the features of User Datagram Protocol (UDP)
- 3.14 Compare the features of TCP and UDP
- 3.15 State the use of Gateway Router.

c) Application Layer:

- 3.16 Mention the role of DNS server
- 3.17 Explain how email is transferred
- 3.18 Discuss POP server and SMTP server
- 3.19 Explain file transfer operation using FTP
- 3.20 Explain the working of Web server
- 3.21 Describe the web browser architecture
- 3.22 Explain the internal architecture of ISP
- 3.23 Write the purpose of proxy server
- 3.24 Explain remote login

4.0 Wireless Network Protocols

- 4.1 Define Wireless LAN.
- 4.2 List the advantages of WLAN.
- 4.3 Explain the infrastructure based topology of wireless LAN
- 4.4 Explain the Ad hoc topology of wireless LAN
- 4.4 Compare the features of IEEE 802.11n and IEEE 802.11b.
- 4.5 State the necessity of Bluetooth technology
- 4.6 Explain the features of Bluetooth technology.
- 4.7 State the applications of Bluetooth technology.
- 4.8 State the purpose of Zigbee technology
- 4.9 Explain the features of Zigbee technology and its topologies.
- 4.10 State the need of WiMax technology
- 4.11 List the applications of WiMax
- 4.12 Differentiate between WiFi and WiMax
- 4.13 Explain the features of WiMax technology

5.0 Cyber Security

- 5.1 Define the term Cyber Security.
- 5.2 State the necessity of Cyber Security.
- 5.3 State the fundamentals of Cyber Security.
- 5.4 List the layers of Cyber Security.
- 5.5 Explain the active and passive attacks in Cyber attacks.
- 5.6 Explain the functions of firewall
- 5.7 Define the terms: i) virus ii) malware iii) adware iv) trojan v) worm related to computer security
- 5.8 Explain the features of a typical “total security” tools
- 5.9 List different types of viruses and various ways of removing viruses
- 5.10 List any six popular Anti-Virus Software available in market

CO-PO/PSO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2		3		3	3	1	

CO2	3	2	2	3	3		3	3	3	3
CO3	3	3	1		3		1	3		1
CO4	3	3	2		3		1	3		1
CO5	3	3	2	3	3		3	3	3	3
Average	3	2.6	1.8	3	3		2.2	3	2.3	2

3=strongly mapped 2=moderately mapped 1=slightly mapped

Note:

The gaps in CO and PO mapping will be met by one or more appropriate activities from the following:

- (i) Assignments, (ii) Tutorials, (iii) Seminars, (iv) Guest Lectures, (v) Group Discussions, (vi) Quizzes,
- (vii) Industrial visits, (viii) Tech Fests, (ix) Mini projects, (x) Library visits etc.

COURSE CONTENTS:

1.0 a) Basics of Data communication and OSI Reference Model

Need for data communication networking, network topology, different network topologies,

Bus, Star, Ring network topologies, OSI 7-layer architecture- functions of each layer, TCP/IP

reference model- functions of each layer

2.0 Physical Layer and Data Link Layer

a) Physical Layer:

Different physical transmission media- UTP, STP, Coaxial and Fiber optic cable, switching

techniques - circuit switching, packet switching and message switching, virtual circuit and

datagram approaches in packet switching, use of repeater/hub

b) Data Link Layer:

Protocol, need for protocols, need for framing, need for flow control and error control protocols, medium access control (MAC) - its functions, CSMA/CD and CSMA/CA, Local area

network - its use, Ethernet and its frame format, working of token ring network.

3.0 Network Layer, Transport Layer and Application Layer

a) Network Layer:

Internet and Intranet, classful addressing and classless addressing in IPv4, use of routers in

networking, concept of routers and routing, cut through & store-and-forward and adaptive

switch mechanism, packet transfer mechanism using routers and IP address.

b) Transport Layer:

Features of Transmission Control Protocol (TCP), flow control in TCP, error control in TCP, connectivity of systems using TCP (Three-way hand shake), end-to-end connectivity in TCP using ports and sockets, features of User Datagram Protocol (UDP), use of Gateway Router

c) Application Layer: Role of DNS server, how email is transferred, POP server and SMTP server, FTP working of Web server, web browser architecture, internal architecture of ISP, purpose of proxy server, remote login

4. Wireless Network Protocols

Define Wireless LAN-List the advantages of WLAN-Explain the infrastructure based topology of wireless LAN -Explain the Ad hoc topology of wireless LAN-Compare the features of IEEE

802.11n and IEEE 802.11g-State the necessity of Bluetooth technology-Explain the features of Bluetooth technology-State the applications of Bluetooth technology-State the purpose of Zigbee technology-Explain the features of Zigbee Technology and its topologies- State the need of WiMax technology-List the applications of WiMax-Differentiate between WiFi and WiMax-Explain the features of WiMax technology.

5 Cyber Security:

Basic Cyber Security Concepts, fundamentals and layers of security, Cyber attacker actions, active attacks, passive attacks, functions of firewall, define the terms: i) virus ii) malware iii) adware iv) trojan v) worm related to computer security, List the features of a typical “total security” tool, List different types of viruses and various ways of removing viruses, List any six popular Anti-Virus Software available in market

REFERENCE BOOKS:

1. Ata Elahi Thomson, Network communication Technology
2. Godbole, Data Communication and Networking, TMH
3. William Stallings ,Data and Computer Communications, 7thedition. PHI
4. BehrouzForouzan, Data Communication and Networking, 3rdedition.TMH
5. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley
6. B.B. Gupta , D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles,Algorithm, Applications, and Perspectives, CRC Press
7. Wayne Tomasi, Introduction to data communication and networking, Pearson India Publications
8. Thomas Robertazzi, Basics of computer networking, Springer publishers.

Table specifying the scope of syllabus to be covered for Unit Test-I & Unit Test- II

Unit Test	Learning outcomes to be covered
Unit Test-I	From 1.1 to 3.7
Unit Test-II	From 3.8 to 5.8

WEB DESIGNING

Course code	Course Title	No. of Periods/ Weeks	Total No. of periods	Marks for FA	Marks for SA	Credits
26CI404E	Web Designing	3	45	30	70	2

TIME SCHEDULE

S.No	Chapter/Unit Title	No. of Periods	Weightage of Marks	No. of Short Answer Questions	No of Essay Questions	CO's Mapped
1.	Introduction to HTML	10	22	2	2	CO1, CO5
2.	CSS (Cascading Style Sheets) and XML	12	25	3	2	CO2, CO5
3.	JavaScript	11	22	2	2	CO3, CO5
4.	jQuery	12	25	3	2	CO4, CO5
Total		45	94	10	8	

COURSE OBJECTIVES

Upon completion of the course, the student shall be able to	
(i)	To introduce the fundamentals of HTML and CSS for creating and styling structured web pages.
(ii)	To develop the ability to organize and represent data using XML.
(iii)	To enable students to use JavaScript and jQuery for DOM manipulation, event handling, validation, and interactivity.
(iv)	To integrate web technologies for building dynamic, interactive, and user-friendly websites.

COURSE OUTCOMES

CO1	CI404.1	Demonstrate the ability to create structured web pages using HTML elements, attributes, lists, tables, forms, and layout tags.
CO2	CI404.2	Apply Cascading Style Sheets (CSS) to format and style web pages using selectors, properties, positioning, and layouts, and organize and represent data using XML.
CO3	CI404.3	Implement JavaScript to manipulate the DOM, validate forms, handle events, and enhance interactivity in web applications.
CO4	CI404.4	Utilize jQuery to simplify DOM manipulation, implement event handling, apply effects, and extend functionality with plugins.
CO5	CI404.5	Design and develop dynamic, interactive, and user-friendly websites by integrating HTML, CSS, JavaScript, and jQuery.

LEARNING OUTCOMES

1. Introduction HTML

- 1.1 What is HTML
- 1.2 Explain the structure of HTML document.
- 1.3 Define HTML element and Attribute.
- 1.4 List header tags
- 1.5 Create paragraphs, Horizontal rules, Line breaks
- 1.6 List text formatting tags and their purpose
- 1.7 Explain creating Unordered List, Ordered List
- 1.8 Describe the tags table, th, tr, td, th and border, colspan, rowspan attributes
- 1.9 Use <div>,
- 1.10 Explain HTML layout elements (header, nav, main, article, section, aside, footer).
- 1.11 Build web forms using various <form>, <input>, <button>, <label>, <select>, <options>, <textarea>, <legend><fieldset>with attributes.
- 1.12 **Exercise1:** Write a HTML code to display welcome text using different text formatting tags.(Use h1-h6, bold, italic, underline, strikethrough, div, p, pre tags) (**HTML Basic tags**)
- 1.13 **Exercise2:** Design a HTML page to list the computer languages where each language is a

link. Prepare separate HTML documents for each language and call them in the appropriate link. **(Lists and Links)**

- 1.14 Exercise3:** Create a form with text fields such as username, mail id, password, retype password, gender (radio), languages known (check box), Describe yourself (textarea), submit button **(Forms)**

2. CSS (Cascading Style Sheets) and XML

2.1 Illustrate about cascading style sheets

2.1.1 Need for CSS

2.1.2 CSS Syntax

2.1.3 Types of CSS selector: Class, id, pseudo-class, attribute, universal selector

2.1.4 Understand the level of styles inline, internal and external style sheets.

2.1.5 Explain about Color and background properties

2.1.6 Explain about Border, margin, padding, width, height properties

2.1.7 What inline and block, inline-block elements.

2.1.8 What is float property

2.1.9 Explain position property in CSS.

2.1.10 Exercise4: Develop a web page using CSS to create a timetable for the class using different border style. **(Table tags and internal style sheets)**

2.2 Understand XML

2.2.1 Explain the Purpose of XML

2.2.2 Describe how to organize data in the form of XML

2.2.3 Explain the rules for designing XML document.

2.2.4 Understand the significance of Namespace.

2.2.5 List the various applications of XML.

3. JavaScript

3.1 Define Client Side scripting and server side scripting

3.2 Differentiate between Client-side and Server-side scripting.

3.3 Identify and list commonly used client-side and server-side scripting languages.

3.4 Describe the features of Java Script.

3.5 Know how to Place JavaScript code in HTML.

3.6 What is DOM

- 3.7 Explain DOM tree structure (document, elements, attributes, text nodes)
- 3.6 Access elements using JavaScript(getElementById and getElementByName)
- 3.7 Modify webpage content and attributes dynamically using JavaScript
- 3.8 Explain various Objects provided by JavaScript(Array, String, Date, Math, Number, Boolean)
- 3.9 Explain Message Boxes in JavaScript : Dialog Box- Alert Box- Confirm Box- Prompt Box
- 3.10 **Exercise5:** Write a JavaScript program to change the color of a web page to the color typed by the user in the text box. (DOM)
- 3.11 **Exercise6:** Create a form with text fields such as username, mail id, password, retype password, gender (radio), languages known (check box), Describe yourself (textarea), submit button and perform form validation on submit using javascript such as username must not be less than 8 characters, mail id should contain @ symbol, password and retype password must be the same.

4. jQuery

- 4.1 What is framework
- 4.2 Difference between libraries and frameworks
- 4.3 List popular JavaScript frameworks
- 4.4 List the features of jQuery
- 4.5 Explain the steps for to include jQuery in Web Pages
- 4.6 Explain jQuery Syntax with example program
- 4.7 Describe the jQuery Selectors
- 4.8 Access HTML elements by using Element Selectors, ID, Class Selectors
- 4.9 Explain the jQuery Document Ready Event
- 4.10 Describe the jQuery Event handling methods
 - 4.10.1 Mouse Events
 - 4.10.2 Keyboard Events
 - 4.10.3 Form Events
 - 4.10.4 Document/Window events
- 4.11 Explain effects of jQuery like hide, show, fade In, fadeout, fade Toggle, fade To, SlideDown, SlideUp, Slide Toggle
- 4.12 Perform DOM manipulation using jQuery methods .html(), .text(), .val(), .append()
- 4.13 List jQuery plugins
- 4.14 **Exercise7:** Create a simple **image gallery web page** containing 4–6 images. On hovering an image, it should fade to 50% and return to normal when the mouse leaves. Add a

“Hide Gallery / Show Gallery” button that toggles the visibility of all images.

CO-PO & PSO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	2	1		1	2	3	2
CO2	3	3	2	2	1	1	1	2	3	2
CO3	3	3	3	3	1	1	2	2	3	3
CO4	3	3	3	3	1	1	2	2	3	3
CO5	3	3	3	3	2	2	3	2	3	3
Average	3	3	2.6	2.6	1.2	1.25	1.8	2	3	2.6

3=strongly mapped 2=moderately mapped 1=slightly mapped

Note:

The gaps in CO and PO mapping will be met by one or more appropriate activities from the following:

- (i) Assignments, (ii) Tutorials, (iii) Seminars, (iv) Guest Lectures, (v) Group Discussions, (vi) Quizzes,
- (vii) Industrial visits, (viii) Tech Fests, (ix) Mini projects, (x) Library visits etc.

COURSE CONTENTS:

Unit 1: Introduction to HTML

What is HTML, Structure of an HTML Document, HTML Elements and Attributes, Header Tags, Paragraphs, Horizontal Rules, Line Breaks, Text Formatting Tags, Lists, Tables, Div and Span, HTML Layout Elements (header, nav, main, article, section, aside, footer), Forms, Practical Exercises (Basic tags, Links, Lists, Forms).

Unit 2: CSS and XML

Introduction to CSS, Need for CSS, Syntax, Types of Selectors, Levels of Styles (Inline, Internal, External), CSS Properties (Color, Background, Border, Margin, Padding, Width, Height), Inline/Block/Inline-block elements, Float Property, Position Property, XML Purpose, Rules for XML Document, Organizing Data in XML, Namespaces, Applications of XML.

Unit 3: JavaScript

Client-side vs Server-side Scripting, Features of JavaScript, Placement of JavaScript in HTML, DOM and DOM Tree Structure, Accessing Elements, Modifying Content and Attributes Dynamically, JavaScript Objects (Array, String, Date, Math, Number, Boolean), Message Boxes (Alert, Confirm, Prompt), Exercises (Change webpage color dynamically, Form validation for username, email, password).

Unit 4: jQuery

Introduction to Frameworks and Libraries, Features of jQuery, Including jQuery in Web Pages, Syntax and Selectors, Document Ready Event, Event Handling Methods (Mouse, Keyboard, Form, Document/Window), jQuery Effects (hide, show, fadeIn, fadeOut, fadeToggle, fadeTo, slideDown, slideUp, slideToggle), DOM Manipulation (.html(), .text(), .val(), .append()), Event Handling (click,

hover, submit), jQuery Plugins, Exercises (Interactive buttons with hide/show, Fade and Slide effects on images).

REFERENCE BOOKS

- 1) Principles of Web Design, Sklar, TMH
- 2) HTML complete reference, Powell, TMH
- 3) Basics of Web Site Design, NIIT – PHI
- 4) WWW Design with HTML, Xavier (TMH)
- 5) Internet & World Wide Web, Dietel and Dietel, Pearson education Asia.
- 6) Complete Reference PHP, Steven Holzer-McGraw Hill
- 7) jQuery Cook book, O' Reilly Media
- 8) www.w3schools.com

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TEST-I & UNIT TEST-II

Unit Test	Learning outcomes to be covered
Unit test-1	<i>1.1 to 2.1.10</i>
Unit test-2	<i>2.2 to 4.14</i>

SOFTWARE ENGINEERING

Course code	Course Title	No. of Periods/Weeks	Total No. of periods	Marks for FA	Marks for SA	CREDITS
26CI405E	Software Engineering	3	45	30	70	2

TIME SCHEDULE

S.No	Chapter/Unit Title	No. of Periods	Weightage of Marks	No. of Short Answer Questions	No. of Essay Questions	CO's Mapped
1.	Basics of Software Engineering Designs & Life Cycle Models	10	22	2	2	CO1

2.	Software Project Management	8	14	2	1	CO2
3.	Requirement Analysis & Specifications	9	14	2	1	CO3
4.	Software Design, Coding	8	22	2	2	CO4
5.	Software testing, Debugging, Reliability, Quality Management & Maintenance	10	22	2	2	CO5
Total		45	94	10	8	

COURSE OBJECTIVES

Upon completion of the course, the student shall be able to	
(i)	To know the fundamentals of software engineering & life cycle modes
(ii)	To familiarize project managements
(iii)	To design software projects with the help of software engineering principles and UML models

COURSE OUTCOMES

CO1	CI405.1	Explain Software life cycle models and basics of software engineering
CO2	CI405.2	Describe Software Project Management
CO3	CI405.3	Prepare SRS document
CO4	CI405.4	Apply Design ,coding techniques.
CO5	CI405.5	Apply Testing Techniques ,Quality and reliability metrics

LEARNING OUTCOMES:

1- Basics of Software Engineering Designs & Life Cycle Models

- 1.1 Know the Evolution and Impact of the Software Engineering
- 1.2 Evolution of an Art to an Engineering Discipline
- 1.3 A Solution to the Software Crisis?
- 1.4 Know the difference between Programs and Software Products

1.5 Understand the evolution of Software Engineering Design

1.6 Early Computer Programming

1.7 High Level Language

1.8 Programming Control Flow- Based

Design

1.9 Data Structure-

Oriented

1.10 Design Data Flow-

Oriented

1.11 Design Object

Oriented

1.12 Design Other Developments

1.13 Explain the Software Life Cycle Models 1.14 Classical Waterfall Model

1.15 Iterative Water fall model

1.16 Prototyping Model

1.17 Evolutionary Model

1.18 Spiral Model

1.19 AGILE Model

1.20 Comparison of Different Life Cycle Models

2 - Software Project Management

2.1 Software Project Manager

2.2 Job Responsibilities of a Software Project

2.3 Manager Skills Necessary for Software Project Management

2.3.1 Know about Software Project

2.3.2 Planning The SPMP Document

2.4 Metrics for Project Size Estimation

2.5 Lines of Code

2.5 Function Point Metric

2.6 Project Estimation Techniques

2.7 Empirical Estimation Technique

2.8 Heuristic Technique

2.9 Staffing Level Estimations

2.10 Nordens Work Putnam"s Work

2.10.1 Learn how to do Staffing

2.10.2 Who is a Good Software Engineer?

2.11 Risk Management

2.12 Risk Identification

2.13 Risk Assessment

2.14 Risk Containment

3- Requirement Analysis & Specifications

3.1 Requirements Gathering and Analysis

3.2 Software Requirement Specifications

3.3 List Contents of the SRS Document

- 3.4 Explain Functional Requirements
- 3.5 Describe Procedure to identify the Functional Requirements
- 3.6 How to Document the Functional Requirements
- 3.7 Explain requirements Traceability
- 3.8 List Characteristics of a Good SRS Document
- 3.9 Give Examples of Bad SRS Document
- 3.10 Explain Organization of the SRS Document

4 - Software Design, Coding

- 4.1 What is a good Software Design?
- 4.2 Define and Classify Cohesion and Coupling
- 4.3 Classification of Cohesiveness
- 4.4 Classification of Coupling
- 4.5 Approaches of Software Design
- 4.6 Function-Oriented Design
- 4.7 Object-Oriented Design
- 4.8 Function-Oriented vs Object-Oriented Design
- 4.9 User Interface Design
- 4.10 List the Characteristics of a good User Interface
- 4.11 Understand the Basic Concepts
- 4.12 User Guidance and Online Help
- 4.13 Mode Based vs Mode less Interface
- 4.14 Graphical User Interface (GUI) vs Text-Based User Interface
- 4.15 Types of User Interface
 - 4.15.1 Command Language Based
 - 4.15.2 Interface Menu Based Interface
 - 4.15.3 Direct Manipulation Interfaces
- 4.16 Component Based GUI Development Window System and Types of Widgets.
- 4.17 Unified Modeling Language
 - 4.17.1 List the goals of UML
- 4.18 Role of UML in Object oriented Design
- 4.19 List and explain Building blocks of UML
- 4.20 List different symbols used in UML notation
- 4.21 Classify and list standard UML diagrams

5 - Testing, Debugging, Reliability, Quality Management & Maintenance

- 5.1 Understand Testing
- 5.2 What is Testing?
- 5.3 Differentiate Verification and Validation
- 5.4 List 3 Designs of Test Cases
- 5.5 Compare Testing in the Large vs Testing in the Small
- 5.6 Explain Unit Testing
- 5.7 Explain Black box Testing and White Box Testing.
- 5.8 Explain Open source software testing tools : Selenium, Bugzilla
- 5.9 Debugging

- 5.10 Explain Debugging Approaches.
- 5.11 List the Debugging Guidelines.
- 5.12 Explain Program Analysis Tools (Static Analysis Tools& Dynamic Analysis)
- 5.13 List and Explain Integration Testing
- 5.14 Explain System Testing
- 5.15 Explain Performance Testing.

CO-PO/PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	1	1	2	2	2
CO2	3	3	3	3	1	3	2	2	2	3
CO3	3	3	1		3		1	2	2	3
CO4	3	3	3	3	2	2	2	2	3	3
CO5	3	2	3	3	2	2	3	2	2	3
Average	3	2.6	2.6	2.75	2	2	1.8	2	2.2	2.8

3=strongly mapped 2=moderately mapped 1=slightly mapped

Note:

The gaps in CO and PO mapping will be met by one or more appropriate activities from the following:

- (i) Assignments, (ii) Tutorials, (iii) Seminars, (iv) Guest Lectures, (v) Group Discussions, (vi) Quizzes,
- (vii) Industrial visits, (viii) Tech Fests, (ix) Mini projects, (x) Library visits etc.

COURSE CONTENT

1. Introduction to Software Engineering- Life Cycle Models.
2. Software Project Management- Responsibilities of a Software Project

Manager- Project planning – Metrics-Project Estimation Techniques- Staffing Level Estimation

- Scheduling – Risk Management

3. Requirement Analysis and Specification: Requirement Gathering and Analysis - SRS document

4. Software Design , Coding : Good software design, Cohesion and Coupling, Software Design Approaches, User interface Design, Software Coding and Goals of UML - Role of UML in Object oriented Design - Building blocks of UML : Things, Relationships, and Diagrams - Symbols used in UML notation - Classify and list standard UML diagrams
5. Software Testing, Debugging ,Reliability, Quality Management and maintenance – Testing, Debugging

REFERENCE BOOKS

1. Fundamentals of Software Engineering – Rajib Mall (PHI)Second Edition.
2. Software Engineering - Jawadekar (TMH)
3. Software Engineering Concepts - Fairley (TMH)
4. Pankaj Jalote international approach to software engineering “:2nd edition Narosal publishing house 1997
4. <http://www.tutorialspoint.com/uml/>
- 6.The Unified Modelling Language User guide...Grady Booch

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TEST-I &UNIT TEST-II

Unit Test	Learning outcomes to be covered
Unit test-1	From 1.1 to 3.6
Unit test-2	From 4.1 to 5.7

TROUBLESHOOTING OF COMPUTER NETWORKS

Course code	Course Title	No. of Periods / Week	Total No. of periods	Marks for FA	Marks for SA	Credits
26CI406A	TROUBLESHOOTING OF COMPUTER NETWORKS	2	30	NIL	NIL	NIL

TIME SCHEDULE

S No.	Chapter/Unit Title	No. of Periods	COs Mapped
1	Basics of Troubleshooting and Network Faults	10	CO1
2	Troubleshooting Tools and Commands	10	CO2
3	Troubleshooting Wired and Wireless Networks	10	CO3

	Total	30	
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COURSE OBJECTIVES

Upon completion of the course, the student shall be able to	
(i)	Identify and analyze network-related issues in LAN/WAN environments.
(ii)	Understand error types in hardware and software components of networks.
(iii)	Use diagnostic tools and commands to resolve common network problems.

COURSE OUTCOMES (COS)

CO1	CI406.1	Identify common network faults and failures.
CO2	CI406.2	Use hardware and software tools for network troubleshooting.
CO3	CI406.3	Troubleshoot connectivity issues in wired and wireless networks.

LEARNING OUTCOMES:

1: Basics of Troubleshooting and Network Faults

1.1 Fundamentals of troubleshooting?

- 1.1.1 What is trouble shooting?
- 1.1.2 Types of Maintenance: Preventive & Corrective Maintenance
- 1.1.3 Various approaches to Troubleshooting
 - 1.1.3.1 Top-Down Approach
 - 1.1.3.2 Bottom-up Approach
 - 1.1.3.3 Divide and Conquer
 - 1.1.3.4 Follow the Path
 - 1.1.3.5 Spot the difference
- 1.1.4 Key Steps in Network Troubleshooting

1.2 Common network faults:

Cable issues, NIC failure, switch/router faults

1.3 Types of errors:

Link down, IP conflict, DNS resolution error

1.4 Importance of logs and reporting

1.5 Service Desk Process:

Basic ticket lifecycle – Ticket creation, classification, assignment, resolution, closure

2: Troubleshooting Tools and Commands

2.1 OS-level tools:

ping, tracert / traceroute, ipconfig / ifconfig, netstat, nslookup, arp, route

2.2 Graphical tools:

Wireshark, Advanced IP Scanner, Cisco Packet Tracer

2.3 Hardware tools:

Cable tester, Loopback plug, Crimping tools

2.4 Hands-on activities:

- 2.4.1. Crimp RJ-45 connectors
- 2.4.2. Test Ethernet cables using LAN cable tester
- 2.4.3. Observe and interpret LED indicators on switches and routers

3: Troubleshooting Wired and Wireless Networks

3.1 Wired LAN issues:

- 1.1.1 Bad cables
- 1.1.2 Loose connectors
- 1.1.3 Improper crimping

3.2 LAN setup:

- 3.2.1 Assign static/dynamic Ips
- 3.2.2 verify subnet mask and gateway
- 3.2.3 test network connectivity
- 3.2.4 Addressing misconfigurations (e.g., IP conflicts, subnet errors, VLAN issues)

3.3 Diagnosing Common Network Faults

- 3.3.1 Loss of network connectivity
- 3.3.2 slow network performance
- 3.3.3 intermittent disconnections

3.4 Packet analysis: Use Wireshark to capture and examine packets (e.g., ARP, ICMP, DNS)

3.5 Wireless network problems:

- 3.5.1. Interference from other devices/networks
- 3.5.2. Weak signal coverage/ coverage gaps
- 3.5.3. Authentication failures (wrong password, encryption type mismatch)

3.6 Wireless troubleshooting activities:

- 3.5.4. Change SSID and security settings
- 3.5.5. Analyze signal strength
- 3.5.6. Resolve connection issues by adjusting placement, channel, or encryption

Lab Activities (Suggestive)

Unit 1: Basics of Troubleshooting and Network Faults

1. **Exercise 1.1:** Identify Physical Layer Faults
 - **Activities:** Unplug NIC, use faulty cable, disable network interface
 - **Objective:** Detect and isolate hardware faults
 - **Tools:** Ethernet cable, PC NIC settings
2. **Exercise 1.2:** Simulate and Troubleshoot IP Address Conflict
 - **Activities:** Assign same IP to two hosts in a LAN and resolve the conflict
 - **Objective:** Understand IP address management and conflict resolution
 - **Tools:** PCs, LAN Switch
3. **Exercise 1.3:** Diagnose and Resolve DNS Resolution Error
 - **Activities:** Use incorrect DNS entry and troubleshoot using nslookup
 - **Objective:** Understand name resolution
 - **Tools:** Command prompt / Terminal, DNS server or public DNS (e.g., 8.8.8.8)
4. **Exercise 1.4:** Simulate and Troubleshoot Link Down Scenarios
 - **Activities:** Disconnect cable or disable port and restore connectivity

- **Objective:** Practice identifying and resolving Layer 1/2 link issues and resolution
 - **Tools:** Switch/router, cable
5. **Exercise 1.5:** Apply Structured Troubleshooting and Documentation
- **Activities:** Document a network issue and follow the ticket lifecycle
Simulate a network issue (e.g., no internet)
Use step by step troubleshooting process
Fill out a troubleshooting report/log
 - **Objective:** Use a structured troubleshooting method to diagnose and resolve a simulated issue
 - **Tool:** Excel or simulated ticketing software (osTicket), windows/Linux system
6. **Exercise 1.6:** Log File Analysis for Network Issues
- **Activities:** Use Windows Event Viewer or Linux log files to trace network events
 - **Objective:** Learn how to interpret logs for fault diagnosis
 - **Tools:** Windows/Linux system

Unit 2: Troubleshooting Tools and Commands

7. **Exercise 2.1:** Use Using OS-level Network Commands for Network Testing
- **Activities:** Test IP connectivity using ping, View routing table and ARP cache, Resolve DNS using nslookup
 - **Objective:** Understand diagnostic command outputs
 - **Tools:** ping, tracer, ipconfig, netstat, nslookup, arp, route
8. **Exercise 2.2:** Capture and Analyze Packets Using Wireshark
- **Activities:** Capture packets during web access or ping, filter DNS/HTTP/ARP
 - **Objective:** Observe packet-level communication and identify errors
 - **Tools:** Wireshark
9. **Exercise 2.3:** Discover devices and open ports in a subnet Using IP Scanning Tools
- **Activities:** Scan subnet with Advanced IP Scanner; identify live hosts and open ports
 - **Objective:** Practice IP Scanning and Host Discovery
 - **Tools:** Advanced IP Scanner
10. **Exercise 2.4:** Crimp RJ-45 Cables and Test
- **Activities:** Create straight-through/crossover cables; test using LAN cable tester
 - **Objective:** Verify cable quality and pinout
 - **Tools:** Crimping tool, cable tester, RJ-45 connectors, Cat5e/Cat6 cables
11. **Exercise 2.5:** Use Loopback Plugs and Cable Testers
- **Activities:** Check NIC functionality and test cable continuity
 - **Objective:** Understand use of loopback plugs; Validate hardware and cabling with tools
 - **Tools:** Loopback plug, LAN cable tester

Unit 3: Troubleshooting Wired and Wireless Networks

12. **Exercise 3.1:** Configure and Troubleshoot a Wired LAN
- **Activities:** Assign static and dynamic IP addresses
Set subnet mask and gateway
Use ping to test connectivity
 - **Objective:** Perform LAN setup and diagnose IP/subnet/VLAN misconfigurations

- **Tools:** PCs, Switch, DHCP server/router
13. **Exercise 3.2:** Diagnose Wired Network Performance
- **Activities:** Capture traffic in problematic scenarios (e.g., high latency)
 - **Objective:** Identify retransmissions, delays, and dropped packets
 - **Tools:** Wireshark, Switch, PCs
14. **Exercise 3.3:** Set Up and Troubleshoot Wireless Networks
- **Activities:** Change SSID/security settings
Measure signal strength and adjust channel
Simulate and resolve auth errors
 - **Objective:** Resolve coverage, interference, and auth errors
 - **Tools:** Wireless router, Wi-Fi analyzer app, laptop
15. **Exercise 3.4:** Simulate Network Faults Using Packet Tracer
- **Activities:** Create a small topology in Cisco Packet Tracer or GNS3
Introduce faults (e.g., wrong IP, missing cable, switch off)
Diagnose and resolve
 - **Objective:** Practice fault handling virtually
 - **Tools:** Cisco Packet Tracer

Required Software:

Software	Purpose	Platform
Wireshark	Packet capture and analysis	Windows/Linux
Cisco Packet Tracer	Network simulation	Windows/Linux
Advanced IP Scanner	Host discovery & scanning	Windows
Event Viewer	View system and network logs	Windows
Notepad++ / Excel	Logging and ticket simulation	Windows/Linux
Basic ticketing software (e.g., osTicket)	To manage customer support requests	Windows/Linux

Required Hardware and Tools:

Hardware / Tools	Purpose
PCs/Laptops (Min 2)	Testing, configuration, and monitoring of network setups
RJ-45 Cables	Provides physical LAN connectivity
Crimping Tool	Used to attach RJ-45 connectors to Ethernet cables
LAN Cable Tester	Tests continuity and pin configuration of Ethernet cables
Loopback Plug / Adapter	Tests NIC and serial port functionality
Network Switch	Facilitates basic wired LAN connectivity between devices
Wi-Fi Router/Access Point	Provides wireless network setup and troubleshooting
Multimeter (optional)	Measures voltage, continuity in electrical components/cables
Cable Stripper	Strips insulation from cables before crimping
Tone Generator	Traces and identifies cables within a bundle or wall
Cables (Cat5e/Cat6)	Used to build or replace Ethernet connections

Labeling Stickers / Tags	For labeling cables and ports for easier identification
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CO-PO/PSO MAPPING:

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	2	2	3	2	2
CO2	3	3	3	2	2	2	2	3	2	2
CO3	3	3	3	3	2	2	2	3	2	2
Average	3	3	2.67	2.33	1.67	2	2	3	2	2

3 = strongly mapped, 2=moderately mapped, 1=slightly mapped

Note:

The gaps in CO and PO mapping will be met by one or more appropriate activities from the following:

- (i) Assignments, (ii) Tutorials, (iii) Seminars, (iv) Guest Lectures, (v) Group Discussions, (vi) Quizzes,
- (vii) Industrial visits, (viii) Tech Fests, (ix) Mini projects, (x) Library visits etc.

Suggested Textbooks & References

1. "Computer Networks" by Andrew S. Tanenbaum
2. "Networking All-in-One for Dummies" by Doug Lowe
3. Cisco Networking Academy Course Materials
4. Official Manuals for Wireshark, Packet Tracer, Windows/Linux networking commands

Recommended Resources

1. Cisco Networking Academy – *Network Troubleshooting Module*
2. CompTIA Network+ – *Troubleshooting Section*
3. LiveAction, FITA, GeeksforGeeks – Articles on troubleshooting techniques
4. Wireshark & Packet Tracer official documentation

MICROCONTROLLERS AND INTERFACING LAB

Course Code	Course title	No of periods/week	Total no of periods	Marks For FA	Marks For SA	Credits
26CI407L	Microcontrollers and Interfacing Lab	06	90	40	60	2.5

TIME SCHEDULE

S. No	Unit/Title	No. of Periods	COs Mapped
1	Familiarization with Keil software and Microcontroller Kit	06	CO1
2	Basic programming using Microcontroller kit/Keil	42	CO2
3	Interfacing I/O devices with 8051 using Embedded C	21	CO3
4	Application development using Proteus/equivalent software	18	CO4
5	Dumping/Burning into Microcontroller chip	3	CO4
	Total	90	

COURSE OBJECTIVES

Upon completion of the course, the student shall be able to	
(i)	To familiarize with 8051 Microcontroller kit and Keil compiler
(ii)	To understand the programming and interfacing concepts of 8051 Microcontroller
(iii)	To learn the practical importance and applications of programming and interfacing of 8051 Microcontroller chip

COURSE OUTCOMES

CO1	CI407.1	Describe the usage of 8051 Microcontroller kit and Keil Compiler
CO2	CI407.2	Apply Instruction set of 8051 Microcontroller in AL programming
CO3	CI407.3	Apply Instruction set of 8051 Microcontroller for interfacing of I/O devices
CO4	CI407.4	Simulate Interfacing circuits using Proteus and learn the burning of Firmware into Microcontroller chip

LEARNING OUTCOMES:

I. Familiarization with Microcontroller Kit & Simulators

1. Familiarize with 8051 Microcontroller Kit
2. Familiarize with 8051 simulator KEIL (or equivalent software)

II. Basic programming using Microcontroller kit/Keil

3. Write an ALP to perform Block move - 10bytes of data from 0X30-0X39 to 0X40-0X49
4. Write an ALP to perform Block exchange – 10bytes of data between 0X30-0X39 to 0X40 0X49
5. Write an ALP to perform: Addition of two 8-bit numbers
6. Write an ALP to perform: Subtraction of two 8-bit numbers
7. Write an ALP to perform: Multiplication of two 8-bit numbers
8. Write an ALP to perform: Division of two 8-bit numbers
9. Write an ALP to perform addition of two 16-bit numbers
10. Write an ALP to perform subtraction of two 16-bit numbers
11. Write an ALP to find Smallest number in 10bytes of data stored from 0X30 to 0X39 and store the result in the next location i.e., 0X3A
12. Write an ALP to find Largest number in 10bytes of data stored from 0X30 to 0X39 and store the result in the next location i.e., 0X3A
13. Write an ALP to arrange the 'N' 8-bit numbers stored starting at RAM address 2000H in ascending order
14. Write an ALP to arrange the 'N' 8-bit numbers stored starting at RAM address 2000H in descending order
15. Write an ALP to find the 2's complement of given 8-bit number
16. Write an ALP to simulate BCD up counter.

III. To practice Interfacing Techniques using Embedded C

17. Write a program to make an LED connected to port pin P1.5, light up for specific time on pressing a switch connected to port pin P2.3
18. Write a Program to make an LED connected to pin P1.7 to blink at a specific rate
19. Interface a 7segment LED display with 8051 microcontroller and write a program to display a given decimal digit
20. Interface a small DC motor with 8051 and write a program to rotate the motor in clockwise/anti clockwise direction
21. Write an 8051 C program to display the messages LIFE and HOPE alternately on a 4-digit seven-segment display Interface
22. Interface a stepper motor with 8051 and write a program to rotate the motor in clockwise/anti clockwise direction in steps
23. Interface a dot matrix display with 8051 and write a program to display a message on it

IV. Application development using proteus/equivalent software

24. Familiarization of firmware-based application with proteus/equivalent software
- 25.0 Perform the following experiments using proteus
- 25 Write a program to make an LED connected to port pin P1.5, light up for specific time on pressing a switch connected to port pin P2.3
- 26 Write a Program to make an LED connected to pin P1.7 to blink at a specific rate
- 27 Interface a 7segment LED display with 8051 microcontroller and write a program to display a given decimal digit
- 28 Interface a small DC motor with 8051 and write a program to rotate the motor in clockwise/anti clockwise direction
29. Interface a small DC motor with 8051 and write a program to rotate the motor in clockwise/anti

clockwise direction

V. Dumping/Burning into Microcontroller

30.0. Perform burning/loading of .HEX file of experiments given below into flash memory for 89C51 and test it in development kit.

30 Write a program to make an LED connected to port pin P1.5, light up for specific time on pressing a switch connected to port pin P2.3

CO-PO/PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	3	3			3	3	3	
CO2	3	3	3	3	3			3	3	3
CO3	3	3	3	3	3	1	3	3	3	3
CO4	3	3	3	3	3	1	3	3	3	3
Average	3	3	3	3	3	1	3	3	3	3

3=strongly mapped 2=moderately mapped 1=slightly mapped

COMMUNICATION AND EMPLOYABILIGY SKILLS

Course Code	Course title	No of periods/week	Total no of periods	Marks for FA	Marks for SA	Credits
26CI408L	Communication and Employability Skills	04	60	40	60	2

TIME SCHEDULE

S. No.	Chapter/ Unit Title	No. of Periods	CO's Mapped
1.	ABC of Communication	6	CO1
2.	Let's Learn to Listen	6	CO2
3.	I am...	4	CO4
4.	Let's Talk About...	4	CO4

5.	JAM	6	CO4
6	Interpreting Data	6	CO3
7	Your Perfect Profile	4	CO5
8	Group Discussion	8	CO4
9	Interview Skills	8	CO5
10	Making Presentations	8	CO3
	Total	60	

COURSE OBJECTIVES

Upon completion of the course, the student shall be able to:	
(i)	To impart verbal and non-verbal communication skills
(ii)	To foster employability skills among the students for career building

COURSE OUTCOMES:

CO1	CI408.1	Practise appropriate body language and etiquette
CO2	CI408.2	Listen and comprehend the listening inputs related to different genres effectively
CO3	CI408.3	Interpret data and give oral and written presentations in academic and professional contexts
CO4	CI408.4	Communicate effectively in interpersonal interactions, interviews, and group discussions
CO5	CI408.5	Exhibit employability skills: job hunting, resume writing, attending interviews

LEARNING OUTCOMES

UNIT 1 :ABC of Communication

- 1.1. Identify and practice the process of communication.
- 1.2. Demonstrate befitting body language traits to enhance communication.
- 1.3. Apply appropriate strategies to minimize various barriers of communication.
- 1.4. Communicate effectively in a given situation with a purpose.

UNIT 2: Let's Learn to Listen

- 2.1. Identify and distinguish different phonic sounds in English language.
- 2.2. Practice active listening in the process of communication.
- 2.3. Comprehend diverse listening inputs in academic, professional and everyday situation using appropriate strategies.

UNIT 3: I am...

- 3.1. Prepare an organized self-introduction for formal and informal situations.
- 3.2. Introduce yourself in job interviews effectively.
- 3.3. Use appropriate body language while introducing yourself.

UNIT 4: Let's Talk About...

- 4.1. Describe objects, places, events and people using appropriate adjectives.
- 4.2. Use appropriate sentences and expressions while describing anything.
- 4.3. Use suitable adjectives to convey mood or tone.

UNIT 5: JAM

- 5.1. Generate ideas on a given topic.
- 5.2. Organize the ideas sequentially for an effective JAM speech.
- 5.3. Speak spontaneously and fluently on a given topic within the stipulated time.

UNIT 6: Data Interpretation

- 6.1. Identify different forms of graphs, charts, diagrams and tables.
- 6.2. Analyse and interpret data.
- 6.3. Present the inferences and findings in spoken and written communication.

UNIT 7: Your Perfect Profile

- 7.1. Draft a customised professional resume.
- 7.2. Create a professional Applicant Tracking System (ATS) compliant Resume.
- 7.3. Draft a cover letter to communicate with prospective employers.

UNIT 8: Group Discussion

- 8.1. Identify the significance of group discussion and differentiate the various stages involved.
- 8.2. Practice various roles and skills involved in group discussion.
- 8.3. Demonstrate appropriate body language for effective participation in group discussion.

UNIT 9: Interview Skills

- 9.1. Practice proper interview demeanour.
- 9.2. Respond effectively to frequently asked interview questions (FAQs).
- 9.3. Demonstrate readiness to job opportunities.

UNIT 10: Making Presentations

- 10.1. Demonstrate the features of a good presentation.
- 10.2. Use appropriate presentational aids.
- 10.3. Prepare and give presentations on various topics effectively.

CO-PO/PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PS01	PS02	PS03
CO1	PO's 1 to 5 are not directly applicable for English course.					1	1	Programme Specific Outcomes are Branch specific with technical aspects which are not directly applicable to English Language course.		
CO2						1	1			
CO3						2	2			
CO4						2	2			
CO5						2	2			
Average						1.6	1.6			

3-StronglyMapped

2-ModeratelyMapped

1-Slightly Mapped

Note:

The gaps in CO and PO mapping will be met by one or more appropriate activities from the following:
 (i)Assignments (ii)Tutorials (iii)Seminars (iv)GuestLectures (v)GroupDiscussions(vi) Quizzes (iv) Library Visits etc.,

REFERENCE BOOKS

1. A Textbook of English Phonetics for Indian Students by T. Balasubramaian
2. Better English Pronunciation by J.D. O'Connor
3. Group Discussion for Admissions and Jobs by Anand. S. Ganguly
4. Communicative English by E. Suresh Kumar and P. Sreehari

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR INTERNAL ASSESSMENTS I& II

Assessment	Learning Outcomes to be Covered
Internal Assessment – I	From1.1to5.3
Internal Assessment – II	From6.1to. 10.3

JAVA PROGRAMMING LAB

Course code	Course Title	No. of Periods/ WeeK	Total No. of periods	Marks for FA	Marks for SA	Credits
26CI409L	Java Programming Lab	4	60	40	60	2.5

TIME SCHEDULE

S.No.	Chapter/Unit Title	No. of Periods	CO's Mapped
1.	Basics, overloading, inheritance, overriding	14	CO1,CO2
2.	Streams, Interfaces and Packages and Collections.	12	CO2,CO3
3.	Exceptions and Multi threaded programming.	14	CO3,CO4
4.	Swings and Event Handling	20	CO5
Total Periods		60	

COURSE OBJECTIVES

Upon completion of the course, the student shall be able to	
(i)	Design object oriented programming paradigm
(ii)	Able to develop multi tasking application with the knowledge of multi threading.
(iii)	Familiarized to develop graphical user interface with event handling mechanism

COURSE OUTCOMES

CO1	CI409.1	Perform object oriented programming model application
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		design.
CO2	CI409.2	Design optimized definition for an application with reusability features like inheritance and polymorphism.
CO3	CI409.3	Analyze modular design for real time applications by using packages concept in projects. Able to design data structures used in applications.
CO4	CI409.4	Apply multi threading concepts to implement multitasking and multi programming applications.
CO5	CI409.5	Develop effective dynamic user interface for any front end applications using Swings and events.

LEARNING OUTCOMES

1. Exercise programs on conditional statements and loop statements
2. Exercise programs on Strings.
3. Exercise program to create class and objects and adding methods.
4. Exercise programs using constructors and construction over loading.
5. Exercise programs on command line arguments.
 - i) Input as command line arguments and perform operation on that data.
 - ii) Input as command line arguments and update manipulated data in Files.
6. Exercise programs using concept of overloading methods.
7. Exercise programs on inheritance.
8. Write a program using the concept of method overriding.
9. Exercise on packages.
 - i) Creation of packages
 - ii) Design module to importing packages from other packages.
10. Exercise programs on interfaces.
11. Exercise programs on I/O Streams
 - i) Reading data through Keyboard
 - ii) Perform Reading and Writing operations on files using File Streams.
12. Exercise programs on Collections.

- i) Write a java program to search a student mark percentage based on pin number using Array list.
 - ii) Write a java program to create linked list to perform delete, insert, and update data in linked list with any application.
13. Exercise on exception handling.
- i) Programs on try, catch and finally.
 - ii) Programs on multiple catch statements
 - iii) Programs on nested try statements.
14. Exercise on multithreading
- i) Programs on creation of single and multiple threads.
 - ii) Programs on adding priorities to multiple threads.
15. Exercise on applets
- i) Programs on Graphics and colors.
 - ii) Simple animations using threads and graphics.
16. Exercise on AWT controls and Swings
- i) Program to handle mouse events.
 - ii) Program to handle keyboard events.
 - iii) Programs to illustrate JText Fields andJ Button control.
 - iv) Programs to illustrate JCheckBox and JList control.
 - v) Write an application program to illustrate multiple controls.
 - vi) Programs to illustrate JFrame and JDialog with controls.

KEY COMPETENCIES

Exp. No.	Name of the experiment	Objectives	Key Competencies
1	Exercise programs on conditional statements and loop statements.	(a) Write program using if statement and switch (b) Write program using while, do and for constructs.	(a) Know the usage of IF and switch statements. (b) Compile the program and rectify the errors. (c) Observe the output.
2	Exercise programs on Strings.	(a) Write a programs to manipulate Strings (b) Write a programs to arrange array of strings in ascending order	(a) Create String objects (b) Use string class methods Observe the output.
3	Exercise program to create class and objects and adding methods.	(a) Write a program to create a class and create objects. (b) Write a program to create class adding methods and access class members.	(a) Create class. (b) Declare methods. (c) Create objects. (d) Write main method. (e) Access class members.
4	Exercise programs using constructors and construction over loading.	(a) Write a program using default constructor. (b) Write a program using parameterized constructor.	(a) Declare and define constructor. (b) Call default constructor. (c) Call parameterized constructor. (d) observe constructor overloading.
5	Exercise programs on command line arguments.	(a) Write a program to illustrate usage of command line arguments. (b) Write a program to read data as command line arguments and update it into Files.	(a) Use command line arguments. (b) Run the program. (c) Understand usage of Files. (c) Observe the output.
6	Exercise programs using concept of overloading methods.	(a) Write a program to illustrate method overloading. (b) Write a program to illustrate method overloading using constructors.	(a) Observe method overloading. (b) Overload constructor methods.
7	Exercise on inheritance.	(a)Write a program to illustrate single inheritance. (b)Write a program to illustrate multiple inheritance.	(a) Create base class. (b) Write base class constructor. (c) Create derived class. (d) Use extends keyword. (e) Use super keyword. (f) Write derived class constructor.
8	Write a program using the concept of method overriding.	Write a program using the concept of method overriding.	(a) Use method overriding. (b) Use this keyword. (c) use super keyword

9	Exercise on importing packages.	Write a program to create and importing package.	(a) Create package. (b) Use of access specifiers. (b) Use package. (c) Use import keyword.
10	Exercise on interfaces.	Write a program to illustrate multiple inheritance using interfaces.	(a) Define interface. (b) Use extends keyword. (c) Use implements keyword. (d) Access interface variables.
11	Exercise programs on I/O Streams	(a) Write a program to give values to variables interactively through the keyboard. (b) Write program to read and write primitive data types. (c) Write programs to handle Files.	(a) Use different data types. (b) Use readLine() method. (c) Use println() method. (d) use File Streams Observe the output.
12	Exercise programs on Collections.	(a) Write a java program to search a student mark percentage based on pin number using Array list. (b) Write a java program to create linked list to perform delete, insert, and update data in linked list with any application.	(a) Define collection classes (b) use ArrayList, LinkedList (c) apply List and Iterator Interface
13	Exercise on exception handling	(a) Write a program to illustrate exception handling. (b) Write a program to illustrate exception handling using multiple catch statements. (c) Write a program to illustrate exception handling using nested try.	(a) Use try – catch. (b) Use multiple catch blocks. (c) Use finally statement. (d) use Nested try
14	Exercise on multithreading	(a) Write a program to create single a thread by extending the thread class. (b) Write a program to create a single thread by implementing the runnable interface. (c) Write a program to create multiple threads. (d) Write a program to illustrate thread priorities.	(a) Use extends, new. (b) Use run() and start() methods. (c) Observe thread execution. (d) Use implements runnable interface. (e) Use setPriority() and getPriority() methods. (f) use wait(),notify() methods
15	Exercise on Swings.	Write a program to create simple applet to display different shapes with colors. Write an applet program to design simple animation.	(a) Use <applet>...</applet> tag. (b) Add applet to html file. (c) Run the applet. (d) use graphics methods (e) use threads and graphics.

16	Exercise on AWT controls using swings controls	<p>(a) Write an applet program to handle key events.</p> <p>(b) Write an applet program to handle mouse events.</p> <p>(c) Write a swing program to illustrate JTextField and JButton control.</p> <p>(d) Write a swing program to illustrate JCheck box and JList control.</p> <p>(e) Write swing program to illustrate multiple controls.</p>	<p>(a) Use keyboard event methods</p> <p>(b) Use mouse event methods</p> <p>(c) Use JText Field class methods</p> <p>(d) Use JButton class methods</p> <p>(e) Use JCheckbox and JList class methods</p>
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CO-PO/PSO MAPPING:

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	1	3	2		2	1	2	3	3
CO2	1	3	3	3	1	3	2	2	3	3
CO3	1	2	3	2	2	3	1	2	3	3
CO4	1	1	3	2	2	3	2	2	3	3
CO5	3	3	3	3	2	3	2	2	3	3
Average	1.6	2	3	2.4	1.5	3	1.6	2	3	3

3=strongly mapped, 2=moderately mapped, 1=slightly mapped

V SEMESTER

Course code	Course Title	No. of Periods/ Week	Total No. of periods	Marks for FA	Marks for SA	Credits
26CI501T	BASICS OF QUANTUM COMPUTING	6	90	30	70	4

BASICS OF QUANTUM COMPUTING

TIME SCHEDULE:

S.No.	Chapter/Unit Title	No. of Periods	Marks	No. of Short Answer Questions	No. of Essay Type Questions	CO's Mapped
1.	Introduction to Quantum Computing	18	14	2	2	CO1
2.	Qubits and Superposition	18	22	2	2	CO2
3.	Quantum Gates and Circuits	20	22	2	1	CO3
4.	Entanglement and Quantum Teleportation	19	14	2	1	CO3,CO4
5.	Quantum Computing in AI & ML	15	22	2	2	CO3,CO5
Total Periods		90	94	10	8	

COURSE OBJECTIVES:

<p>Understand the fundamental differences between classical and quantum computing concepts.</p> <p>Learn the evolution, history, and key terminology of quantum computing.</p> <p>Comprehend the principles of qubits, superposition, and quantum measurement.</p> <p>Gain conceptual knowledge of quantum gates, circuits, and their role in quantum computation.</p> <p>Explore the phenomena of quantum entanglement and teleportation and their applications.</p> <p>Recognize how quantum computing can enhance Artificial Intelligence and Machine Learning techniques.</p> <p>Analyze real-world applications, hardware platforms, and current research trends in quantum technology.</p> <p>Develop foundational understanding required for further studies or practical work in quantum computing and AI/ML integration.</p>

COURSE OUTCOMES:

At the end of the course the student able to learn following:		
CO1	CI501.1	Describe the basic principles and evolution of quantum computing , distinguishing it from classical computing systems.
CO2	CI501.2	Explain the concept of qubits, superposition, and quantum states , and understand their role in quantum computation.
CO3	CI501.3	Construct and interpret simple quantum circuits using quantum logic gates , and simulate quantum operations using basic tools or visualizations.
CO4	CI501.4	Understand and apply the principles of entanglement and quantum teleportation , and discuss their implications in secure data transmission.
CO5	CI501.5	Identify and explain potential applications of quantum computing in AI and ML , and evaluate how quantum algorithms may accelerate machine learning tasks.

LEARNING OUTCOMES:

Chapter 1 – Introduction to Quantum Computing

- 1.1 Introduction to classical vs quantum computing.
- 1.2 History and evolution of quantum computing.
- 1.3 Key differences between bits and qubits (conceptual view).
- 1.4 Limitations of classical computing.
- 1.5 Quantum computing advantages and challenges.
- 1.6 Quantum computing terminology (conceptual glossary).
- 1.7 Real-world applications overview.
- 1.8 Major milestones in quantum computing.
- 1.9 Overview of quantum hardware platforms (IBM, Google, etc.).
- 1.10 Future prospects and trends in quantum technology.

Chapter 2 – Qubits and Superposition

- 2.1 Concept of a qubit.
- 2.2 Physical representation of qubits (photons, electrons, etc.).
- 2.3 Difference between 0/1 bits and qubits.
- 2.4 Superposition explained using analogies.
- 2.5 Measurement and its effect on qubits.
- 2.6 Quantum state examples without equations.
- 2.7 Quantum decoherence (basic understanding).
- 2.7 Examples of superposition in daily life.
- 2.9 Role of superposition in computational speed-up.

Chapter 3 – Quantum Gates and Circuits

- 3.1 Introduction to quantum logic gates.
- 3.2 Single-qubit gates (X, Y, Z, H) – conceptual only.
- 3.3 Multi-qubit gates (CNOT, SWAP) – conceptual only.
- 3.4 Gate operations as transformations without math.
- 3.5 Building a simple quantum circuit (conceptual).
- 3.6 Difference between classical and quantum logic gates.

- 3.7 Quantum parallelism (idea only).
- 3.8 Circuit representation diagrams (without equations).
- 3.9 Practical examples of gate usage.

Chapter 4 – Entanglement and Quantum Teleportation

- 4.1 Concept of quantum entanglement.
- 4.2 Real-world analogies for entanglement.
- 4.3 Applications of entanglement in communication.
- 4.4 Role of entanglement in secure communication.
- 4.5 Quantum key distribution concept.
- 4.6 Entanglement in quantum networks.
- 4.7 Experimental demonstrations of teleportation.
- 4.8 Limitations and challenges of entanglement.

Chapter 5 – Quantum Computing in AI & ML

- 5.1 Introduction to AI & ML.
- 5.2 Why quantum computing can enhance AI & ML.
- 5.3 Examples of quantum-enhanced machine learning.
- 5.4 Concept of quantum data encoding (no math).
- 5.5 Quantum pattern recognition (conceptual).
- 5.6 Quantum clustering – high-level explanation.
- 5.7 Industries using quantum AI.
- 5.8 Case studies of quantum ML applications.
- 5.9 Challenges and future research directions.

CO-PO/PSO MAPPING:

CO/PO	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	1	1	1	0	0	2	0	1	1
CO2	1	0	1	2	1	0	2	2	2	0
CO3	3	0	0	1	0	0	2	2	1	0
CO4	2	2	1	1	0	0	1	2	1	3
CO5	2	0	1	1	1	0	2	2	3	0
Average	1.8	0.6	0.8	1.2	0.5	0	1.8	1.6	1.6	0.8

3=Strongly mapped , 2=moderately mapped, 1=slightly mapped

COURSE CONTENT:

Chapter 1 – Introduction to Quantum Computing:

Introduction to classical vs quantum computing-History and evolution of quantum computing-Key differences between bits and qubits (conceptual view)-Limitations of classical computing-Quantum computing advantages and challenges-Quantum computing terminology (conceptual glossary)-Real-world applications overview- Major milestones in quantum computing- Overview of quantum hardware platforms (IBM, Google, etc.)- Future prospects and trends in quantum technology.

Chapter 2 – Qubits and Superposition:

Concept of a qubit-Physical representation of qubits (photons, electrons, etc.)-Difference between 0/1 bits and qubits-Superposition explained using analogies-Measurement and its effect on qubits-Quantum state examples without equations-Quantum decoherence (basic understanding)-Examples of superposition in daily life-

Role of superposition in computational speed-up.

Chapter 3 – Quantum Gates and Circuits:

Introduction to quantum logic gates-Single-qubit gates (X, Y, Z, H) – conceptual only. Multi-qubit gates (CNOT, SWAP) – conceptual only-Gate operations as transformations without math-Building a simple quantum circuit (conceptual)-Difference between classical and quantum logic gates-Quantum parallelism (idea only)-Circuit representation diagrams (without equations)-Practical examples of gate usage

Chapter 4 – Entanglement and Quantum Teleportation

Concept of quantum entanglement-Real-world analogies for entanglement-Applications of entanglement in communication-Role of entanglement in secure communication.

Quantum key distribution concept-Entanglement in quantum networks.

Experimental demonstrations of teleportation-Limitations and challenges of entanglement.

Chapter 5 – Quantum Computing in AI & ML

Introduction to AI & ML-Why quantum computing can enhance AI & ML.

Examples of quantum-enhanced machine learning-Concept of quantum data encoding (no math)-Quantum pattern recognition (conceptual)-Quantum clustering – high-level explanation-Industries using quantum AI-Case studies of quantum ML applications.Challenges and future research directions.

REFERENCE BOOKS:

- 1) Quantum Computation and Quantum Information
Authors: Michael A. Nielsen & Isaac L. Chuang Publisher: Cambridge University Press
- 2) Dancing with Qubits: How quantum computing works and how it can change the world
Author: Robert S. Sutor Publisher: Packt Publishing / IBM Press
- 3) Quantum Computing: An Applied Approach
- 4) Learn Quantum Computing with Python and Q#
Authors: Sarah Kaiser, Christopher Granade, Nathan Wiebe, and Brian C. Beckman
Publisher: Manning Publications
- 5) Quantum Machine Learning: What Quantum Computing Means to Data Mining Author: Peter Wittek

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TESTS

Unit Test	Learning outcomes to be covered
Unit test-1	From 1.1 to 3.5
Unit test-2	From 3.6 to 5.9

HARDWARE PLATFORMS FOR IOT

Course Code	Course title	No of periods/ week	Total no of periods	Marks for FA	Marks for SA	Credits
26CI502T	HARDWARE PLATFORMS FOR IOT	06	90	30	70	4

TIME SCHEDULE

S No	Unit Title	No. of Periods	Weightage of Marks	No. of Short Answer Questions	No. of Essay Questions	COs Mapped
1	Introduction to Hardware Platforms for IoT	15	14	2	1	CO1
2	Building IoT with Arduino	20	22	2	2	CO2
3	Building IoT with ESP8266 Node Microcontroller Unit (Node MCU)	16	22	2	2	CO3
4	Building IoT with Raspburry Pi	21	22	2	2	CO4
5	Arduino Programming fundamentals	18	14	2	1	CO5
	Total	90	94	10	8	

COURSE OBJECTIVES

Upon completion of the course the student shall be able to	
i)	To Introduce Hardware Platforms for IoT
ii)	To understand about building IoT with Arduino
iii)	To know about Building IoT with ESP8266 Node Microcontroller Unit (Node MCU)
iv)	To explore building IoT with Raspburry Pi
v)	To get acquaint with Arduino Programming fundamentals

COURSE OUTCOMES

CO1	CI502.1	Introduce Hardware Platforms for IoT
CO2	CI502.2	understand about building IoT with Arduino
CO3	CI502.3	Know about building IoT with ESP8266 Node MCU
CO4	CI502.4	Build IoT with Raspburry Pi
CO5	CI502.5	Acquaint with Arduino Programming fundamentals

LEARNING OUTCOMES

1 Introduction to Hardware Platforms for IoT

- 1.1 State the need of hardware platform in IoT

- 1.2 List any six different common hardware platforms used in IoT
- 1.3 Explain the features of hardware platform such as i) power supply ii) Input/output iii) Memory iv) communication v) clock frequency
- 1.4 Draw the block diagram of an IoT based smart home automation system and explain the role of Hardware platform in that system.
- 1.5 List the advantages of hardware platforms in building IoT
- 1.6 List the applications of hardware platforms in IoT
- 1.7 List the factors to be considered for selection of an IoT hardware platform

2 Building IoT with Arduino

- 2.1 State the purpose Arduino development boards in building IoT projects
- 2.2 List different entry level Arduino boards
- 2.3 Draw the layout diagram of Arduino Uno and identify different functional blocks
- 2.4 List the features of Arduino Uno
- 2.5 Explain about the analog, digital and PWM I/O pins of Arduino Uno
- 2.6 List the communication protocols supported by Arduino Uno
- 2.7 State the memory modules associated with Arduino Uno
- 2.8 State the power supply features of Arduino Uno
- 2.9 Compare the specifications and features of entry level Arduino boards such as: Uno R3, Nano, Mini, Micro and Mega boards.
- 2.10 List different Enhanced Featured Arduino boards
- 2.11 Compare the specifications and features of Enhanced Featured Arduino boards such as: Nano BLE, MKR Zero, and Zero boards.
- 2.12 List different IoT Arduino boards
- 2.13 Compare the specifications and features of IoT featured Arduino boards such as: Nano 33 IoT, MKR FOX 1200, MKR WAN 1300/1310, MKR GSM 1400, MKR WiFi and MKR NB 1500 boards.
- 2.14 Explain the step by step procedure of interfacing and building a project by taking DHT11 temperature sensor and LCD display interface with Arduino Uno as an example
- 2.15 Explain the step by step procedure for programming the Arduino board with Arduino IDE

1.0 Building IoT with ESP8266 Node Microcontroller Unit (Node MCU)

- 1.1 State the purpose of ESP 8266 Node MCU development board
- 1.2 State the features and specifications of ESP 8266 Node MCU
- 1.3 Draw the pin configuration of ESP8266 NodeMCU and state the purpose of each pin
- 1.4 Differentiate between Arduino uno and NodeMCU ESP8266
- 1.5 Differentiate between ESP32 and ESP 8266
- 1.6 List the applications of ESP8266 Node MCU
- 1.7 Explain about the significance of Wifi module in ESP8266
- 3.8 List the different protocols supported by ESP8266 in each layer of TCP/IP stack
- 3.9 Explain the step by step procedure of interfacing and building a project by taking SPI camera interface with ESP8266 WiFi module to display the video on mobile phone as an example
- 3.10 Explain the step by step procedure for programming the ESP8266 with Arduino IDE

4 Building IoT with Raspborry Pi

- 4.1 State the purpose of Raspborry Pi board
- 4.2 Classify Raspborry Pi generations and models

- 4.3 List the important specifications and features of Raspburry Pi
- 4.4 Compare different Raspburry Pi generations and models (Gen 4 Model B, Gen 3 model B+, Gen 3 model B and Gen 3 model A+) on the basis of: i) General Purpose Input/Output (GPIO), ii) clock frequency of CPU, iii) no. of cores and iv) RAM size
- 4.5 Compare different Raspburry Pi generations and models (Gen 4 Model B, Gen 3 model B+, Gen 3 model B and Gen 3 model A+) on the basis of: i) USB ports ii) power supply requirements iii) HDMI ports
- 4.6 Compare different Raspburry Pi generations and models (Gen 4 Model B, Gen 3 model B+, Gen 3 model B and Gen 3 model A+) on the basis of: i) video out quality ii) video in iii) Ethernet iv) bluetooth v)Wi-Fi and vi) external storage
- 4.7 State the significant usage of Raspburry Pi Zero
- 4.8 Compare Raspburry Pi and Arduino development boards
- 4.9 List the factors influencing the choice of selection of Raspburry Pi and Arduino
- 4.10 Explain the step by step procedure of interfacing and building a project by taking Fire sensor interface with Raspburry Pi to send notifications on mobile phone in case of fire as an example
- 4.11 Explain the step by step procedure for installation of Raspburry Pi OS (ex:Raspbian OS)
- 4.12 Explain the step by step procedure of programming the Raspburry Pi

5 Arduino Programming fundamentals

- 5.1 State the purpose of Arduino programming language
- 5.2 State the structure of Arduino sketch.
- 5.3 State the syntax and purpose of setup() and loop() functions
- 5.4 State the data types, variables, and operators of Arduino programming language
- 5.5 State the syntax of following Arduino constant declaration : HIGH, LOW,INPUT, OUTPUT, INPUT_PULLUP,LED_BUILTIN, true, false
- 5.6 Explain about the control statements such as: i) if statement ii) if...else statement iii)if...else if..else statement iv) switch statement and v) control operator of Arduino programming language
- 5.7 Explain about the loop statements such as : i) while loop ii) do...while loop iii) for loop of Arduino programming language
- 5.8 Explain the syntax and usage of Arduino I/O functions such as: i) pinMode() ii)digitalRead() iii)digitalWrite() iv)analogRead() v) analogWrite() vi) analogReference() Functions
- 5.9 Explain about the syntax and usage of times functions such as: i) delay() ii)delayMicroseconds() iii)millis() iv)micros()
- 5.10 State the need for Arduino library functions
- 5.11 State the process of adding library to the Arduino sketch
- 5.12 State the use of Tinkercad simulator
- 5.13 Explain the step by step procedure of building and simulating an Arduino based circuit (ex. LED blinking) using Tinkercad.

CO-PO/PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3				1			3		1

CO2	3	2	1		2			3	1	
CO3	3	1	1		1			3		1
CO4	3	3	2	1	2			3		2
CO5	3	3	1	2	3		1	3	1	2
Average	3	2.25	1.25	1.5	1.8	0	1	3	1	1.5

3=strongly mapped, 2=moderately mapped, 1=slightly mapped

NOTE:

The gap in CO and PO mapping will be met by one or more appropriate activities from the following:

- (i) Assignments (ii) Tutorial (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizes
- (vii) Industrial Visits (viii) Techfests (ix) Mini Projects (x) Library visits etc.,

COURSE CONTENT:

1. Introduction to Hardware Platforms for IoT

State the need of hardware platform in IoT-List any six different common hardware platforms used in IoT -Explain the features of hardware platform such as i) power supply ii) Input/output ii) Memory iii) communication iv) clock frequency-Draw the block diagram of an IoT based smart home automation system and explain the role of Hardware platform in that system. -List the advantages of hardware platforms in building IoT -List the applications of hardware platforms in IoT-List the factors to be considered for selection of an IoT hardware platform

2 Building IoT with Arduino

State the purpose Arduino development boards in building IoT projects-List different entry level Arduino boards -Draw the layout diagram of Arduino Uno and identify different functional blocks-List the features of Arduino Uno--Explain about the analog, digital and PWM I/O pins of Arduino Uno-List the communication protocols supported by Arduino Uno-State the memory modules associated with Arduino Uno-State the power supply features of Arduino Uno-Compare the specifications and features of entry level Arduino boards such as: Uno R3, Nano, Mini, Micro and Mega boards.-List different Enhanced Featured Arduino boards -Compare the specifications and features of Enhanced Featured Arduino boards such as: Nano BLE, MKR Zero, and Zero boards.-List different IoT Arduino boards - Compare the specifications and features of IoT featured Arduino boards such as: Nano 33 IoT, MKR FOX 1200, MKR WAN 1300/1310, MKR GSM 1400, MKR WiFi and MKR NB 1500 boards.-Explain the step by step procedure of interfacing and building a project by taking DHT11 temperature sensor and LCD display interface with Arduino Uno as an example -Explain the step by step procedure for programming the Arduino board with Arduino IDE

3 Building IoT with ESP8266 Node Microcontroller Unit (Node MCU)

State the purpose of ESP 8266 Node MCU development board-State the features and specifications of ESP 8266 Node MCU-Draw the pin configuration of ESP8266 NodeMCU and state the purpose of each pin-Differentiate between Arduino uno and NodeMCU ESP8266 Differentiate between ESP32 and ESP 8266-List the applications of ESP8266 Node MCU Explain about the significance of Wifi module in ESP8266 - List the different protocols supported by ESP8266 in each layer of TCP/IP stack-Explain the step by step procedure of interfacing and building a project by taking SPI camera interface with ESP8266 WiFi module to display the video on mobile phone as an example-Explain the step by step procedure for programming the ESP8266 with Arduino IDE

4 Building IoT with Raspberry Pi

State the purpose of Raspberry Pi board-Classify Raspberry Pi generations and models-List the important specifications and features of Raspberry Pi-Compare different Raspberry Pi generations and models (Gen 4 Model B, Gen 3 model B+, Gen 3 model B and Gen 3 model A+) on the basis of: i) General Purpose Input/Output (GPIO), ii) clock frequency of CPU, iii) no. of cores and iv) RAM size -

Compare different Raspberry Pi generations and models (Gen 4 Model B, Gen 3 model B+, Gen 3 model B and Gen 3 model A+) on the basis of: i) USB ports ii) power supply requirements iii) HDMI ports-Compare different Raspberry Pi generations and models (Gen 4 Model B, Gen 3 model B+, Gen 3 model B and Gen 3 model A+) on the basis of: i) video out quality ii) video in iii) Ethernet iv) bluetooth v)Wi-Fi and vi) external storage-State the 302 significant usage of Raspberry Pi Zero-Compare Raspberry Pi and Arduino development boards List the factors influencing the choice of selection of Raspberry Pi and Arduino -Explain the step by step procedure of interfacing and building a project by taking Fire sensor interface with Raspberry Pi to send notifications on mobile phone in case of fire as an example -Explain the step by step procedure for installation of Raspberry Pi OS (ex:Raspbian OS)- Explain the step by step procedure of programming the Raspberry Pi

5 Arduino Programming fundamentals

State the purpose of Arduino programming language-State the structure of Arduino sketch. State the syntax and purpose of setup() and loop() functions-State the data types, variables, and operators of Arduino programming language-State the syntax of following Arduino constant declaration : HIGH, LOW,INPUT, OUTPUT, INPUT_PULLUP,LED_BUILTIN, true, false Explain about the control statements such as: i) if statement ii) if...else statement iii)if...else if..else statement iv) switch statement and v) control operator of Arduino programming language-Explain about the loop statements such as : i) while loop ii) do...while loop iii) for loop of Arduino programming language-Explain the syntax and usage of Arduino I/O functions such as: i) pinMode() ii)digitalRead() iii)digitalWrite() iv)analogRead() v) analogWrite() vi) analogReference() Functions-Explain about the syntax and usage of times functions such as: i) delay() ii)delayMicroseconds() iii)millis() iv)micros()-State the need for Arduino library functions-State the process of adding library to the Arduino sketch-State the use of Tinkercad simulator -Explain the step by step procedure of building and simulating an Arduino based circuit (ex. LED blinking) using Tinkercad.

Reference Books:

1. Rao, M., “Internet of Things with Raspberry Pi 3: Leverage the power of Raspberry Pi 3 and JavaScript to build exciting IoT projects”, Packt Publishing Ltd,2018
- 2.Baichtal, J., “Arduino for beginners: essential skills every maker needs” Pearson Education, 2013
3. Schwartz, M. ,” Internet of Things with ESP8266. Packt Publishing Ltd, 2016
4. Richardson, M., & Wallace, S., “Getting started with raspberry PI. " O’Reilly Publisher Media, Inc., 2012
5. John C. Shovic , “Raspberry Pi IoT Project: Prototyping Experiments for Makers”, Apress publishers,2016
6. Erik Savasgard, “Arduino For Beginners”, ebook, 2014

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TEST-I & UNIT TEST-II

Unit Test	Learning outcomes to be covered
Unit Test-I	From 1.1 to 3.4
Unit Test-II	From 3.5 to 5.13

BIG DATA & CLOUD COMPUTING

Course code	Course Title	No. of Periods/Weeks	Total No. of periods	Marks for FA	Marks for SA	Credits
26CI503T	BIGDATA & CLOUD COMPUTING	6	90	20	80	4

TIME SCHEDULE

S.No.	Chapter/Unit Title	No. of Periods	Weightage of marks	No. of short Answer Questions	No. of Essay Questions	CO's Mapped
1.	Over View of Data Mining and Data Ware housing	25	33	3	3	CO1
2.	Introduction to Big Data	15	14	2	1	CO2
3.	Big Data Analytics	20	22	2	2	CO3
4.	CLOUD COMPUTING	15	11	1	1	CO4
5.	Interplay of IoT, Big Data & Cloud Computing	15	14	2	1	CO5
Total Periods		90	94	10	8	

COURSE OBJECTIVES

Upon completion of the course the student shall be able to	
i)	To know the fundamentals of Data Mining
ii)	To know the fundamentals of Data Ware Housing
iii)	To familiarize with Big Data and Big Data Analytics
iv)	To Know Big data Technologies

COURSE OUTCOMES

CO1	CI503.1	Describe Data Mining AND Data Ware Housing
CO2	CI503.2	Describe Big Data
CO3	CI503.3	Analyse functioning of various Big data Analytical techniques
CO4	CI503.4	Explain Cloud computing
CO5	CI503.5	Interplay of IoT, Big Data & Cloud Computing

LEARNING OUTCOMES:

1. OVER VIEW DATA MINING and DATA WARE HOUSING

- 1.1. Define Data Mining
- 1.2. List type of Data Mining
- 1.3. List Advantages of Data Mining
- 1.4. List Disadvantages of Data Mining
- 1.5. List Applications of Data Mining
- 1.6. List Challenges of Implementation in Data mining
- 1.7. Evolution of Data Mining
- 1.8. List and explain Data Mining Techniques
- 1.9. Explain Data Mining Implementation Process
- 1.10. Explaining Data Mining Architecture
- 1.11. Explain KDD- Knowledge Discovery in Databases of Data Mining
- 1.12. List and explain Data Mining tools
- 1.13. Define data ware housing
- 1.14. State the importance of Data Ware Housing
- 1.15. Differences between Database and Data Warehouse
- 1.16. Explain Data Warehouse Architecture
- 1.17. Explain Three-Tier Data Warehouse Architecture
- 1.18. State the importance of Operational Data Stores
- 1.19. Define ETL and ELT
- 1.20. List Types of Data Warehouses
- 1.21. Explain Data Ware Housing Model
- 1.22. Differentiate between Data Mining and Data Warehousing

2. Introduction to Big Data

- 2.1. Define Big data
- 2.2. Evolution of Big data
- 2.3. List Challenges of Traditional system
- 2.4. Describe three V's of big data
- 2.5. Describe Storing Big Data
- 2.6. How do you Select Big Data
- 2.7. Explain Processing of Big Data
- 2.8. Classify the structures of Big Data
- 2.9. State the Need of Big Data
- 2.10. List the sources of big data
- 2.11. Define Big Data Analytics
- 2.12. List the types of tools used in Big Data
- 2.13. List and explain the applications of big data

- 2.14. List various risks of Big Data
- 2.15. Describe Intelligent data analysis
- 2.16. Differentiate between Traditional and Big data approach

3. BIG DATA ANALYTICS

- 3.1. State the importance of big data analytics
- 3.2. Explain Big Data Life Cycle
- 3.3. State the Methodology in Big data Analytics
- 3.4. List Core Deliverables
- 3.5. List Key Stakeholders
- 3.6. List the responsibilities of Data Analyst
- 3.7. List the basic skills necessary for data analyst
- 3.8. State the importance of Data Scientist
- 3.9. Dealing with Big Data Analytic Project
 - 3.9.1. How to manage a Bigdata Analytics Project
 - 3.9.2. State Problem Definition
 - 3.9.3. Data collection
 - 3.9.4. Cleansing data
 - 3.9.5. Summarizing
 - 3.9.6. Data exploration
 - 3.9.7. Data Visualization
- 3.10. Big data Analytic methods
 - 3.10.1. Importance of SQL in Data Analytics
 - 3.10.2. Importance of Charts & Graphs
 - 3.10.3. Importance of Data Analysis Tools: R Programming, Python for data analysis, Julia, SPSS, MATLAB, Octave
- 3.11. ADVANCED METHODS
 - 3.11.1. Role of Machine Learning for Data Analysis
 - 3.11.2. List association rules
 - 3.11.3. State importance of Decision trees
 - 3.11.4. State importance of Text Analytics
- 3.12. BIG DATA TECHNOLOGIES
 - 3.12.1. State the importance of NOSQL
 - 3.12.2. List advantages of NOSQL
 - 3.12.3. Sate the importance of NEWSQL
 - 3.12.4. List advantages of NEWSQL
 - 3.12.5. HADOOP
 - 3.12.5.1. List advantages
 - 3.12.5.2 List Features
 - 3.12.5.3 List versions
 - 3.12.5.4. Explain Hadoop components
 - 3.12.5.5.Explain HADOOP Architecture

4. CLOUD COMPUTING

- 4.1. What is cloud computing
- 4.2. List Advantages of cloud computing
- 4.3. List disadvantages of cloud computing
- 4.4. Evolution of cloud computing
- 4.5. Draw and explain NIST Visual Model of Cloud Computing

- 4.6. List features of Cloud computing
- 4.7. List and explain components of cloud computing
- 4.8. List and explain Cloud computing technologies
- 4.9. List and explain different service models in cloud computing
- 4.10. Compare different service models
- 4.11. List and explain different deployment models or types of clouds
- 4.12. Differentiate between private cloud and public cloud
- 4.13. Compare traditional data center and Cloud storage
- 4.14. Describe how data is managed in cloud (DBaaS)
- 4.15. Explain security concepts in cloud
- 4.16. List different types of cloud simulator
- 4.17. State the importance of cloud simulator

5. Interplay of IoT, Big Data & Cloud Computing

- 5.1 Architecture linking IoT, Cloud, and Big Data
 - 5.1.1 IoT device layer (sensors, actuators)
 - 5.1.2 Edge/gateway layer (data aggregation, filtering)
 - 5.1.3 Cloud ingestion (APIs, MQTT, HTTP)
 - 5.1.4 Big Data storage (data lake, NoSQL, time-series DB)
 - 5.1.5 Analytics & visualization layer
- 5.2 Designing simple IoT → Cloud data pipelines
 - 5.2.2 Device connectivity & protocols
 - 5.2.3 Data preprocessing at edge
 - 5.2.4 Cloud data ingestion services
 - 5.2.5 Storage setup (raw & processed)
 - 5.2.6 Basic ETL workflow
- 5.3 Basic Big Data processing techniques
 - 5.3.1 Batch processing (Hadoop, Spark batch jobs)
 - 5.3.2 Stream processing (Spark Streaming, Flink, Kafka)
 - 5.3.3 Use cases for each method
- 5.4 Evaluating cloud services for IoT
 - 5.4.1 Storage: S3, Azure Blob, GCP Storage
 - 5.4.2 Compute: AWS Lambda, Azure Functions, GCP Cloud Functions
 - 5.4.3 Messaging: AWS IoT Core, Azure IoT Hub, GCP Pub/Sub
- 5.5 Small IoT → Cloud → Analytics demo
 - 5.5.1 Choose IoT device & sensors
 - 5.5.2 Send data via MQTT/HTTP to cloud
 - 5.5.3 Store in time-series DB
 - 5.5.4 Apply simple analytics (trend, threshold alerts)
 - 5.5.5 Visualize in dashboard tool

CO-PO/PSO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	1	1	1	0	0	2	0	1	1
CO2	1	0	1	2	1	0	2	2	2	0
CO3	3	0	0	1	0	0	2	2	1	0
CO4	2	2	1	1	0	0	1	2	1	3

CO5	2	0	1	1	1	0	2	2	3	0
Average	1.8	0.6	0.8	1.2	0.5	0	1.8	1.6	1.6	0.8

3=Strongly mapped , 2=moderately mapped, 1=slightly mapped

NOTE:

The gap in CO and PO mapping will be met by one or more appropriate activities from the following:

- (i) Assignments (ii) Tutorial (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizes
- (vii) Industrial Visits (viii) Techfests (ix) Mini Projects (x) Library visits etc.,

COURSE CONTENT

UNIT-I

DATA MINING: Data Mining - definition – Types- Advantages - Disadvantages - Applications - challenges - Evolution – Techniques - Implementation Process – Architecture - KDD- Knowledge Discovery - tools

DATA WARE HOUSING: What is data ware housing - importance of Data Ware Housing – differences between Database and Data Warehouse - Data Warehouse Architecture - Three-Tier Data Warehouse Architecture - Operational Data Stores? - Define ETL and ELT - Types of Data Warehouses - Data Ware Housing Model -Data Mining Vs Data Warehousing

UNIT - II

Introduction to Big Data: Define big data & analytics - Evolution of data/big data - Challenges of Traditional system - The three V's of big - Storing Big Data - Selecting Big Data - Processing of Big Data- structures of Big Data - Need Big Data - tools used in Big Data - applications of big data - risks of Big Data - importance of Intelligent data analysis - Traditional vs. Big Data approach

UNIT – III

BIG DATA ANALYTICS: Importance of big data analytics - Big Data Life Cycle - Methodology in Big data Analytics - Core Deliverables - Key Stakeholder - responsibilities of Data Analysis - basic skills necessary for data analyst - importance of Data Scientist- Big Data Analytic Project- Big data Analytic methods - ADVANCED METHODS- BIG DATA TECHNOLOGIES -NOSQL -NEWSQL – HADOOP

UNIT - IV

CLOUD COMPUTING: cloud computing - Advantages and disadvantages - Evolution of cloud computing - Draw and explain NIST Visual Model of Cloud Computing - features of Cloud computing- components of cloud computing- Cloud computing technologies - different service models in cloud computing - Compare different service models- different deployment models or types of clouds- Differentiate between private cloud and public cloud - Compare traditional data centre and Cloud storage - how data is managed in cloud(DBaaS)- security concepts in cloud- cloud simulator and List different types

UNIT – V

Interplay of IoT, Big Data & Cloud Computing – Architecture Linking IOT, Cloud and Big Data – Data Pipelines – Cloud Processing – Data Processing – Cloud Services- Demo

REFERENCE BOOKS

1. H.Dunham, "Datamining: Introductory and Advanced Topics" Pearson Education.
2. Sam Anahory, Dennis Murray, "Data Warehousing in the Real World : A Practical Guide for Building Decision Support Systems, Pearson Education.
3. Jiawei Han, Micheline Kamber, "Data Mining Concepts & Techniques" Elsevier.
4. Mallach, "Data Warehousing System", McGraw –Hill.
5. **Big Data and Internet of Things: A Roadmap for Smart Environments** Nik Bessis, Ciprian Dobre — Springer, 2014.

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TEST-I & UNIT TEST-II

Unit Test	Learning outcomes to be covered
Unit test-1	1.1 to 3.8
Unit test-2	3.9 to 5.6.9

INDUSTRIAL IOT AND ITS SECURITY

Course Code	Course title	No of periods/week	Total no of periods	Marks for FA	Marks for SA	Credits
26CI504E	INDUSTRIAL IOT AND ITS SECURITY	03	45	30	70	2

TIME SCHEDULE

S No	Unit Title	No. of Periods	Weightage of Marks	No. of Short Answer Questions	No. of Essay Questions	COs Mapped
1	Introduction to Industrial Internet of Things (IIOT)	8	14	2	1	CO1
2	Reference Architecture of IIoT and Key Technologies of IIoT	10	22	2	2	CO2
3	Data Transmission technologies in IIoT	10	22	2	2	CO3
4	Industrial Data Acquisition and Control in IIoT & IIoT Analytics	10	22	2	2	CO4
5	Industrial IoT Security	7	14	2	1	CO5
	Total	45	94	10	8	

COURSE OBJECTIVES

Upon completion of the course the student shall be able to	
i)	To introduce Industrial Internet of Things (IIOT)
ii)	To explore reference Architecture of IIoT and Key Technologies of IIoT
iii)	To understand the Data Transmission technologies in IIoT
iv)	To familiarise with Industrial Data Acquisition and Control in IIoT & IIoT Analytics
v)	To know about Industrial IoT Security

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COURSE OUTCOMES

CO1	CI504.1	Introduction about Industrial Internet of Things (IIOT)
CO2	CI504.2	Exploration of reference Architecture of IIoT and Key Technologies of IIoT
CO3	CI504.3	Understanding the Data Transmission technologies in IIoT

CO4	CI504.4	Familiarisation with Industrial Data Acquisition and Control in IIoT & IIoT Analytics
CO5	CI504.5	Understanding the basics of Industrial IoT Security

LEARNING OUTCOMES

1. Introduction to Industrial Internet of Things (IIoT)

- 1.1 Explain the concept of Industrial Internet of Things (IIoT)
- 1.2 Distinguish between IoT and Industrial IoT
- 1.3 List the applications of Industrial IoT
- 1.4 List the benefits of Industrial IoT in manufacturing
- 1.5 List any six IIoT vendors
- 1.6 Explain the impact of 5G mobile communication technology on Industrial IOT
- 1.7 Explain the role of IIoT in Industry 4.0
- 1.8 Explain about the important requirements of IIoT
- 1.9 Explain the concept of Cyber Physical System (CPS)
- 1.10 State any six important features of CPS
- 1.11 State the characteristics of CPS
- 1.12 List the applications of CPS
- 1.13 Explain about mobile Cyber Physical System
- 1.14 State the similarities and differences between CPS and IoT
- 1.15 Draw a Venn diagram depicting the relationship between IoT, CPS, IIoT, and Industry 4.0 and explain.

2. Reference Architecture of IIoT and Key Technologies of IIoT

- 2.1 Define Business model of IoT
- 2.2 List the primary principles of a reference architecture for Industrial IoT
- 2.3 List different viewpoint framework of Industrial Internet reference architecture (IIRA).
- 2.4 Explain the Business viewpoint framework of IIRA
- 2.5 Explain the usage viewpoint framework of IIRA
- 2.6 Explain the functional viewpoint framework of IIRA
- 2.7 Explain the implementation viewpoint framework of IIRA
- 2.8 State the key technologies of IIoT
- 2.9 Define Artificial Intelligence (AI).
- 2.10 List the advantages of AI-powered IIoT
- 2.11 Define Cloud Computing.
- 2.12 Explain the role of Cloud computing in IoT
- 2.13 List the advantages and disadvantages of cloud computing in IoT
- 2.14 Define edge Computing.
- 2.15 List the key benefits of edge computing in IoT based manufacturing.
- 2.16 Define Data Mining
- 2.17 Explain about the role of Data mining in IIoT

3. Data Transmission technologies in IIoT

- 3.1 List different data transmission technologies used in IIoT

- 3.2 State the salient features of Foundation Fieldbus (FF)
- 3.3 State the salient features of Profibus
- 3.4 State the salient features of Interbus
- 3.5 Differentiate between the Profibus and the Interbus.
- 3.6 State the salient features of Highway Addressable Remote Transducer (HART)
- 3.7 State the salient features of Bitbus
- 3.8 State the salient features of CC-Link
- 3.9 State the salient features of Modbus
- 3.10 State the salient features of Batibus
- 3.11 Explain about Controller Area Network (CAN)
- 3.12 State the salient features of CAN
- 3.13 State the salient features of DeviceNet
- 3.14 State the salient features of LonWorks
- 3.15 State the important features of ISA100.11a
- 3.16 State the important features of Wireless HART
- 3.17 Differentiate between HART and Wireless HART
- 3.18 State the important features of Narrow Band-IoT (NB-IoT)

4 Industrial Data Acquisition and Control in IIoT & IIoT Analytics

- 4.1 State the necessity of Industrial Control
- 4.2 List the important systems used for Industrial control in IIoT
- 4.3 Explain the architecture and components of Distributed control System (DCS) with a block diagram
- 4.4 Explain Architecture and components of Programmable Logic Control (PLC) with a block diagram
- 4.5 Explain Architecture and components of Supervisory Control And Data Acquisition (SCADA) with a block diagram
- 4.6 Differentiate between PLC and SCADA
- 4.7 State the necessity of analytics
- 4.8 List the four major types of IIoT analytics
- 4.9 State the concepts of descriptive analytics, diagnostic analytics, prescriptive analytics, and predictive analytics.
- 4.10 List the challenges of analytics in Industries.

5 Industrial IoT Security

- 5.1 Define IIoT Security
- 5.2 List different security goals.
- 5.3 Explain the terms referred to IIoT Security: i) Confidentiality i) Integrity iii) Availability iv) Authenticity v) Non-repudiation vi) Access Control vi) Authorization
- 5.4 Define the terms passive and active security threats
- 5.5 Differentiate between passive and active security threats.
- 5.6 List and explain categories of security services.
- 5.7 List and explain categories of security mechanisms.
- 5.8 Explain the model for network security and with block diagram.
- 5.9 Explain why security is required for IIoT

- 5.10 State the common security problems in Perception layer
- 5.11 State the common security problems in Network layer
- 5.12 State the common security problems in Application layer
- 5.13 Explain the ways to protect IIoT from common security attacks

CO-PO/PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3				1			3		1
CO2	3	2	1		2			3	1	
CO3	3	1	1		1			3		1
CO4	3	3	2	1	2			3		2
CO5	3	3	1	2	3		1	3	1	2
Average	3	2.25	1.25	1.5	1.8	0	1	3	1	1.5

3=strongly mapped, 2=moderately mapped, 1=slightly mapped

NOTE:

The gap in CO and PO mapping will be met by one or more appropriate activities from the following:

- (i) Assignments (ii) Tutorial (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (vii) Industrial Visits (viii) Techfests (ix) Mini Projects (x) Library visits etc.,

COURSE CONTENT:

1. Introduction to Industrial Internet of Things (IIoT)

Explain the concept of Industrial Internet of Things (IIoT)-Distinguish between IoT and Industrial IoT-List the applications of Industrial IoT-List the benefits of Industrial IoT in manufacturing-List any six IIoT vendors-Explain the impact of 5G mobile communication technology on Industrial IOT Explain the role of IIoT in Industry 4.0-Explain about the important requirements of IIoT-Explain the concept of Cyber Physical System (CPS)-State any six important features of CPS-State the characteristics of CPS-List the applications of CPS- Explain about mobile Cyber Physical System State the similarities and differences between CPS and IoT-Draw a Venn diagram depicting the relationship between IoT, CPS, IIoT, and Industry 4.0 and explain.

2. Reference Architecture of IIoT and Key Technologies of IIoT

Define Business model of IoT-List the primary principles of a reference architecture for Industrial IoT-List different viewpoint framework of Industrial Internet reference architecture (IIRA).-Explain the Business viewpoint framework of IIRA-Explain the usage viewpoint framework of IIRA-Explain the functional viewpoint framework of IIRA-Explain the implementation viewpoint framework of IIRA-State the key technologies of IIoT-Define Artificial Intelligence (AI).-List the advantages of AI powered IIoT-Define Cloud Computing.-Explain the role of Cloud computing in IoT-List the advantages and disadvantages of cloud computing in IoT-Define edge Computing.-List the key benefits of edge computing in IoT based manufacturing.-Define Data Mining-Explain about the role of Data mining in IIoT

3. Data Transmission technologies in IIoT

List different data transmission technologies used in IIoT-State the salient features of Foundation Fieldbus (FF)-State the salient features of Profibus-State the salient features of Interbus Differentiate between the Profibus and the Interbus.-State the salient features of Highway Addressable Remote Transducer (HART)-State the salient features of Bitbus-State the salient features of CC-Link-State the salient features of Modbus-State the salient features of Batibus Explain about Controller Area Network (CAN)-State the salient features of CAN-State the salient features of DeviceNet-State the salient

features of LonWorks-State the important features of ISA100.11a-State the important features of Wireless HART-Differentiate between HART and Wireless HART-State the important features of Narrow Band-IoT (NB-IoT)

4. Industrial Data Acquisition and Control in IIoT & IIoT Analytics

State the necessity of Industrial Control-List the important systems used for Industrial control in IIoT-Explain the architecture and components of Distributed control System (DCS) with a block diagram-Explain Architecture and components of Programmable Logic Control (PLC) with a block diagram-Explain Architecture and components of Supervisory Control And Data acquisition (SCADA) with a block diagram-Differentiate between PLC and SCADA-State the necessity of analytics-List the four major types of IIoT analytics-State the concepts of descriptive analytics, diagnostic analytics, prescriptive analytics, and predictive analytics.-List the challenges of analytics in Industries.

5. Industrial IoT Security

Define IIoT Security-List different security goals.-Explain the terms referred to IIoT Security: i) Confidentiality ii) Integrity iii) Availability iv) Authenticity v) Non-repudiation vi) Access Control vii) Authorization-Define the terms passive and active security threats-Differentiate between passive and active security threats.-List and explain categories of security services.-List and explain categories of security mechanisms.-Explain the model for network security and with block diagram.-Explain why security is required for IIoT -State the common security problems in Perception layer -State the common security problems in Network layer -State the common security problems in Application layer -Explain the ways to protect IIoT from common security attacks-

Reference Books:

- 1 Alasdair Gilchrist, "Industry 4.0: The Industrial Internet of Things", Apress
- 2 Audrey O'Shea, "A Geek Girl's Guide to Electronics and the Internet of Things", 2020, Wiley Publishing house
- 3 smail Butun, "Industrial-iiot-challenges-design-principles-applications-and-security", 2020, Springer publishers
4. Sravani Bhattacharjee, "Practical Industrial Internet of Things Security", Packt Publishing, 2018
5. Anandarup Mukherjee, Chandana Roy, Sudip Misra, "Introduction to Industrial Internet of Things and Industry 4. 0", CRC Press, 2020
6. Uthayan Elangovan, "Product Lifecycle Management (PLM)_ A Digital Journey Using Industrial Internet of Things (IIoT)", CRC Press, 2020

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TEST-I & UNIT TEST-II

Unit Test	Learning outcomes to be covered
Unit Test-I	From 1.1 to 3.7
Unit Test-II	From 3.8 to 5.13

Course Code	Course Title	Periods/ week	Total No of Periods	Marks for FA	Marks for SA	Credits
26CI505E	Fundamentals of AI & ML	3	45	30	70	2

Fundamentals of AI & ML

TIME SCHEDULE

Chapter No.	Chapter Title	No. of Periods	Weight age	Short Answers	Long Answers	Mapped COs
1	Introduction to AI	8	11	1	1	CO1
2	Problem Solving with AI	9	22	2	2	CO2
3	Foundations of Machine Learning	10	22	2	2	CO3
4	Supervised Learning	10	25	3	2	CO4
5	Unsupervised Learning & Apps	8	14	2	1	CO5, CO6
Total		45	94	10	8	

COURSE OBJECTIVES

The primary objectives are:	
(i)	To provide a strong foundational understanding of AI principles and problem-solving techniques.
(ii)	To introduce the core concepts, types, and applications of Machine Learning.

(iii)	To equip students with the knowledge to differentiate between various AI and ML models.
(iv)	To make students aware of the real-world impact and applications of this technology, making them more industry-ready.

COURSE OUTCOMES

C01	CI505.1	Explain the fundamental concepts of Artificial Intelligence, its history, and intelligent agents.
C02	CI505.2	Apply various search strategies to solve well-defined problems.
C03	CI505.3	Differentiate between supervised, unsupervised, and reinforcement learning.
C04	CI505.4	Apply basic supervised learning algorithms for classification and regression tasks.
C05	CI505.5	Describe the working of unsupervised learning algorithms and the basics of neural networks.
C06	CI505.6	Identify real-world applications of AI and ML across various domains.

LEARNING OUTCOMES

1.0 *Introduction to Artificial Intelligence*

- 1.1 Define Artificial Intelligence and its goals
- 1.2 Explain the different types of AI.
- 1.3 Describe the structure of an intelligent agent.
- 1.4 Differentiate between various types of agent environments.
- 1.5 Analyze the structure of different agent types.

2.0 *Problem Solving with AI*

- 2.1 Define a problem using state space representation.
- 2.2 Explain the difference between uninformed and informed search.
- 2.3 Apply Breadth-First Search (BFS) to find a solution.
- 2.4.1 Apply Depth-First Search (DFS) to find a solution.
- 2.5 Describe how heuristics can guide a search process.

3.0 *Foundations of Machine Learning*

- 3.1 Define Machine Learning and its relevance.
- 3.2 Differentiate between AI, ML and Deep Learning.
- 3.3 Explain the three main types of machine learning.
- 3.4 Describe the typical workflow of an ML project.
- 3.5 Analyze the concepts of training, validation, and test datasets
- 3.6 Explain the concepts of overfitting and underfitting.

4.0 *Supervised Learning*

- 4.1 Differentiate between regression and classification problems.
- 4.2 Explain the working of Linear Regression for prediction.
- 4.3 Apply the K-Nearest Neighbors (k-NN) algorithm to classify new data points.
- 4.4 Explain how Decision Trees are used for classification.
- 4.5 Apply a simple decision tree model to solve a classification problem.
- 4.6 Describe basic metrics for evaluating classification models.

5.0 Unsupervised Learning & Applications

- 5.1 Explain the goal of unsupervised learning.
- 5.2 Apply the K-Means algorithm to group data into clusters.
- 5.3 Describe the basic structure of an Artificial Neural Network (ANN).
- 5.4 Identify various real-world applications of AI and ML.
- 5.5 Discuss the ethical considerations related to AI.

CO-PO/PSO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	2	1	-	1	-	2	2	-
CO2	3	3	2	1	-	1	2	2	-
CO3	2	3	2	-	1	-	2	2	-
CO4	3	3	2	2	-	1	2	2	-
CO5	2	2	1	-	1	-	2	2	-
CO6	1	2	2	1	3	2	2	2	1
Average	2.33	2.5	1.66	1.33	1.5	1.33	2	2	1

3-Strongly Mapped

2- Moderately Mapped

1- Slightly Mapped

COURSE CONTENT

Chapter 1: Introduction to Artificial Intelligence

What is AI? A brief history, Turing Test. The AI Problems, AI Techniques, Applications of AI. Intelligent Agents: Agents and Environments. Concept of Rationality, Nature of Environments. Structure of Agents: Simple reflex agents, Model-based agents, Goal-based agents, Utility-based agents.

Chapter 2: Problem Solving with AI

Problem Solving: Define the problem as a State Space Search. Search Strategies: Uninformed (blind) vs Informed (Heuristic) Search. Uninformed Search Algorithm: Breadth-First Search (BFS), Depth-First Search (DFS), Comparing BFS and DFS on completeness, time complexity, space complexity and optimality. Informed Search: Heuristic Functions, Greedy Best-First Search, A* Search concept.

Chapter 3: Foundations of Machine Learning

Introduction to Machine Learning: What is ML? Why do we need ML? Relationship between AI, ML and Deep Learning. Types of Machine Learning: Supervised, Unsupervised and Reinforcement Learning. General ML Workflow: Data collection, preprocessing, Model Training, Evaluation, Deployment. Key Terms: Features, Labels, Training set, Test set, Validation set. Introduction to Model Evaluation: Overfitting vs Underfitting, Bias-Variance Tradeoff (conceptual)

Chapter 4: Supervised Learning

Introduction to Supervised Learning: Classification vs Regression. Regression: Simple Linear Regression. Classification: K-Nearest Neighbors(k-NN) algorithm, choosing the value of 'k'. Decision Tree Classification: Structure of a decision tree (nodes, edges, leaves), basic concept of splitting. Building a simple decision tree from a given data set. Model Evaluation for Classification: Accuracy, Confusion Matrix (True Positives, False Negatives, etc.).

Chapter 5: Unsupervised Learning & Applications

Introduction to Unsupervised Learning: The concept of finding hidden patterns in unlabeled data. Clustering: K-Means Algorithm (steps involved, choosing 'k', concept of centroids).

Introduction to Neural Networks & Deep Learning: The neuron model (Perceptron), layers (input, hidden, output), activation functions. Real-world Applications of AI/ML: Image recognition, spam detection, recommendation systems (Eg. Netflix, Amazon), medical diagnosis. Ethics in AI: Bias in AI, data privacy, and the societal impact of AI.

Reference Books

1. *Artificial Intelligence: A Modern Approach* by Stuart Russell and Peter Norvig
2. *Introduction to AI & Machine Learning* by Munesh Chandra Trivedi, Ankit Srivastava
3. *Machine Learning* by Dr. S. Sridhar, and Dr. M. Vijaya Lakshmi
4. *Machine Learning* by Saikat Dutt, Subramanian Chandra Mouli, Amit Kumar Das

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TESTS

Unit Test	Learning Outcomes to be Covered
Unit Test – 1	From 1.1 to 3.3
Unit Test – 2	From 3.4 to 5.5

DATA ANALYTICS USING POWER BI

Course code	Course Type	Course Title	No. of Periods Per Week	Total No. of periods	Marks for FA	Marks for SA	Credits
26CI506A	Practicum	Data Analytics Using Power BI	2	30	-	-	-

TIME SCHEDULE

S.No.	Chapter/Unit Title	No. of Periods	CO's Mapped
1.	World of Data Analytics	4	CO1
2.	Work with Power BI Desktop	6	CO2
3.	Apply Data Analysis Expressions (DAX)	8	CO3

4.	Create Effective Data Visualizations	8	CO4
5.	Build and Publish Dashboards	4	CO5
Total		30	

COURSE OBJECTIVES

Upon completion of the course the student shall be able to	
i)	Equip learners with the foundational knowledge and practical skills required to perform data analysis and create impactful business intelligence solutions using Microsoft Power BI.

COURSE OUTCOMES

CO1	CI506.1	Comprehend the fundamental concepts, importance, and various types of data analytics, and their application in contemporary business environments.
CO2	CI506.2	Utilize Power BI Desktop to effectively import, clean, transform, and model data from diverse sources.
CO3	CI506.3	Apply Data Analysis Expressions (DAX) to perform advanced calculations and derive meaningful insights from data.
CO4	CI506.4	Design and create visually compelling and interactive data visualizations and reports that effectively communicate analytical findings.
CO5	CI506.5	Build and publish dynamic dashboards using Power BI Service for secure sharing and collaborative decision-making.

LEARNING OUTCOMES

By the end of this training, learners will be able to:

1 World of Data Analytics

- 1.1 Define **Data Analytics**.
 - 1.2 Discuss the **importance of data analytics** and its role in modern businesses.
 - 1.3 Identify and differentiate between the **types of data analytics** (descriptive, diagnostic, predictive, prescriptive).
 - 1.4 Analyze how **data analytics supports decision-making** through evidence-based insights.
 - 1.5 Describe the **features and capabilities** of data analytics tools.
 - 1.6 Apply the basics of **data visualization** to present analytical findings effectively.
 - 1.7 **Define** Power BI and its function as a business intelligence tool..
 - 1.8 Describe the **architecture** and **components** of Power BI system.
- 2 Work with Power BI Desktop**
- 2.1 Import data from various sources and establish connections.
 - 2.2 Use the Query Editor to clean, transform, and shape data.
 - 2.3 Create and manage relationships between different datasets.
 - 2.4 Implement calculated columns, measures, and filters at the data level.
- 3 Apply Data Analysis Expressions (DAX)**
- 3.1 Understand the purpose and syntax of DAX.
 - 3.2 Use different data types and calculation types in DAX.
 - 3.3 Apply DAX functions for filtering, aggregation, and analysis.
- 4 Create Effective Data Visualizations**
- 4.1 Choose appropriate chart types and map visualizations.
 - 4.2 Customize visuals using color palettes, shapes, text boxes, and images.
 - 4.3 Utilize custom visuals and layering (Z-order) techniques.
- 5 Build and Publish Dashboards**
- 5.1 Differentiate between dashboards and reports.
 - 5.2 Create interactive dashboards using Power BI Service.
 - 5.3 Generate quick insights and share reports securely

CO-PO/PSO MAPPING

COs \ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	–	–	1	–	3	3	-	2
CO2	3	2	2	3	–	–	2	2	3	-
CO3	3	3	2	3	–	–	2	-	3	3

CO4	3	2	3	3	1	2	2	-	3	2
CO5	2	2	3	3	1	3	2	2	3	-
Average	2.8	2.2	2.5	3	1	2.5	2.2	2.3	3	2.3

NOTE:

The gap in CO and PO mapping will be met by one or more appropriate activities from the following:

- (i) Assignments (ii) Tutorial (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizes
- (vii) Industrial Visits (viii) Techfests (ix) Mini Projects (x) Library visits etc.,

COURSE CONTENT(Lab Activities)

1 World of Data Analytics

2 Work with Power BI Desktop

2.1 Import sales dataset that contains data is messy, with some missing values, incorrect data types, and redundant columns, and perform essential data cleaning and shaping tasks using Power Query Editor

3 Apply Data Analysis Expressions (DAX)

3.1 Use DAX Functions for Filtering & Aggregation

4 Create Effective Data Visualizations

4.1 Create Effective Data Visualizations by choosing Appropriate Chart Types, Customize Visuals with Formatting

5 Build and Publish Dashboards

Required Software:

Software	Purpose	Platform
Power BI Desktop (Free)	Primary tool for creating reports, writing DAX, and designing visuals.	Windows
Power BI Mobile App (Optional)	For viewing dashboards on the go.	Mobile
DAX Studio (Free)	Advanced DAX writing, query performance tuning. Debugging	Windows

Required Hardware and Tools:

Hardware / Tools	Purpose
PCs/Laptops	Handling medium/large datasets, complex DAX, and multiple visuals)

Suggested Textbooks & References

1. "Beginning Power BI" by Dan Clark

2. "Power BI from Rookie to Rockstar" by Peter Myers & Greg Deckler
3. "Pro Power BI Architecture" by Phil Seamark
4. "The Definitive Guide to DAX" by Marco Russo & Alberto Ferrari

Recommended Resources

- Microsoft Power BI Documentation
 - <https://docs.microsoft.com/en-us/power-bi/>
- Power BI YouTube Channel
 - <https://www.youtube.com/c/MicrosoftPowerBI>

ANDROID PROGRAMMING LAB

Course code	Course Title	No. of Periods/Weeks	Total No. of periods	Marks for FA	Marks for SA	Credits
26CI507L	Android Programming Lab	4	60	40	60	2

TIMESCHEDULE:

S.No.	Chapter/Unit Title	No. of Periods	Weightage of marks	CO's Mapped
1.	Android Basics Activity Life Cycle	8	10	CO1
2.	Android – User Interface	16	15	CO2
3.	Android Advanced Concepts	24	20	CO3
4.	DataBase connectivity in Android	12	15	CO4
Total Periods		60	60	

COURSE OBJECTIVES:

At the end of the course, the student shall be able to
i)To know the Basics of Android Application Development
ii)To familiarize with the Android Anatomy, Components, Activity Life Cycle, Intents
iii)To use various User Interface controls in Android Application Development
iv)To reinforce theoretical concepts by creating relevant Android applications.

COURSE OUTCOMES

At the end of the course, the student shall be able to		
CO1	CI507.1	Demonstrate the Basics of Android Programming for developing Android Applications
CO2	CI507.2	Incorporate the User Interface Controls in Android Programming
CO3	CI507.3	Analyse the Android Advanced Concepts in Android Programming
CO4	CI507.4	Integrate the DataBase with Android Applications.

CO-PO/PSO MAPPING:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	3	1	2	2	3	3	2
CO2	2	2	3	3	1	2	2	2	3	2
CO3	2	3	3	3	2	2	2	2	3	2
CO4	2	3	3	3	2	2	3	3	3	3
Average	2.3	2.5	2.8	3.0	1.5	2.0	2.3	2.5	3.0	2.3

3=strongly mapped, 2=moderately mapped, 1=slightly mapped

LIST OF EXERCISES:

1. Create an Android Application To display “Hello World”
2. Create an Android app to shift from one activity to another activity using a button.
3. Create an Android app to accept a number in textfield and display the factorial of it in a Toast message on clicking a button
4. Create an Android app to illustrate the use of Datepickerwidget and Timepickerwidget.
5. Create an Android app that uses multiple UI controls like EditText, CheckBox, Spinner and Buttons.

6. Create an Android app to show Analog and Digital clock
7. Create an Android app to set an alarm.
8. Create an Android Application To Integrate Google Maps
9. Create an Android Application To send SMS
10. Create an Android Application To calling a number
11. Create an Android Application To send E-mail
12. Create an Android Application to show clock widget.
13. Create an Android Application Using Database operations like insert and display.
14. Create an Android Application Using Database operations like delete and display?
15. Create an Android Application Using Database operations like update and display?

Android Programming Lab Objectives and Key Competencies			
Sl.No	Name of the Experiment	Objectives	Key Competencies
1	Exercise to display "Hello World".	Create an Android app to show "Hello World"	<ul style="list-style-type: none"> ❖ Correct syntactical errors ❖ Debug logical errors ❖ Confirm whether the required output generated properly or not
2	Exercise on Intent.0	Create an Android app to shift from one activity to another activity using a button.	<ul style="list-style-type: none"> ❖ Correct syntactical errors ❖ Debug logical errors ❖ Know how to apply start Activity () method using intent ❖ Confirm whether the control moves from one activity to another activity.
3	Exercise on textfield and toast message.	Create an Android app to accept a number in textfield and display the factorial of it in a Toast message on clicking a button	<ul style="list-style-type: none"> ❖ Correct syntactical errors ❖ Debug logical errors ❖ Study the EditText and Button classes and the required methods ❖ Confirm whether the factorial is computed and shown in the Toast or not
4	Exercise on Datepicker and Timepicker	Create an Android app to illustrate the use of Datepicker and Timepicker.	<ul style="list-style-type: none"> ❖ Correct syntactical errors ❖ Debug logical errors ❖ Study the Datepicker and Timepicker class and its required methods ❖ Confirm whether the selected date and time is shown on a Toast message.
5	Exercise on multiple UIcontrols	Create an Android app that uses multiple UI controls like textfield, Checkbox, Spinner and Buttons	<ul style="list-style-type: none"> ❖ Correct syntactical errors ❖ Debug logical errors ❖ Study the textfield, Checkbox, Spinner and Buttons classes and its

Android Programming Lab Objectives and Key Competencies			
Sl.No	Name of the Experiment	Objectives	Key Competencies
			required methods. ❖ Confirm whether the required operations are done properly
6	Exercise on Analog and Digital clock	Create an Android app to show Analog and Digital clock	❖ Correct syntactical errors ❖ Debug logical errors ❖ Study the Analog and Digital clock view. ❖ Confirm whether the selected time is shown as a Toast message.
7	Exercise on Alarm.	Create an Android app to set an alarm	❖ Correct syntactical errors ❖ Debug logical errors ❖ Study the alarm class. ❖ Confirm whether the alarm is worked or not.
8	Create an Android Application To Integrate Google Maps	Create an Android Application To Integrate Google Maps	❖ Correct syntactical errors ❖ Debug logical errors ❖ Study the GoogleMap class and its methods ❖ Confirm whether the Map working properly or not
9	Create an Android Application To send SMS	Create an Android Application To send SMS	❖ Correct syntactical errors ❖ Debug logical errors ❖ Study the SmsManager class and its methods ❖ Confirm whether the messages are sending properly or not
10	Create an Android Application To calling a number	Create an Android Application To calling a number	❖ Correct syntactical errors ❖ Debug logical errors ❖ Study the class and its methods ❖ Confirm whether the event performed or not
11	Create an Android Application To send E-mail	Create an Android Application To send E-mail	❖ Correct syntactical errors ❖ Debug logical errors ❖ Study the E-mail functionality with Intents ❖ Confirm whether the E-mails are sending properly or not
12	Exercise on clock widget	Create an Android Application to show a clock widget.	❖ Correct syntactical errors ❖ Debug logical errors ❖ Study the widgets ❖ Confirm whether the clock widget is properly placed or not
13	Exercise on Database	Create an Android Application Using	❖ Correct syntactical errors ❖ Debug logical errors

Android Programming Lab Objectives and Key Competencies			
Sl.No	Name of the Experiment	Objectives	Key Competencies
	operations like insert and display.	Database operations like insert and display.	<ul style="list-style-type: none"> ❖ Study the operations of Database ❖ Confirm whether the data is properly inserted or not ❖ Confirm whether the data is properly fetched or not
14	Exercise on Database operations like delete and display.	Create an Android Application Using Database operations like delete and display.	<ul style="list-style-type: none"> ❖ Correct syntactical errors ❖ Debug logical errors ❖ Study the operations of Database ❖ Confirm whether the data is properly deleted or not ❖ Confirm whether the data is properly fetched or not
15	Exercise on Database operations like update and display.	Create an Android Application Using Database operations like insert and display.	<ul style="list-style-type: none"> ❖ Correct syntactical errors ❖ Debug logical errors ❖ Study the operations of Database ❖ Confirm whether the data is properly updated or not ❖ Confirm whether the data is properly fetched or not

EMBEDDED SYSTEMS FOR IOT LAB

Course Code	Course title	No of periods/week	Total no of periods	Marks for FA	Marks for SA	Credits
26CI508L	Embedded Systems for IOT Lab	04	60	40	60	1.5

TIME SCHEDULE

S.No	Unit Title	No. of Periods	COs Mapped
1	Familiarization with ESP8266 Node MCU and Raspberry Pi development Boards	09	CO1
2	Basic I/O interfacing with ESP8266 Node MCU and Raspberry Pi development Boards	18	CO2
3	Interfacing with sensors and actuators with ESP8266 Node MCU and Raspberry Pi development Boards	21	CO3
4	Interfacing Wifi, Bluetooth, GSM modules	12	CO4
	Total	60	

COURSE OBJECTIVES

Upon completion of the course the student shall be able to	
i)	1. To Familiarization with ESP8266 Node MCU and Raspberry Pi development Boards
ii)	2. To interface Basic I/O devices with ESP8266 Node MCU and Raspberry Pi development Boards
iii)	3. To interface sensors and actuators with ESP8266 Node MCU and Raspberry Pi development Boards

iv)	4. To interface Wifi, Bluetooth modules
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COURSE OUTCOMES

CO1	CI508.1	1. Familiarize with ESP8266 Node MCU and Raspberry Pi development Boards
CO2	CI508.2	2. Interface Basic I/O devices with ESP8266 Node MCU and Raspberry Pi development Boards
CO3	CI508.3	3. Interface sensors and actuators with ESP8266 Node MCU and Raspberry Pi development Boards
CO4	CI508.4	4. Interface Wifi, Bluetooth modules

LEARNING OUTCOMES:

I. Familiarization with ESP8266 Node MCU and Raspberry Pi development Boards

1. Familiarize with ESP8266 Node MCU Board
2. Familiarize with Raspberry Pi development Board Install and
3. Familiarize with Raspberry IDE (or equivalent software). Execute a program using Raspberry Pi to ON an LED when push button is pressed.

II. Basic I/O interfacing with ESP8266 Node MCU and Raspberry Pi development Boards

4. Interface Seven segment display with ESP8266/Raspberry Pi and demonstrate the display of numbers from 0 to 9 with delay
5. Interface 4x3 Keypad with ESP8266/Raspberry Pi and Display the status of the keys on LCD display
6. Interface four seven segment display units and 4x3 keypad with ESP8266/Raspberry Pi to display a four digit number typed on keypad.
7. Interface LED bar graph with ESP8266 and turns on a series of LEDs based on the value of analog sensor
8. Display moving(scrolling) text on 16x2 LCD with ESP8266

III. Interfacing with basic sensors and actuators with ESP8266 Node MCU and Raspberry Pi development Boards

9. Interface temperature sensor with ESP8266/ Raspberry Pi and turn on LED when temperature exceeds the threshold level
10. Interface a LDR to the ESP8266/ Raspberry Pi and write a program to turn ON the LED when it is dark and turn OFF the LED when there is light on the sensor.
11. Design and write the program of an ESP8266/ Raspberry Pi board based DC motor speed control using a potentiometer
12. Interface Ultrasonic sensor with ESP8266/ Raspberry Pi board to measure the distance from the target and display it on LCD display.
13. Rotate a stepper motor either clock wise or anti clock wise at 'n' number of steps using ESP8266/ Raspberry Pi

14. Interface proximity sensor with ESP8266/ Raspberry Pi and indicate the object movement

IV. Interfacing WiFi and Bluetooth with ESP8266 Node MCU and Raspberry Pi development Boards

15. Interface Raspberry Pi with a camera and display it on mobile phone

16. Interface a relay with bulb and switch ON/OFF the bulb using mobile phone with Bluetooth interface using Raspberry Pi

17. Display a text message on LCD by interfacing Raspberry Pi with Mobile phone

CO-PO/PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	1					3	3	3	
CO2	3	1						3	3	3
CO3	3	1				2	3	3	3	3
CO4	3	1								
Average	3	1	0	0	0	2	3	3	3	3

3=strongly mapped 2=moderately mapped 1=slightly mapped

NOTE:

The gap in CO and PO mapping will be met by one or more appropriate activities from the following:

- (i) Assignments (ii) Tutorial (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (vii) Industrial Visits (viii) Techfests (ix) Mini Projects (x) Library visits etc.,

PROJECT WORK

Course Code	Course Title	No. of Periods/ Week	Total No. of Periods	Marks for FA	Marks for SA	Credits
26CI509P	PROJECT WORK	6	90	40	60	2

COURSE OBJECTIVES

Upon completion of this course, students will be able to:

- Inculcate team spirit.
- Apply various software life cycle models.

- Successfully design, develop, and deploy a project.

COURSE OUTCOMES

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

CO No.	Syllabus Code	Course Outcome
CO1	CI509.1	Identify hardware components and software requirements.
CO2	CI509.2	Prepare an SRS document based on gathered and analyzed requirements.
CO3	CI509.3	Design the plan document based on the SRS.
CO4	CI509.4	Code and test the software based on the design document.
CO5	CI509.5	Practice software maintenance skills, ensuring quality and reliability.
CO6	CI509.6	Calculate software metrics like cost, LOC, scheduling, manpower, and other resources.

LEARNING OUTCOMES (Project Execution Steps)

Students are expected to follow a systematic approach to their project, encompassing the following key stages:

1. Conduct a need survey to identify a problem.
2. Gather relevant data and select an appropriate software life cycle model.
3. Estimate project costs, required technology, and resources.
4. Develop a detailed project plan and schedule.
5. Prepare a comprehensive Software Requirement Specification (SRS) document.
6. Design the system architecture and elements using standard models like UML.
7. Develop the software modules as per the design.
8. Thoroughly test, debug, and validate the project to ensure it meets requirements.
9. Record results and prepare the final project report and, if applicable, a user manual.

CO-PO/PSO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	1	3	1			2	3	
CO2	3	2	3	1	2	1		2	3	2
CO3	3	2	3	1	2	1		2	3	2
CO4	3	2	3	3	3	1		2	3	2
CO5	3		2	2	3	3	3	2	3	2
CO6	3	2		2	1	3	3	2	3	2
Average	3	2	2.4	2	2.2	1.8	3	2	3	2

3=strongly mapped, 2=moderately mapped, 1=slightly mapped

EVALUATION SCHEME

The project will be evaluated based on the successful completion and demonstration of various tasks throughout its lifecycle.

S.No	Task	Internal Marks (40)	External Marks (60)
1.	Feasibility Study of the Problem	4	6
2.	Requirement Analysis & SRS Document Preparation	4	8
3.	Designing the Problem	6	10
4.	Implementation	8	10
5.	Testing and Verification	10	16
6.	Project Report Preparation and Presentation	8	10
	Total	40	60

Internal Assessment Scheme (40 Marks)

The 40 internal marks are split between two reviews to assess the project's progress at critical stages. The first review focuses on planning and design, while the second evaluates the implementation, testing, and final delivery.

First Project Review (14 Marks)

This review assesses the initial planning, analysis, and design phases of the project.

Task	Mapping to Project Stage	Max. Marks
Feasibility Study	Assesses the viability and initial plan for the project.	4
Requirement Analysis & SRS	Defines the project scope, functionalities, and deliverables in the SRS document.	4
Designing the Problem	Evaluates the system architecture, database design, and module planning (e.g., using UML diagrams).	6
Total for Review 1		14

Second Project Review (26 Marks)

This review focuses on the development, execution, and final presentation of the completed project.

Task	Mapping to Project Stage	Max. Marks
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Implementation	Assesses the quality of the code, adherence to design, and functional modules.	8
Testing and Verification	Evaluates the thoroughness of testing, bug fixing, and validation against the SRS.	10
Project Report & Presentation	Assesses the final documentation, project demonstration, and presentation skills.	8
Total for Review 2		26

Summary of Internal Marks Distribution

Review	Total Marks
First Project Review	14
Second Project Review	26
Grand Total	40

Suggested Project Domains & Ideas (Aligned with C26 Curriculum)

Projects can be chosen from the following domains. These categories are directly linked to the subjects you have studied, allowing you to apply your specialized knowledge.

1. Full-Stack Web and Database Applications

- **Relevant Subjects:** WEB TECHNOLOGIES, DBMS, OOP THROUGH JAVA, PYTHON PROGRAMMING, UI/UX DESIGN.
- **Project Ideas:**
 - **E-commerce Platform:** Develop a complete online store with user accounts, product catalogs, a shopping cart, and an integrated payment gateway.
 - **Online Learning Management System (LMS):** Create a portal for students and teachers to manage courses, submit assignments, and track progress.
 - **Real-time Polling/Survey Application:** Build a web app where users can create polls and see live results, similar to Mentimeter or Kahoot!
 - **Hostel or Mess Management System:** An application for managing student accommodations, fee payments, and meal preferences.

2. AI/ML and Data Science Projects

- **Relevant Subjects:** FUNDAMENTALS OF AIML, AI USING PYTHON, DATA STRUCTURES THROUGH PYTHON.
- **Project Ideas:**
 - **Student Performance Predictor:** Use college data to build a model that predicts student academic outcomes, helping identify at-risk students early.
 - **College Admissions Chatbot:** Develop an NLP-based chatbot to answer prospective students' questions about courses, fees, and campus life.
 - **Sentiment Analysis of Social Media:** Create a tool to analyze public sentiment on a specific topic (e.g., a new policy or event) by scraping data

from social media.

- **Handwritten Digit or Object Recognizer:** Build and train a neural network to recognize handwritten text or objects in images.

3. Mobile and Android Applications

- **Relevant Subjects:** ANDROID PROGRAMMING, JAVA, MOBILE COMMUNICATIONS, UI/UX DESIGN.
- **Project Ideas:**
 - **Campus Navigator App:** An app that provides indoor maps and navigation for the college campus, helping new students find labs, classrooms, and offices.
 - **Event Notification App:** A mobile application for the college that sends real-time notifications about events, workshops, and placement drives.
 - **Personal Finance Tracker:** Develop an Android app to help users track their income and expenses, with features for budgeting and generating reports.
 - **Fitness and Wellness App:** An app to track daily physical activity, set fitness goals, and provide simple workout routines.

4. Internet of Things (IoT) and Embedded Systems

- **Relevant Subjects:** IoT, COMPUTER ORGANIZATION, DIGITAL ELECTRONICS.
- **Project Ideas:**
 - **Smart Campus System:** Design an IoT network to monitor and control classroom lights and fans based on occupancy, saving energy.
 - **Automated Irrigation System:** Create a system using soil moisture sensors to automatically water plants, with a dashboard to monitor water usage. * **Smart Parking Solution:** Develop a system using sensors to detect empty parking spots and an app to guide drivers to them.
 - **Environment Monitoring Station:** Build a device that measures air quality (PM2.5, CO2) and temperature, and uploads the data to a cloud platform for analysis.

5. Networking and Cyber Security Projects

- **Relevant Subjects:** COMPUTER NETWORKS, CYBER SECURITY, LINUX PRACTICALS, TROUBLESHOOTING OF COMPUTER NETWORKS.
- **Project Ideas:**
 - **Phishing Website Detector:** Create a browser extension or tool that analyzes URLs and web page content to detect and warn users about potential phishing scams.
 - **Secure File Transfer Utility:** Develop a client-server application for transferring files securely over a network using encryption algorithms.
 - **Network Intrusion Detection System (NIDS):** Design a basic NIDS that monitors network traffic for suspicious patterns or signatures of common attacks.
 - **Folder/File Encryption Tool:** A desktop utility that allows users to encrypt and password-protect their sensitive files and folders.

VI SEMESTER

CURRICULUM-2026

DIPLOMA IN COMPUTER ENGINEERING AND IOT

SCHEME OF INSTRUCTIONS AND EXAMINATION

(VI Semester)

Industrial Training

Course Code	Course title	Assessment	Periods/hours	Duration	Marks for FA	Marks for SA
26CI601I	INDUSTRIAL TRAINING (Online Certificate courses /Industry)	I	315	90 working days	240	60
		II	315			
TOTAL			630			

LEARNING OUTCOMES (In Industry): The student shall be able to display the following skill sets

1. Apply knowledge and skill already learnt in the institution.
2. Acquire the required skills of analysis, design and development, testing, verification and Validation.
3. Acquire skills of deployment and distribution of the product.
4. Involve in product design, development, and quality testing and maintenance production by Exhibiting the strength, teamwork spirit and self-confidence
5. Prepare product documents like user manual ,installation guide and operational manuals.
6. Perform the activities of deploying product at customer site and training the enduser.
7. Maintaining the system at user site (Post product services)

SNo	UnitTitle	Duration	COsMapped
1	Application of Knowledge acquired.	1month	CO1
2	Skill Acquirement.	2months	CO2
3	Participate in product development.	2months	CO3
4	Preform onsite service.	1month	CO4
	Total	6months	

Course Outcomes

At the end of course student able to:		
CO1	CI601.1	Apply knowledge and skill already learnt in the institution.
CO2	CI601.2	Acquire the required skills of analysis, design and development, testing, verification and validation, deployment and distribution of the product.
CO3	CI601.3	Involve in product design, development, quality testing and maintenance production by exhibiting the strength, teamwork spirit and self-confidence
CO4	CI601.4	Prepare product document, gain the skills in deploying product at customer site , training the end user, maintaining the system.

LEARNING OUTCOMES–SCHEMOFEVALUATION (Two Online Certificate courses):

TRAINING MODULE NO.	TOPIC	LEARNING OUTCOMES (In-house training)	MARKS
First3 Months/12 weeks	1) Registration at Nptel/Swayam/Moocs/course era/lectera/caltech/NA SSCOM/AP SKILL DEVELOPMENT/oxford/hackerrank/udemy ...etc.,	i) Learning ii) Mini Application development iii) Report preparation iv) 1 st Assessment	120

Next3 Months/12 Weeks	1) Registration at Nptel/Swayam/Moocs/courseera/lectera/caltech/NASSCOM/AP SKILL DEVELOPMENT/oxford/hackerrank/udemy...etc.,	i) Learning ii) Mini Application development iii) Report preparation iv) 2 st Assessment	120
External Evaluation	Seminar on two reports/viva	Evaluation by GUIDE/Co-Examiner, HOD and External Examiner	60
		TOTAL	300

Scheme of evaluation (Training at Industry)

SI. No.	Subject	Duration	Scheme of evaluation		
			Item	Nature	Max. Marks
1	Industrial Training	6 months	1.First Assessment at Industry(After 12Weeks)	Assessment of learning Out comes by Both the Faculty and training Mentor of the industry	120
			2.Second Assessment at the Industry (After 20 weeks))	Assessment of learning outcomes by both the faculty and training mentor of the industry	120
			Final Summative Assessment at institution level	Training Report	20
				Demonstration of any one of The skills listed In learning outcomes	30
				Viva Voce	10
TOTAL MARKS				300	

The industrial training shall carry 300 marks and pass marks are 50%. A candidate failing to secure the minimum marks should complete it at his own expenses.

During Industrial training the candidate shall put in a minimum of 90% attendance.

Weightage of marks for Assessment of Learning Outcomes during first and second assessment (at industry)

Sl. No	Learning Outcome	Max Marks Allotted For first assessment	Max Marks Allotted For second assessment
1	Apply knowledge and skill already learnt in the institution.	50	10
2	Acquire the required skills of analysis, design and development, testing, verification and validation , deployment and distribution of the product.	70	30
3	Involve in product design, development, quality testing and maintenance production by exhibiting the strength, teamwork spirit and self-confidence	-	40
4	Prepare product document, gain the skills in deploying product at customer site, training the end user, maintaining the system.	-	40
	Total	120	120

During assessment the performance of the students shall be assessed in those skills in which the student has been trained and be awarded the marks as per the weightage assigned as above. In case the student has undergone training in a few skill sets then the total marks obtained shall be raised to 120marks for the given assessment i.e. either assessment 1 or 2. However the performance of the student shall be assessed at the most skill sets listed above but not less than three skill sets.

Illustration for First assessment:

If the student has undergone training in only in 2 skillsets (namely 1 for 50 marks, and 2 for 40 marks) out of 3 (namely 1 for 50 marks, 2 for 40 marks and 3 for 30 marks) in First assessment and marks awarded during assessment is 60 out of 90 marks, then the marks of 60 shall be enhanced to 120 proportionately as $(60/90) * 120 = 80$.

Illustration for second assessment:

If the student has undergone training in only in 5 skillsets (namely 1 for 10 marks, 2 for 20 marks, 3 for 10 marks, 4 for 25 marks, 5 For 15 marks) out of 7 (namely 1 for 10 marks, 2 for 20 marks, 3 For 10 marks, 4 for 25 marks, 5 For 15 marks, 6 for 25 marks and 7 for 15 marks) in second assessment and marks awarded during assessment is 65 out of 80 marks, then the marks of 65 shall be enhanced to 120 proportionately as $(65/80) * 120 = 97.5 = \text{rounded to } 98$.

GUIDELINES FOR INDUSTRIAL TRAINING OF DIPLOMA IN COMMUNICATION AND NETWORKING ENGINEERING PROGRAMME

1. Duration of the training: 6 months.
2. Eligibility: The as per SBTET norms
3. Training Area: Students can be trained in either in In-house/Industry in the areas of
4. Application Software Development / system software Development / firmware development/ Mobile application development/ Database applications / Web development/ IoT application development / smart technologies / Hardware interfacing/ Networking.
5. The candidate shall put a minimum of 90% attendance during Industrial Training.
6. If the student fails to secure 90% attendance during industrial training, the student shall reappear for 6 months industrial training.
7. Formative assessment at industry level shall be carried out by the Mentor from of the industry, where the student is undergoing training and the faculty in charge (Guide) from the concerned section in the institution.
8. The Industrial training shall carry 300 marks and pass marks is 50% in assessments at industry (first and second assessment) and final summative assessment at institution level put together i.e. 150 marks out of 300 marks.
9. If the student fails to secure 50% marks in final summative assessment at institution level, the student should reappear for final summative assessment in the subsequent board examination.
10. Final summative assessment at institution level is done by a committee including 1. Head of the section (of concerned discipline ONLY), 2. External examiner from an industry and 3. Faculty member who assessed the student during Industrial Training as members.

Guidelines and responsibilities of the faculty members who are assessing the students' performance during industrial training

**DEPARTMENT OF TECHNICAL EDUCATION
NAME OF THE INSTITUTION
INDUSTRIAL TRAINING FIRST ASSESSMENT**

PIN:

NAME OF THE STUDENT:

Name of the Industry:

Skill Set Sl. No	SKILL SET	Max Marks Allotted For each parameter	Marks obtained
1	Apply knowledge and skill already learnt in the institution.	50	
2	Acquire the required skills of analysis, design and development ,testing, verification and validation.	40	
3	Acquire the required skills of deployment and distribution of the product.	30	
	Total	120	

(Marks in words:)

Signature of the Training In-charge(Mentor)

Signature of the visiting staff(Guide)

Name:

Name:

Designation:

Designation:

**DEPARTMENT OF TECHNICAL EDUCATION
NAME OF THE INSTITUTION
INDUSTRIAL TRAINING SECOND ASSESSMENT**

PIN:

NAME OF THE STUDENT:

Name of the Industry:

Skill Set Sl. No	SKILL SET	Max Marks Allotted For Each parameter	Marks obtained
1	Apply knowledge and skill already learnt in the institution.	10	
2	Acquire the required skills of analysis, design and development ,testing, verification and validation.	20	
3	Acquire the required skills of deployment and distribution of the product.	10	
4	Involve in product design, development, quality testing and maintenance production by exhibiting the strength, teamwork spirit and self- confidence	25	
5	Prepare product documents like user manual and installation guide and operational manuals.	15	
6	Perform the activities of deploying product at customer site and training the end user.	25	
7	Maintaining the system at user site(Post product services)	15	
		120	

(Marks in words:)

Signature of the Training In-charge (Mentor)

Signature of the visiting staff(Guide)

Name:

Name:

Designation:

Designation: