

22  
ANNIVERSARY



**SAHRDAYA** **AUTONOMOUS**  
COLLEGE OF ENGINEERING & TECHNOLOGY

A CENTRE OF EXCELLENCE IN SCIENCE & TECHNOLOGY | MANAGED BY IRINJALAKUDA DIOCESAN EDUCATION TRUST

Approved by AICTE & Affiliated to APJ Abdul Kalam Technological University | Accredited by:



**B. Tech**

**Curriculum (2024) and Syllabus - Semester I & II**

**Computer Science Engineering**

**Branch Code: CSE**

*(SHR/AC/Auto/ Acad. Council /B.Tech/3/Syll./CSE)*

EDUCATION IS DEDICATION  
*Recommended by BoS on 30/08/2024*

*Approved by Academic Council on 31/08/2024*

## **Preface to the Curriculum**

The B.Tech Computer Science and Engineering (CSE) curriculum is meticulously crafted to cultivate industry-ready professionals endowed with creativity and innovative thinking. This comprehensive curriculum encompasses various components, including induction programs, core and elective courses, practical courses, projects, internships, skill enhancement courses, and extracurricular activities. Designed to total 170 credits, the curriculum ensures a holistic education that prepares students for the dynamic field of Computer Science & Engineering. Below is a detailed overview of the curriculum's salient features:

- 1. Project-Based Learning Courses:** From the first semester to the fifth semester, one course integrated with Project-Based Learning (PBL) empowers students with autonomy, engaging them in meaningful projects to learn, explore, and investigate. PBL promotes teamwork and collaboration, essential skills for any professional, by having students work together in teams, each contributing unique skills and perspectives to achieve a common goal.
- 2. Skill Enhancement Courses:** These courses are designed to provide students with industry-relevant certifications from reputed organizations, enhancing their employability by certifying their skill sets. They are integral to the academic curriculum and offered from Semester 1 to Semester 5, each carrying one credit.
- 3. Foreign Language Courses:** To prepare students for global careers, the curriculum includes options to learn foreign languages, promoting cross-cultural communication skills and international collaboration. These courses are available in the seventh semester.
- 4. Program Electives and Micro Specializations:** Students can pursue micro-specializations by completing thematic courses, which allow them to gain in-depth knowledge in specific sub-areas of their discipline. Starting in the fourth semester, this provides an opportunity for focused learning and expertise in emerging fields in alignment with program elective courses.
- 5. Industry Elective Courses:** Offered jointly with industry partners, these courses ensure relevance and practical applicability. The academic department and industry partners develop and assess them collaboratively, without end-semester examinations, ensuring continuous and practical learning experiences.
- 6. Startups and Entrepreneurial Skills:** The curriculum encourages students to pursue startups, offering options to engage in product-based or service-based startups during their seventh and eighth semesters. This fosters innovation, creativity, and entrepreneurial skills, preparing students for the dynamic business environment.
- 7. Courses Embedded with Practical:** The curriculum includes theory courses embedded with practical and projects, ensuring that students apply theoretical

knowledge to real-world problems. This hands-on approach enhances learning outcomes and practical skills.

- 8. Internships:** The program includes mandatory internships, allowing students to gain industry exposure and practical experience. Students can undertake at least four to six months of internship in a recognized industry, research organization, or prestigious institution relevant to their field. This bridges the gap between academic learning and industry requirements, enhancing employability.
- 9. Community Work, Social Responsibility, and Universal Human Value Courses:** The curriculum integrates opportunities for community work and socially relevant projects, promoting civic responsibility and leadership skills. Universal Human Value courses also aim to cultivate a holistic understanding of life, enhancing physical and mental well-being, social skills, and life skills. These courses address various dimensions of life, including individual, family, society, and the environment, promoting a healthy and harmonious lifestyle.
- 10. Activity Points:** In addition to academic credits, students must earn activity points through participation in extracurricular activities such as sports, cultural events, community service, and entrepreneurship. This holistic approach ensures the development of leadership, teamwork, and communication skills, preparing students for global challenges.
- 11. MOOC Courses:** Students selected for internships can fulfil their credit requirements in the seventh and eighth semesters through MOOC courses, providing flexibility and additional learning opportunities.
- 12. Higher Credit Elective:** These courses carry more than the standard credit weight of elective courses. They allow students pursuing honors to reduce the number of required courses by earning additional credits through higher-credit electives. Additional credits earned from higher credit electives can be credited towards the total credit requirement of the honors program, with a maximum of 12 additional credits being applied towards the honors credit requirement.

This curriculum is designed to seamlessly blend theoretical knowledge with practical experience, foster interdisciplinary learning, and enhance employability through hands-on projects and internships, thereby preparing students for successful careers in Computer Science & Engineering.

### **General Course Structure**

#### **1. Credit and Courses:**

Credits are a unit of measurement for coursework and are based on the number of hours of instruction required per week. One hour of classroom lecture (L) that is 60 minutes long per week carried out during all weeks of the semester, is considered one Instructional Unit or one Credit. The same goes for a tutorial (T) or a project (R) that is 60 minutes long per week and carried out during all weeks of the semester. In addition, a minimum of 120 minutes per week of laboratory session, practical or fieldwork,

training (P) or a combination of these, carried out during all weeks of the semester, is also considered one Instructional Unit or one Credit.

Classification	Credit assigned
1 Hour Lecture [L] per week	1 Credit
1 Hour Tutorial [T] per week	1 Credit
1 Hour Project [R] per week	1 Credit
1-2 Hours Practical [P] per week	1 Credit
3-4 Hours Practical [P] per week	2 Credit

- For internship/Start-Up/Main project/Mini project, the credit weightage for equivalent hours is 50% of that for lectures/tutorials

The B.Tech. program curriculum has a total of 168 academic credits and 2 additional pass/fail credits that can be gained through 100 activity points. The program is expected to accommodate courses from other disciplines so that students have multi-disciplinary exposure. Additionally, the program should provide sufficient opportunities for students to enhance their communication, soft, managerial, and technical skills. Depending on the program, the courses should fall under the engineering, basic science, humanities science, and management categories. The structure of the UG program should essentially have the following categories of courses with the breakup of credits as given:

Sl. No	Category	Code	Credits
1	Humanities and Social Sciences including Management Courses	HMC	9
2	Basic Science Courses	BSC	20
3	Engineering Science Courses	ESC	26
4	Programme (Professional) Core Courses	PCC	52
5	Programme (Professional) Core Courses-Project Based Learning	PBL	16
6	Program Elective Courses	PEC	18
7	Open Elective Courses/Industry Linked Elective	OEC/ILE	9
8	Project Work and Seminar	PS	12
9	UHV and Community Work	PW	1
10	Skill Enhancement Courses	SEC	5
11	Mandatory Student Activities.	MSA	2
<b>Total Mandatory Credits</b>		<b>170</b>	

A 10% to 15 % deviation in credits is permitted under each discipline. While developing the curriculum, the department offering the program should ensure that the students attain the above distribution upon completing their program. Either Minor or Honors can be opted from the optional specialization.

The courses are organized into 1/2/3/4 credit courses based on the content delivery

mechanism and desired depth of the course. The delivery methods include Theory-only, Theory with tutorial, Theory with practice, Theory with project etc. The L-T-P-R notation for each course signifies the allocation of hours for content delivery in terms of Lecture (L), Tutorial (T), Practical (P), and Project (R) per week, as well as the credit earned from the course. The L-T-P- R-C for each course indicates the number of credits delivered as Lecture (L), Tutorial (T), Practical (P), Project (R) and the total instructional delivery indicated as Credits (C).

$$C = L + T + [P/2] + R$$

Apart from lectures, tutorials, practical/practice and project hours, the curriculum offers Self-learning hours (S) that indicate the number of hours students are expected to spend for activities that should be completed outside the class defined by the faculty handling courses. The activities aim to support learning and should be initiated by the students themselves without guidance or direction from tutors. For each course, the self-learning hour per week is calculated as:

$$S = (L*1 + P*1 + [R/2])$$

Categories of courses included in the curriculum and their L-T-P-R-C components are given in the table below:

Sl. No.	Lecture- Tutorial- Practical- Project [L-T-P-R]	Credit [C]	Description
1.	1-0-2-0	2	Theory course without End Semester Examination [ESE]
2.	1-0-0-0	1	
3.	2-0-2-1	4	Theory course embedded with practical and project
4.	3-1-0-0	4	Theory course embedded with tutorial
5.	3-0-0-0	3	Theory course
6.	2-0-0-0	2	
7.	3-0-2-0	4	Theory course embedded with practical
8.	3-0-0-1	4	Theory course embedded with project
9.	0-0-2-0	1	Practical course without ESE
10.	0-0-3-0	2	Practical course
11.	0-0-0-3	2	Mini Project
12.	0-0-3-0	2	Seminar
13.	0-0-0-8	4	Major Project/Internship/Start-Up
14.	0-0-0-0	1	MOOC Course
<b>Mandatory Courses</b>			
15.	0-0-2-0	1	Skill Enhancement Courses
<b>Minor/ Honors Course</b>			
16.	4-0-0-0	4	Theory course
17.	0-0-0-4	4	Project only course

### 3. Course Code

Every course of B. Tech. The program shall take a code from the table given below.

Course category	Description
PCC	Program (Professional) Core Courses
PBL	Project Based Learning
CLT	Combined Lab Theory
PEC	Professional Elective Course
OEC	Open Elective Course
BSC	Basic Science Course
ESC	Engineering Science Course
HMC	Humanities, Social Sciences and Management course
MOOC	MOOC Course
IEL	Industry Elective Course
PW	Socially Relevant course
PS	Project Work and Seminar
SEC	Skill Enhancement Courses
HR	Honours
MR	Minor

**Structure of Course Code:** Each course will be identified by a unique Course Code consisting of eight alphanumeric characters, formatted as **24XXYABC**. The code can be interpreted as follows: "24" represents the regulation year, "XX" is the course category code, "Y" indicates the course delivery mode, "A" is the semester number (ranging from 1 to 8, with 0 indicating the course is offered in both odd and even semesters), "B" denotes the version of the course under each category, and "C" signifies the course sequence number. For example, 24CET303 is a theory course offered by the civil engineering department in the third semester of the 2024 scheme.

24BML408 - laboratory course offered by the biomedical engineering department in the fourth semester of the 2024 scheme

The detailed expansion of the abbreviation of the course code structure is listed in the table below:

XX	Y	A	B	C
Course category	Course delivery mode	Semester No	Version of the course	Serial No: of course
BM-Biomedical Engineering BT-Biotechnology CE – Civil Engineering CS-Computer Science	T-Theory L-Laboratory R-Theory Embedded with Project			

Engineering	K-Certification	0	1	1
EC-Electronics and Communication Engineering	Course	1	2	2
EE-Electrical and Electronics Engineering	E-Elective Course	2	3	3
MA-Mathematics	G- Minor	3	etc.	4
CY – Chemistry	H-Honour	etc.		5
PH-Physics	M-MOOC			6
ES-Engineering Science course	O-Open Elective			etc.
HU-Humanities and Management Courses	I-Industry Elective			
SE-Skill Enhancement Courses	S-Seminar			
PW-Social Science and Community work	P-Project			
	N-Internship			
	U-Start Up			
	C – Theory			
	Embedded with practical			

#### 4. Allotted and Cumulative Credits

The allotted and cumulative credits are given in the table below:

Semester	Allotted Credits	Cumulative Credits
First	21	-
Second	22	43
Third	25	68
Fourth	25	93
Fifth	24	117
Sixth	23	140
Seventh	17	157
Eighth	11	168




FIRST SEMESTER (July-December)												
10 Days Compulsory Induction Program												
Sl. No:	Slot	Course Code	Course Type	Course Title (Course Name)	Credit Structure				Total Marks		Credits	Hrs./ Week
					L	T	P	R	CIA	ESE		
1	A	24MAT111	BSC	Calculus & Linear Programming	3	0	0	0	40	60	3	3
2	B	24PHC112	BSC-CLT	Physics for Information Science	3	0	2	0	50	50	4	5
3	C	24EST003	ESC	Engineering Graphics	3	0	0	0	40	60	3	3
4	D	24EST104	ESC	Foundations of Computing	3	0	0	0	40	60	3	4
5	F	24ESR105	ESC-PBL	Algorithmic Thinking with Python-PBL-1	2	0	2	1	50	50	4	5
6	I*	24HUT006	HMC	Professional Ethics and Sustainable Development	1	0	2	0	100	---	2	3
7	L	24ESL007	ESC	Computer Aided Drawing (CAD) & Manufacturing Workshop	0	0	2	0	50	---	1	2
8	J*	24SEK10N	SEC	Skill Enhancement Course 1							1	
<b>Total</b>											<b>21</b>	<b>25</b>

SECOND SEMESTER (January-June)												
Sl. No :	Slot	Course Code	Course Type	Course Title (Course Name)	Credit Structure				Total Marks		Credits	Hrs./ Week
					L	T	P	R	CIA	ESE		
1	A	24MAT211	BSC	Linear Algebra	3	0	0	0	40	60	3	3
2	B	24CYC012	BSC-CLT	Engineering Chemistry	3	0	2	0	50	50	4	5
3	C	24EST023	ESC	Fundamentals of Electrical & Electronics Engineering	4	0	0	0	40	60	4	4
4	D	24ESC204	ESC	Programming in C	3	0	2	0	40	60	4	5
5	D	24CSR205	PCC-PBL	Digital System Design	3	0	0	1	50	50	4	4
6	L	24ESL006	ESC	Basic Electrical and Electronics Engineering Workshop	0	0	2	0	50	---	1	2
7	I*	24HUT107	HMC	Communicative English	0	0	2	0	50	50	1	2
8	J*	24SEK10N	SEC	Skill Enhancement Course 2							1	
<b>Total</b>											<b>22</b>	<b>25</b>

\*No Grade Points will be awarded for the MOOC, I and J slot courses

The self-learning (S) hours for each course is calculated based on the formulae,  $S = (L*1+P*1+[R/2])$





**SEMESTER-I**  
**SYLLABUS**

24MAT111	CALCULUS AND LINEAR PROGRAMMING	L	T	P	R	C	Year of Introduction
		3	0	0	0	3	2024

**Preamble:**

The course enables the students to understand basic concepts and tools of Calculus and Linear Programming. Topics like Multivariable Calculus and applications, Simplex method and Lagrange multipliers for optimization are included. This course helps the learners in modelling and analysing physical phenomena involving continuous changes of variables or parameters with the help of modern tools and has applications across all engineering domains.

**Prerequisite:** Calculus of univariate functions.

**Course Outcomes:** After the completion of the course the student will be able to

<b>CO1</b>	Interpret and compute rates of change for functions, recognizing their significance in various context. <b>[Apply]</b>
<b>CO2</b>	Analyse and represent functions of several variables, including their graphs, level curves and contour plots. <b>[Apply]</b>
<b>CO3</b>	Solve problems using the concept of directional derivative and gradient. <b>[Apply]</b>
<b>CO4</b>	Apply Simplex method and method of Lagrange multipliers in handling constrained equations and optimization. <b>[Apply]</b>

**CO - PO MAPPING**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3	2	3	2							
CO 2	3	3	2	3	2							
CO 3	3	3			2							
CO 4	3	3	2	2								

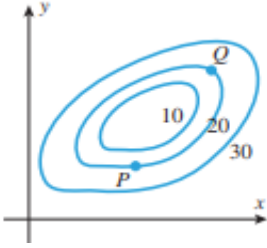
**Assessment Pattern**

Bloom's Category	Continuous Assessment Tools			End Semester Examination
	Test1	Test 2	Other tools	
Remember	√	√	√	√
Understand	√	√	√	√
Apply	√	√	√	√
Analyse				
Evaluate				
Create				

Mark Distribution of CIA					
Course Structure [L-T-P-R]	Attendance	Theory [L]			Total Marks
		Assignment	Test-1	Test-2	
3-0-0-0	5	10	12.5	12.5	40
Total Mark distribution					
Total Marks	CIA (Marks)	ESE (Marks)		ESE Duration	
100	40	60		2.5 hours	
End Semester Examination [ESE]: Pattern					
PATTERN	PART A		PART B		ESE Marks
PATTERN 1	8 Questions (2 Questions from each module), each question carries 3 marks Marks: (3x8 =24 marks)		2 questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 2 subdivisions. Each question carries 9 marks. Marks: (9x4 = 36 marks)		60
SYLLABUS					
MODULE I: (Single variable Calculus and Applications)					
<b>(Text 1: Relevant topics from sections 1.1,1.2,1.3,1.5,2.2,2.3,2.4,2.6,2.7)</b> Limits of function values, The limit laws, Continuous functions, Rates of change, Second- and higher-order derivatives, Instantaneous rates of change, Derivative as a function, Chain rule and Implicit differentiation.					
MODULE II: (Multivariable Calculus and Applications)					
<b>(Text 1: Relevant topics from sections 13.1,13.2,13.3, 13.8)</b> Functions of several variables, Graphs, Level curves and contours of functions of two variables, Limits for functions of two variables, Continuity for functions of two variables, Partial derivatives of functions, Second-order partial derivatives and Relative extrema, Second derivative Test for local Extreme Values.					
MODULE III: (Multivariable Calculus and Applications)					
<b>(Text 1: Relevant topics from sections 13.5,13.6)</b> The Chain Rule for partial derivatives, Directional Derivatives in the plane, Interpretation of the Directional Derivative, Properties of Directional Derivative, Gradient and its properties.					
MODULE IV: (Linear Programming and Optimization)					
<b>(Text 1: Relevant topics from section 13.9)</b> <b>(Text 2: Relevant topics from sections 3.1,3.2,3.3,3.4,4.1,4.2,4.3,4.4)</b> Constrained Maxima and minima. The Method of Lagrange Multipliers, LPP-Formation, Simplex Method.					

<b>Textbooks</b>		
<ol style="list-style-type: none"> <li>1. H. Anton, I. Biven, S. Davis, "Calculus", Wiley, 10th edition, 2015.</li> <li>2. Hillier/Lieberman, "Introduction to Operation Research", McGraw Hill, 7th edition, 2019</li> </ol>		
<b>Reference books</b>		
<ol style="list-style-type: none"> <li>1. A textbook of Engineering Mathematics (8th Edition)- N.P.Bali, Dr. Manish Goyal (Lakshmi Publications India Ltd.) ,2019</li> <li>2. Higher Engineering Mathematics - H.K.Dass, Er. Rajnish Verma (S. Chand &amp; Company Pvt.Limited) ,2014</li> <li>3. Operation Research (4th Edition) - S.Kalavathy (Vikas Publications House Pvt.Ltd.) ,2013</li> <li>4. Operation Research - Ravindran, Philips, Solberg (Wiley India Pvt. Ltd.) , 2007</li> <li>5. Peter V .O'Neil, Advanced Engineering Mathematics ,Indian edition</li> <li>6. David C Lay.Linear Algebra and its applications, Pearson</li> </ol>		
<b>NPTEL/SWAYAM Courses for reference:</b>		
<ol style="list-style-type: none"> <li>1. Dr. Joydeep Dutta, Calculus of Several Real Variables, IIT Kanpur, [NPTEL], <a href="https://nptel.ac.in/courses/111104125">https://nptel.ac.in/courses/111104125</a> (Relevant sections)</li> <li>2. Prof. G. Sreenivasan, Linear Programming, IIT Madras, NPTEL, <a href="https://nptel.ac.in/courses/112106134">https://nptel.ac.in/courses/112106134</a> (Relevant sections)</li> </ol>		
No.	COURSE CONTENTS AND LECTURE SCHEDULE	No. of Hours [ 36 hours]
<b>MODULE 1 [ 9 hours]</b>		
1.1	Limits of function values, The limit laws, Continuous functions	2
1.2	Rates of change	1
1.3	Second- and higher-order derivatives	1
1.4	Instantaneous rates of change	1
1.5	Derivative as a function	2
1.6	Chain rule and Implicit differentiation.	2
<b>MODULE II [ 9 hours]</b>		
2.1	Functions of several variables, Graphs	1
2.2	Level curves and contours of functions of two variables	2
2.3	Limits for functions of two variables, Continuity for functions of two variables	1
2.4	Partial derivatives of functions	2
2.5	Second-order partial derivatives	1
2.6	Relative extrema, Second derivative Test for local Extreme Values.	2
<b>MODULE III [ 9 hours]</b>		
3.1	The Chain Rule for partial derivatives	3
3.2	Directional Derivatives in the plane, Interpretation of the Directional Derivative	2
3.3	Properties of the Directional Derivative	2
3.4	Gradient and its properties.	2

MODULE IV [ 9 hours]		
4.1	Constrained maxima and minima	1
4.2	The Method of Lagrange Multipliers	2
4.3	LPP- Formation	2
4.4	Simplex Method	4
CO Assessment Questions		
CO1	<ol style="list-style-type: none"> <li>Use implicit differentiation to find <math>\frac{dy}{dx}</math> for the Folium of Descartes <math>x^3+y^3= 3 xy</math></li> <li>A spherical balloon is being inflated. Find a general formula for the instantaneous rate of change of the volume <math>V</math> with respect to the radius <math>r</math>, given that <math>V= \frac{1}{3} \pi r^3</math></li> <li>Use the implicit plotting capability of a CAS(MATLAB/SCILAB) to graph the curve <math>C</math> whose equation is <math>x^3 - 2xy + y^3 = 0</math>.</li> </ol>	
CO2	<ol style="list-style-type: none"> <li>An international airline has a regulation that each passenger can carry a suitcase having the sum of its width, length, and height less than or equal to 129 cm. Find the dimensions of the suitcase of maximum volume that a passenger can carry under this regulation.</li> <li>Find three positive numbers whose sum is 48 and such that their product is as large as possible.</li> <li>Use a CAS to generate a contour plot of <math>f(x, y) = 2y^2x - yx^2 + 4xy</math> for <math>-5 \leq x \leq 5</math> and <math>-5 \leq y \leq 5</math>, and use the plot to approximate the locations of all relative extrema and saddle points in the region. Check your answer using calculus, and identify the relative extrema as relative maxima or minima.</li> </ol>	
CO3	<ol style="list-style-type: none"> <li>A heat-seeking particle is located at the point <math>(2, 3)</math> on a flat metal plate whose temperature at a point <math>(x, y)</math> is <math>T(x, y) = 10 - 8x^2 - 2y^2</math>. Find an equation for the trajectory of the particle if it moves continuously in the direction of maximum temperature increase.</li> <li>Let <math>f(x, y) = x^2e^y</math>. Find the maximum value of a directional derivative at <math>(-2, 0)</math>, and find the unit vector in the direction in which the maximum value occurs.</li> <li>The accompanying figure shows some level curves of an unspecified function <math>f(x, y)</math>. Of the gradients at <math>P</math> and <math>Q</math>, which probably has the greater length? Explain.</li> </ol>	

	 <p>4. (a) Use a CAS to graph <math>f(x, y) = (x^2 + 3y^2) e^{-(x^2+y^2)}</math>.          (b) At how many points do you think it is true that <math>D_u f(x, y) = 0</math> for all unit vectors <math>u</math>?          (c) Use a CAS to find <math>\nabla f</math>          (d) Use a CAS to solve the equation <math>\nabla f(x, y) = 0</math> for <math>x</math> and <math>y</math>.</p>
4	<p>1. Work through the simplex method (in algebraic form) step by step to solve the following problem.  <math>\text{Max } Z = 3x_1 + 4x_2 + 5x_3</math>, subject to <math>3x_1 + x_2 + 5x_3 \leq 150</math>, <math>x_1 + 4x_2 + x_3 \leq 120</math>, <math>2x_1 + 4x_2 + 2x_3 \leq 105</math> and <math>x_1 \geq 0</math>, <math>x_2 \geq 0</math>, <math>x_3 \geq 0</math>.</p> <p>2. Consider the following problem. Maximize <math>Z = 5x_1 + 4x_2</math>, subject to  <math>3x_1 + 2x_2 \leq 6</math>, <math>2x_1 - x_2 \geq 6</math> and <math>x_1 \geq 0</math>, <math>x_2 \geq 0</math>.</p> <p>(a) Demonstrate graphically that this problem has no feasible solutions.          (b) Use a computer package based on the simplex method to determine that the problem has no feasible solutions.          (c) Using the Big M method, work through the simplex method step by step to demonstrate that the problem has no feasible solutions.</p>

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<b>24PHC112</b>	<b>PHYSICS FOR INFORMATION SCIENCE</b>					<b>L</b>	<b>T</b>	<b>P</b>	<b>R</b>	<b>C</b>	<b>Year of Introduction</b>	
						3	0	2	0	4	<b>2024</b>	
<b>Preamble:</b>												
Enable the students to enhance their fundamental knowledge of physics and its applications relevant to Computer Science and Engineering. This syllabus is designed to provide a comprehensive understanding of key principles in modern physics, emphasising superconductivity, electrical conductivity, quantum mechanics, semiconductor physics, laser and electromagnetism. The program is designed to develop scientific attitudes and enable the students to correlate the concepts of Physics with the core programmes.												
<b>Prerequisite:</b> Basic knowledge in Physics and Mathematics.												
<b>Course Outcomes:</b> After the completion of the course, the student will be able to												
<b>CO 1</b>	Describe the principles of electrical conductivity, Fermi energy, energy bands and superconductivity.[Understanding]											
<b>CO 2</b>	Apply the knowledge of basic Quantum Mechanics to the behaviour of matter at atomic and subatomic levels. [Apply]											
<b>CO 3</b>	Apply the characteristics of intrinsic semiconductors in the derivation of electron and hole densities, intrinsic carrier concentration and formation of pn junctions. .[Apply]											
<b>CO 4</b>	Apply the principles of laser in the construction and working of different lasers and understand the fundamentals of electromagnetic theory.[Apply]											
<b>CO 5</b>	Apply basic knowledge of principles and theories in physics to conduct experiments.[Apply]											
<b>CO - PO MAPPING</b>												
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO 1</b>	3	3										2
<b>CO 2</b>	3	3										2
<b>CO 3</b>	3	3										2
<b>CO 4</b>	3	3										2
<b>CO 5</b>	3	3			2				2			2
<b>Assessment Pattern for Theory Component</b>												
<b>Bloom's Category</b>			<b>Continuous Assessment Tools</b>						<b>End Semester Examination</b>			
			<b>Test1</b>		<b>Test 2</b>		<b>Other tools</b>					
Remember			✓		✓		✓		✓			



Understand	✓	✓	✓	✓
Apply	✓	✓	✓	✓
Analyse				
Evaluate				
Create				

**Assessment Pattern for the Lab Component**

Bloom's Category	Continuous Assessment Tools	
	Classwork	Test1
Remember	✓	✓
Understand	✓	✓
Apply	✓	
Analyse		
Evaluate		
Create		

**Mark Distribution of CIA**

Course Structure [L-T-P-R]	Attendance	Assignment	Theory [L]		Practical [P]		Total Marks
			Test-1	Test-2	Lab work	Lab Exam	
3-0-2-0	5	5	7.5	7.5	15	10	50

**Total Marks distribution**

Total Marks	CIA (Marks)	ESE (Marks)	ESE Duration
100	50	50	2 hours

**End Semester Examination [ESE]: Pattern**

PATTERN	PART A	PART B	ESE Marks
PATTERN 2	2 Questions from each module, 8 questions, each Question carries 3 marks. Answer any 6  Marks: (6x3 =18 marks)	2 questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 2 subdivisions. Each question carries 8 marks. Marks: (4x 8 = 32 marks)	50

<b>SYLLABUS</b>	
<b>MODULE I: Electrical conductivity and Superconductivity ( 9 hours)</b>	
Classical free electron theory, Electrical conductivity in metals, Fermi Dirac distribution, Variation of Fermi function with temperature, Fermi Energy, Energy bands, Classification of materials into conductor, semiconductor and insulator.	
Superconductivity, Transition temperature, Critical field, Meissner effect, Type I and Type II Superconductors, BCS Theory, Applications of Superconductors	
<b>MODULE II: Quantum Mechanics ( 9 hours)</b>	
Introduction to Quantum Mechanics, Wave nature of particle, Uncertainty principle, Applications-Absence of electron inside the nucleus- Natural line broadening, Wave function- properties - physical interpretation, Formulation of time-dependent and time-independent Schrodinger equations, Particle in a one- dimensional box - Derivation of energy eigenvalues and normalised wave function, Quantum Mechanical Tunnelling (Qualitative), Quantum Computing (Qualitative)	
<b>MODULE III: Semiconductor Physics (9 hours)</b>	
Intrinsic Semiconductor, Derivation of the density of electron in the conduction band and density of holes in the valence band, Intrinsic carrier concentration, Variation of intrinsic carrier concentration with temperature, Extrinsic semiconductor(qualitative), Formation of pn junction, Fermi level in semiconductors-intrinsic and extrinsic, Energy band diagram of pn junction - Qualitative description of charge flow across a pn junction - Forward and reverse bias pn junctions, Diode equation (Derivation), I-V Characteristics of pn junction, Solar cells- IV Characteristics, Efficiency	
<b>MODULE IV : Laser and Electromagnetic Theory ( 9 hours)</b>	
Properties of laser, Absorption, Spontaneous emission and stimulated emission, Principle of laser - conditions for sustained lasing – Population inversion, Pumping, Metastable states, Basic components of laser - Active medium, Energy source, Optical resonant cavity, Construction and working of Ruby laser, Construction and working of Semiconductor laser (qualitative), Applications of laser.	
Magnetic field and Magnetic flux density, Gauss's law for Magnetic flux density, Ampere's Circuital law, Faraday's law, Classification of magnetic materials -Para, Dia and Ferromagnetic materials, Gauss divergence theorem & Stokes' theorem, Equation of continuity, Derivation of Maxwell's Equations	
<b>Text books</b>	
1. M.N. Avadhanulu, P.G. Kshirsagar, TVS Arun Murthy "A Textbook of Engineering Physics", S.Chand &Co., Revised edition 2019.	
2. H.K.Malik , A.K. Singh, "Engineering Physics" McGraw Hill Education, Second Edition 2017.	
<b>Reference books</b>	
1. G Vijayakumari, "Engineering Physics",Vikas Publications, 8th Edition, 2014.	
2. Arthur Beiser, "Concepts of Modern Physics ", Tata McGraw Hill Publications, 6 <sup>th</sup> Edition 2003.	
3. D. .K. Bhattacharya, Poonam Tandon, "Engineering Physics", Oxford University Press, 2015.	

4. Md.N.Khan & S.Panigrahi “Principles of Engineering Physics 1& 2”, Cambridge University Press, 2016.
5. Aruldas G., “Engineering Physics”, PHI Pvt. Ltd., 6th Edition 2015.
6. B Premlet ., “Advanced Engineering Physics”, Phasor Books,11th edition ,2021.
7. I .Dominic and. A. Nahari, “A TextBook of Engineering Physics”, Owl Books Publishers, Revised edition, 2016.
8. H.D Young and R.A Freedman, “University Physics with Modern Physics” 2020, 15th Edition, Pearson, USA.
9. B Premlet ,”Introduction to solid state devices”, Phasor Books.
10. Griffiths “Introduction to Electrodynamics” 4th Edition, Pearson.

**NPTEL/SWAYAM Courses for reference:**

- Module I - A brief course on Superconductivity  
<https://nptel.ac.in/courses/115103108>
- Module II - Quantum Mechanics and Applications  
<https://nptel.ac.in/courses/115102023>  
 Quantum Mechanics I  
<https://nptel.ac.in/courses/115101107>
- Module III - Semiconductor Optoelectronics  
<https://nptel.ac.in/courses/115102103>  
 Semiconductor Optoelectronics  
<https://nptel.ac.in/courses/115102026>
- Module IV - Introduction to LASER  
<https://nptel.ac.in/courses/115102124>  
 Laser: Fundamentals and Applications  
<https://nptel.ac.in/courses/104104085>  
 Electromagnetism  
<https://nptel.ac.in/courses/115106122>

No.	COURSE CONTENTS AND LECTURE SCHEDULE	No. of Hours [36]
<b>MODULE 1: Electrical conductivity and Superconductivity ( 9 hours)</b>		
1.1	Classical free electron theory	1
1.2	Electrical conductivity in metals	1
1.3	Fermi Dirac distribution	1
1.4	Variation of Fermi function with temperature, Fermi Energy	1
1.5	Energy bands, Classification of materials into conductor, semiconductor and insulator.	1
1.6	Super conductivity, Transition temperature	1
1.7	Critical field, Meissner effect	1
1.8	Type I and Type II Superconductors	1
1.9	BCS Theory, Applications of Superconductors	1
<b>MODULE II: Quantum Mechanics ( 9 hours)</b>		
2.1	Introduction to Quantum Mechanics , Wave nature of particles	1
2.2	Uncertainty principle , Applications-Absence of electron inside the nucleus	1

2.3	Natural line broadening	1	
2.4	Wave function- properties - physical interpretation	1	
2.5	Formulation of time- dependent Schrodinger equations	1	
2.6	Formulation of time-independent Schrodinger equations	1	
2.7	Particle in a one- dimensional box - Derivation of energy eigenvalues and normalized wave function	1	
2.8	Quantum Mechanical Tunnelling (Qualitative )	1	
2.9	Quantum Computing ( Qualitative)	1	
<b>MODULE III: Semiconductor Physics ( 9 hours)</b>			
3.1	Intrinsic semiconductor	1	
3.2	Derivation of the density of electrons in the conduction band and density of holes in the valence band	1	
3.3	Intrinsic carrier concentration, Variation of intrinsic carrier concentration with temperature	1	
3.4	Extrinsic semiconductor(qualitative)	1	
3.5	Formation of pn junction, Fermi level in semiconductors- intrinsic and extrinsic	1	
3.6	Energy band diagram of pn junction - Qualitative description of charge flow across a pn junction	1	
3.7	Forward and reverse biased pn junctions	1	
3.8	Diode equation (Derivation)	1	
3.9	I-V Characteristics of pn junction	1	
<b>MODULE IV : Laser and Electromagnetic Theory ( 9 hours)</b>			
4.1	Properties of laser, Absorption, Spontaneous emission and stimulated emission	1	
4.2	Principle of laser - conditions for sustained lasing – Population inversion, Pumping, Metastable states	1	
4.3	Basic components of laser - Active medium, Energy source, Optical resonant cavity, Construction and working of Ruby laser	1	
4.4	Construction and working of Semiconductor laser (qualitative), Applications of laser	1	
4.5	Magnetic field and Magnetic flux density	1	
4.6	Gauss's law for Magnetic flux density, Ampere's Circuital law, Faraday's law	1	
4.7	Classification of magnetic materials-Para, Dia and Ferromagnetic materials	1	
4.8	Gauss divergence theorem & Stokes' theorem, Equation of continuity.	1	
4.9	Derivation of Maxwell's Equations	1	
<b>LESSON PLAN FOR LAB COMPONENT</b>			
No.	Topic	No. of Hours	Experiment

1	Electrical conductivity and Superconductivity	2	Determination of band gap energy of semiconductor.
		2	Variation of the critical magnetic field with temperature using simulation lab.
2	Quantum Mechanics	2	Determination of the size of lycopodium powder using a laser.
		2	Quantum mechanical tunnelling using simulation.
		2	Particle in a 1D box using simulation.
3	Semiconductor Physics	2	V-I characteristics of solar cells.
		2	Diode characteristics.
		2	V-I Characteristics of Zener Diode.
4	Laser and Electromagnetic Theory	2	Laser-determination of wavelength using diffraction grating.
		2	Faraday's law of electromagnetic induction.
		2	CRO-Measurement of frequency and amplitude of wave forms.

(Any 2 experiments from each topic to be completed)

**CO Assessment Questions**

CO1	<ol style="list-style-type: none"> <li>1.Explain Classical free electron theory.</li> <li>2. What is Fermi Dirac distribution and explain variation of Fermi function with Temperature.</li> <li>3. Apply Meissner effect to prove that superconductor is perfectly diamagnetic.</li> <li>4. Distinguish between type I and type II superconductors with suitable diagrams and examples.</li> </ol>
CO2	<ol style="list-style-type: none"> <li>1. Give the physical significance of wave function?</li> <li>2. By applying Heisenberg's uncertainty principle prove the absence of electrons inside the nucleus.</li> <li>3. An electron is confined to a one dimensional potential box of length <math>2\text{\AA}</math>. Calculate the energies corresponding to the first and second quantum states in eV.</li> <li>4. Write down the Schrodinger equation for a particle in a one dimensional infinite square well potential and also derive the equation for normalised wave function and energy eigenvalues for a particle in 1 D Box.</li> </ol>
CO3	<ol style="list-style-type: none"> <li>1. Explain the variation of intrinsic carrier concentration with temperature.</li> <li>2. Derive the density of electrons in the conduction band and the density of holes in the valence band in the intrinsic semiconductor.</li> <li>3. Explain the Energy band diagram of pn junction.</li> <li>4. Apply the principle of pn junction and hence explain the construction and working of a solar cell</li> </ol>

C04	<ol style="list-style-type: none"><li>1. Distinguish between spontaneous and stimulated emission.</li><li>2. Explain the construction and working of a ruby laser with the help of energy level diagrams by applying the concept of stimulated emission.</li><li>3. Compare the properties of paramagnetic, diamagnetic and ferromagnetic materials with two examples for each.</li><li>4. A magnetising field of 1800 A/m produces a magnetic flux of <math>3 \times 10^{-5}</math> Wb in an iron bar of cross-sectional area <math>0.2 \text{ cm}^2</math>. Calculate the permeability.</li></ol>
C05	<ol style="list-style-type: none"><li>1. Determine the band gap energy of the semiconductor.</li><li>2. Determine the size of lycopodium powder using a laser.</li><li>3. By applying the principle of Diffraction determine the wavelength of a laser source using a diffraction grating arrangement.</li><li>4. Draw the V-I Characteristics of Zener Diode.</li></ol>

Prepared by  
Ms.Jimi K J  
Asst. Prof., ASH



24EST003	ENGINEERING GRAPHICS	L	T	P	R	C	Year of Introduction
		3	0	0	0	3	2024

**Preamble:**

Practicing Engineers require the ability to translate ideas into tangible designs and interpret existing drawings. "Engineering Graphics" covers fundamental principles such as orthographic projections, dimensioning, sectional views, surface development, isometric projections and conversion of isometric to orthographic projection. This course equips students with essential skills in engineering drawing, preparing them for careers in Engineering.

**Prerequisite:** Nil

**Course Outcomes:** After the completion of the course, the student will be able to

<b>CO1</b>	Translate the principles of orthographic projections to prepare projections of lines and solids. <b>[Apply]</b>
<b>CO2</b>	Prepare sectional views and develop surfaces of a given solid. <b>[Apply]</b>
<b>CO3</b>	Convert between 2D orthographic views and 3D isometric projections effectively. <b>[Apply]</b>

**CO-PO MAPPING**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>	3	3	2							2		
<b>CO2</b>	3	3	2							3		
<b>CO3</b>	3	3	2							3		

**Assessment Pattern for Theory**

Bloom's Category	Continuous Assessment Tools			End Semester Examination
	Test1	Test2	Other tools	
Remember			✓	
Understand			✓	
Apply	✓	✓	✓	✓
Analyze				
Evaluate				
Create				

**Mark Distribution of CIA**

Course Structure [L-T-P-R]	Attendance	Theory[L-T]			
		Test-1	Test-2	Class work/ Assignment	Total Marks



3-0-0-0	5	10	10	15	40
<b>Total Marks distribution</b>					
<b>Total Marks</b>	<b>CIA(Marks)</b>	<b>ESE(Marks)</b>		<b>ESE Duration</b>	
100	40	60		2hrs 30min	
<b>End Semester Examination [ESE]: Pattern</b>					
	<b>PARTA</b>	<b>PARTB</b>	<b>ESE Marks</b>		
PATTERN 3	NA	2 questions will be given from each module, out of which 1 question should be answered, each carrying 15 marks. Marks:(4x15=60marks)	60		
<b>SYLLABUS</b>					
<b>MODULE I: Introduction to Engineering Drawing and Orthographic Projection of Points and Lines (11 Hours)</b>					
Introduction: Relevance of technical drawing in engineering field. Types of lines, Dimensioning, BIS code of practice for technical drawing. (No questions for the end semester examination)					
Projection of points in different quadrants, Projection of straight lines inclined to one plane and inclined to both planes. Traces of a line. Inclination of lines with reference planes True length and true inclinations of line inclined to both the reference planes.( Questions limited to Lines in first quadrant , lines in first & second quadrants, lines in first & third quadrants, Lines in third quadrant)					
<b>MODULE II: Orthographic Projections of Solids (10 Hours)</b>					
Projection of Simple solids such as Triangular, Rectangle, Square, Pentagonal and Hexagonal Prisms, Pyramids, Cone, Cylinder and tetrahedron. Projection of solids in simple position. Projection of solids with axis inclined to one of the reference planes and with axis inclined to both reference planes.					
<b>MODULE III: Section of solids and Development of Surfaces (10 Hours)</b>					
Sections of Solids: Sections of tetrahedron, Prisms, Pyramids, Cone, Cylinder with axis in vertical position and cut by different section planes. True shape of the sections. (Exclude true shape given problems)					
Development of Surfaces: Development of surfaces of the solids and solids cut by different section planes with axis of the solid perpendicular to HP. (Exclude problems with through holes and shortest distance between two points)					
<b>MODULE IV: Isometric Projection and Multi-view Projection (5 Hours)</b>					
Isometric Projection: Isometric scale- Isometric View and Projections of Prisms, Pyramids, Cone, Cylinder, Frustum of Pyramid, Frustum of Cone, Sphere, Hemisphere and					

their combinations.

Multi view Projection- Conversion of pictorial views to orthographic view(F.V,T.V & S.V)

### Textbooks

1. P.I. Varghese, Engineering Graphics, Tata McGraw Hill Education
2. Prof. J Benjamin, Engineering Graphics, Pentex Publishers
3. John, K.C. Engineering Graphics, Prentice Hall India Publishers.
4. N.D. Bhatt, Engineering Drawing, Charotar Publishing House
5. Agrawal, B. And Agrawal, C.M., Engineering Drawing, Tata McGraw Hill Publishers.

### Reference books

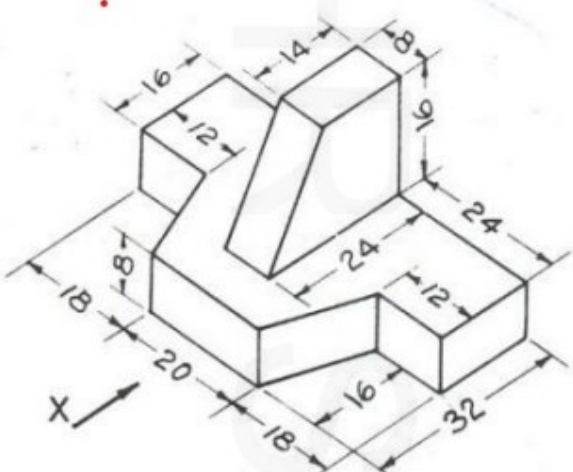
1. Luzaddff, W.J. and Duff, J.M., Fundamentals of Engineering Drawing, PHI.
2. Duff, J.M. and Ross, W.A., Engineering Design and Visualisation, Cengage Learning.

NPTEL/SWAYAM Courses for reference:

1. Engineering Drawing, Prof P.S. Robi, IIT Guwahati  
<https://nptel.ac.in/courses/112103019>
2. Engineering Graphics and Design, Naresh V Datla, Sunil R Kale, IIT Delhi  
<https://archive.nptel.ac.in/courses/112/102/112102304/>

No.	COURSE CONTENTS AND LECTURE SCHEDULE	No. of Hours (36)
<b>MODULE1 (11 Hours)</b>		
1.1	Relevance of technical drawing in engineering field. Types of lines and their Uses	1
1.2	Dimensioning, BIS code of practice for technical drawing.	1
1.3	Orthographic Projection Concepts-Projection of points in different quadrants- Problems	1
1.4	Projection of straight lines parallel to both HP and VP- Problems	1
1.5	Projection of straight lines perpendicular to either HP or VP and parallel to other- Problems	1
1.6	Projection of straight lines inclined to either HP or VP and parallel to other- Problems	1
1.7	Trace of a line- Concept	1
1.8	Projection of straight lines inclined to both HP and VP – Line rotation method- Problems	2
1.9	Projection of straight lines inclined to both HP and VP – Plane rotation method- Problems	2
<b>MODULE II(10 Hours)</b>		
2.1	Types of Solids	1
2.2	Projection of solid in simple position- Problems	1
2.3	Projection of solid inclined to any one reference plane. – Problems	3
2.4	Projection of solid inclined to both reference plane. - Problems	5
<b>MODULE III (10 Hours)</b>		
3.1	Types of Section planes and True shape of section	1

3.2	Sectional view of solids when section plane is parallel to HP and Perpendicular to VP- Problems	1
3.3	Sectional view of solids when section plane is parallel to VP and Perpendicular to HP- Problems	1
3.4	Sectional view of solids and true shape of section when section plane is inclined to HP and Perpendicular to VP- Problems	1
3.5	Sectional view of solids and true shape of section when section plane is inclined to VP and Perpendicular to HP- Problems	1
3.6	Development of surfaces- concept	1
3.7	Development of surfaces- Prism	1
3.8	Development of surfaces- Pyramid	1
3.9	Development of surfaces- Cone and Cylinder	1
3.10	Development of sectioned solids-Problems	1
<b>MODULE IV (5 Hours)</b>		
4.1	Isometric Projection- Isometric Scale- Isometric Drawing	1
4.2	Isometric Projection/drawing of solids- Problems	1
4.3	Isometric Projection/drawing of Combination of solids -Problems	1
4.4	Isometric Projection/drawing of sphere & hemisphere -Problems	1
4.5	Multi-view Projection Concept -Problem	1
<b>Total Hours</b>		<b>36</b>
<b>CO Assessment Questions</b>		
<b>CO1</b>	<ol style="list-style-type: none"> <li>1. The distance between end projectors of a line CD is 65mm. End C is 15mm above HP and 40mm in front of VP. Its front view and top view makes an angle of <math>40^\circ</math> and <math>45^\circ</math> respectively with XY- line. Draw the projections, find the true length and true inclinations with HP and VP, and locate its traces. The line is in the first quadrant.</li> <li>2. The front view of a line AB measures 70mm and makes an angle of <math>50^\circ</math> with XY-line. The end A is in the HP and the VT of the line is 30mm above HP. The line is inclined at <math>40^\circ</math> to the VP. Draw the projections of the line, find its true length and true inclination to HP, and locate its HT.</li> <li>3. One end point of line AB is 12 mm above HP and is 15 mm in front of VP. The other endpoint is 50 mm above HP and is 42 mm in front of VP. Draw the projections of line AB if its elevation measures 70 mm. Find out its true length and the true inclinations with respect to the reference planes.</li> <li>4. A cone of base diameter 40 mm and axis 60 mm long touches the VP on a point of its base circle. The axis is inclined at <math>30^\circ</math> to VP and the front view of its axis is inclined at <math>45^\circ</math> to XY line. Draw its projections.</li> <li>5. A square pyramid of base edge 30 mm and height 60 mm is resting on HP on its triangular face such that the square face edge on HP is inclined <math>30^\circ</math> to VP. Draw its projections.</li> <li>6. A pentagonal prism 30 mm base edge and 60 mm height is on HP on one of its base edges so that the axis is inclined at <math>45^\circ</math> with HP and the base edge on which it rests is inclined at <math>30^\circ</math> with VP. Draw the projections of the solid.</li> </ol>	

<p>CO2</p>	<ol style="list-style-type: none"> <li>1. A pentagonal pyramid side of base 30 mm, height 65 mm has its base on the ground and one of its base edge is parallel to and nearer to VP. This pyramid is cut by a section plane perpendicular to VP, passing through a point on the axis which is 20 mm below the apex and making an angle of <math>40^\circ</math> with HP. Draw the front view, sectional top view and true shape of the section.</li> <li>2. A hexagonal prism of base side 35 mm and height 65 mm rests on its base on HP with one of the base edges parallel to VP. It is cut by a section plane inclined towards right at an angle of <math>30^\circ</math> to HP and perpendicular to VP. The section plane meets the axis of the prism at a height of 45 mm from the base. Draw the front view, sectional top view, and true shape of the section.</li> <li>3. A pentagonal prism of base 30 mm and axis 60 mm long is kept with its base on HP with a base edge perpendicular to VP. It is cut by a plane inclined at <math>45^\circ</math> to HP, perpendicular to VP and passing through the midpoint of the axis. Draw the development showing the remaining portion of the solid.</li> </ol>
<p>CO3</p>	<ol style="list-style-type: none"> <li>1. A hemisphere of diameter 60 mm is placed centrally over a square slab of side 50mm and height 40 mm, with its flat surface facing upward. Draw the isometric view of the combination</li> <li>2. A hexagonal pyramid of base edge 25 mm and height 40 mm is surmounted centrally over a cube of 50 mm side. The cube is lying on HP on one of its square faces so that one base edge of the cube and one base edge of the pyramid are parallel to VP. Draw the isometric view of the combination.</li> <li>3. Draw the orthographic projections (front view, top view, and left side view) of the following figure. The front view direction is marked with a long arrow marking as X. Any missing dimension may be suitably assumed. All dimensions are in mm</li> </ol> 

Prepared by  
 Dr Nixon K, Principal  
 Mr. Mathews V J  
 Asst. Prof, ASH

24EST104	FOUNDATIONS OF COMPUTING					L	T	P	R	C	Year of Introduction		
						3	0	0	0	3	2024		
<p><b>Preamble:</b> This course serves as an introduction to the dynamic field of computing, offering a thorough exploration of foundational principles and practical applications essential to modern technology. It begins with an in-depth study of computing systems, starting from basic hardware components. Participants will also delve into networking fundamentals, learning how computers connect and communicate via various protocols and architectures. Practical exercises and simulations reinforce learning, enabling students to configure networks, troubleshoot issues, and optimize performance.</p>													
<b>Prerequisite:</b> Nil													
<b>Course Outcomes:</b> After the completion of the course, the student will be able to													
CO 1	Identify computer components, their functions and gain proficiency in hardware installation and configuration. <b>[Understand]</b>												
CO 2	Understand the foundational concepts of CPU architecture, ALUs and Registers. <b>[Understand]</b>												
CO 3	Understand Network Types, Topologies, Components, Network Protocols and Models, Plan, design, and implement a network setup. <b>[Understand]</b>												
CO 4	Comprehend Web Design Principles, Web Hosting and Deployment and Explore Advanced Web Technologies. <b>[Understand]</b>												
<b>CO - PO MAPPING</b>													
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
CO 1	2	2										2	
CO 2	3	2	3									2	
CO 3	2	2	3		2							2	
CO 4	2	2	2		2							2	
<b>Assessment Pattern for Theory Component</b>													
<b>Bloom's Category</b>		<b>Continuous Assessment Tools</b>						<b>End Semester Examination</b>					
		Test1	Test 2	Other tools									
Remember		√	√				√						
Understand		√	√				√						
Apply													
Analyze													
Evaluate													
Create													
<b>Mark Distribution of CIA</b>													
<b>Course Structure [L-T-P-R]</b>	<b>Attendance</b>	<b>Theory [L]</b>						<b>Total Marks</b>					
		Assignment	Test-1	Test-2									
3-0-0-0	5	10	12.5	12.5			40						
<b>Total Marks distribution</b>													
<b>Total Marks</b>	<b>CIA (Marks)</b>					<b>ESE (Marks)</b>			<b>ESE Duration</b>				

100	40	60	2.5 hrs.
<b>End Semester Examination [ESE]: Pattern</b>			
<b>PATTERN</b>	<b>PART A</b>	<b>PART B</b>	<b>ESE Marks</b>
Pattern 1	2 questions from each module. 8 Questions, each question carries 3 marks Marks: (3x8 =24 marks)	2 questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of two subdivisions. Each question carries 9 marks. Marks: (9x4 = 36 marks)	60
<b>SYLLABUS</b>			
<b>MODULE I: Computer Hardware (6 Hours)</b>			
<p><b>Introduction to Computer</b> -Computer systems,Types of Computer systems- Micro, Mini, Mainframe and Super Computers - Analog, Digital and Hybrid Computers - Business and Scientific Computer systems - First, second, third and fourth generation Computers. Introduction to Computer Hardware - Overview of computer components - Internal Components - Motherboards and chipsets - Central Processing Unit (CPU)- Memory (RAM, ROM, Cache)- Storage devices (HDD, SSD). Peripheral Devices- Input devices - Output devices - External storage.</p>			
<b>MODULE II: Data Representation and Architecture (7 Hours)</b>			
<p><b>Binary representation of data and numbers</b>, Integer Representation, Data storage units - bits, bytes, kilobytes, etc., ASCII and Unicode, Number Systems and Boolean Algebra – Decimal, Binary, Octal and Hexadecimal Numbers, Arithmetic involving Number Systems, Inter Conversions of Number Systems, 1"s and 2"s Complements, Complement Subtractions, Digital Codes – Binary Coded Decimal (BCD), ASCII Code, Unicode, Gray Code, Excess-3 Code. Boolean Algebra: Basic operations (AND, OR, NOT), truth tables. Combinational Circuits: Gates, half-adders, full-adders, multiplexers, decoders. Gates (AND, OR, NOT, NAND, NOR, XOR, XNOR).</p>			
<b>MODULE III: Computer Architecture (10 Hours)</b>			
<p><b>CPU Architecture and Instruction Set:</b> Basic CPU architecture - ALU, Memory Organization: - Memory Hierarchy-Registers, Main memory, Auxiliary memory, Associative memory, Cache memory, Virtual memory, control unit, Instruction format and assembly language (basics only), Fetch execute cycle and instruction execution. Introduction to operating system. Functions of operating system</p>			
<b>MODULE IV: Computer Network (7 Hours)</b>			
<p><b>Basics of Networking</b> - Network types (LAN, WAN, MAN) - Network topologies and their applications, Network Components- Network interface cards (NICs) - Hubs, switches, routers - Cables and connectors. Network protocols(concept only)</p>			
<b>Textbooks:</b>			
<p>1.Computer Hardware: "Upgrading and Repairing PCs" by Scott Mueller 2.Networking: "Computer Networking: A Top-Down Approach" by James F. Kurose and Keith W. Ross 3. M. Morris Mano, "Computer System Architecture", Pearson Education Third edition</p>			



**Reference books**

1. Data Communications and Networking with TCP/IP Protocol Suite| 6th Edition” by Behrouz Frouzan.
2. P.V.S Rao, Computer System Architecture, PHI, 2009

**NPTEL/SWAYAM Courses for reference: Computer Architecture, IITD****1. Operating System Fundamentals -**

[https://onlinecourses.nptel.ac.in/noc24\\_cs108/preview](https://onlinecourses.nptel.ac.in/noc24_cs108/preview)

No.	COURSE CONTENTS AND LECTURE SCHEDULE	No. of Hours (36)
<b>MODULE I: Computer Hardware (6 Hours)</b>		
1.1	<b>Introduction to Computer Hardware</b> - Overview of computer components - Types of computers and their uses.	2
1.2	<b>Internal Components</b> - Motherboards and chipsets - Central Processing Unit (CPU)	2
1.3	Memory (RAM, ROM, Cache, Registers)- Storage devices (HDD, SSD). <b>Peripheral Devices</b> - Input devices - Output devices - External storage.	2
<b>MODULE II: Data Representation and Architecture (9 Hours)</b>		
2.1	Binary representation of data and numbers, Integer Representation, Data storage units - bits, bytes, kilobytes, etc., ASCII and Unicode.	1
2.2	Number Systems and Boolean Algebra – Decimal, Binary, Octal and Hexadecimal Numbers, Arithmetic involving Number Systems	2
2.3	Inter Conversions of Number Systems, 1"s and 2"s Complements, Complement Subtractions, Digital Codes – Binary Coded Decimal (BCD), ASCII Code, Unicode	2
2.4	Gray Code, Excess-3 Code. Boolean Algebra: Basic operations (AND, OR, NOT), truth tables.	2
2.5	Combinational Circuits: Gates, half-adders, full-adders, multiplexers, decoders. Gates (AND, OR, NOT, NAND, NOR, XOR, XNOR).	2
<b>MODULE III: Computer Architecture (9 Hours)</b>		
3.1	<b>CPU Architecture and Instruction Set:</b> Basic CPU architecture - ALU.	1
3.2	<b>Memory Organization:-</b> Memory Hierarchy-Registers, Main memory, Auxiliary memory, Associative memory, Cache memory, Virtual memory	2
3.3	Instruction format and assembly language (basics only),	2
3.4	Fetch execute cycle and instruction execution.	2
3.5	Introduction to operating system. Functions of operating system.	2



<b>MODULE IV: Computer Network (7 Hours)</b>		
4.1	<b>Basics of Networking</b> - Network types (LAN, WAN, MAN) - Network topologies and their applications.	3
4.2	<b>Network Components</b> - Network interface cards (NICs) - Hubs, switches, routers	2
4.3	<b>Network Components</b> - Network interface cards (NICs) - Cables and connectors .	2
<b>CO Assessment Questions</b>		
CO1	1. Compare and contrast the functions of hardware and software in a computer system. 2. Discuss how advancements in computer hardware have impacted technology over the years. 3. Compare chipsets commonly used in motherboards today, highlighting their differences and uses. 4. Differentiate between RAM, ROM, and cache memory in terms of their purposes and functionalities. 5. Explain how peripheral devices contribute to the user interface and user experience of a computer.	
CO2	1. Explain the significance of binary representation in computing. How does it relate to digital data storage and processing? 2. Define integer representation and explain how integers are stored in memory using binary digits. 3. Explain how the choice of integer representation affects the range and precision of numerical computations. 4. Define the terms bit, byte, kilobyte, megabyte, gigabyte, terabyte, and petabyte in the context of data storage..	
CO3	1. Outline the fetch-execute cycle and its role in the execution of machine instructions. 2. Define assembly language and explain how it relates to machine code and high-level programming languages. 3. What is an operating system (OS), and what are its primary functions in a computer system?	
CO4	1. Explain how the choice of network topology can impact network performance and scalability. 2. Discuss the applications of star, bus, ring, and mesh topologies in different networking environments. 3. How does network latency differ between LANs, WANs, and MANs? 4. Differentiate between hubs, switches, and routers in terms of their roles and functionalities within a network. 5. Compare the characteristics of coaxial, twisted-pair, and fiber optic cables used in networking	

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24ESR105	ALGORITHMIC THINKING WITH PYTHON	L	T	P	R	C	Year of Introduction
		2	0	2	1	4	2024

**Preamble:** The syllabus is prepared with the view of preparing the engineering graduates to be capable of writing readable Python programs to solve computational problems that they may have to solve in their professional lives. The course content is decided to cover the essential programming fundamentals, which can be taught within the given slots in the curriculum.

**Prerequisite:** NIL

**Course Outcomes:** After the completion of the course the student will be able to

<b>CO 1</b>	Analyze and develop an algorithm for solving computational problems. [Apply]
<b>CO 2</b>	Articulate in design programs with interactive input and output, utilizing arithmetic expression repetitions, and decision-making. [Understand]
<b>CO 3</b>	Utilize modular Python programs using functions and process stored data using List, Tuples, Sets, Dictionaries. [Apply]
<b>CO 4</b>	Understand and implement file operations for reading input and storing output. [Understand]

**CO - PO MAPPING**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	3	3	3									3
C02	3	3	3	2			3	3				3
C03	3											3
C04	3											3

**Assessment Pattern for Theory Component**

Bloom's Category	Continuous Assessment Tools			End Semester Examination
	Test1	Test 2	Other tools	
Remember	√	√		√
Understand	√	√		√
Apply	√	√	√	√
Analyze				
Evaluate				
Create				

**Assessment Pattern for Practical Component**

Bloom's Category	Continuous Assessment Tools	
	Class work	Test
Remember	√	√
Understand	√	√

Apply		√		√						
Analyze										
Evaluate										
Create										
<b>Assessment Pattern for Project Component</b>										
<b>Bloom's Category</b>		<b>Continuous Assessment Tools</b>								
		<b>Evaluation 1</b>	<b>Evaluation 2</b>	<b>Report</b>						
Remember		√	√							
Understand		√	√							
Apply		√								
Analyze										
Evaluate										
Create										
<b>Mark Distribution of CIA</b>										
		<b>Theory [L]</b>		<b>Practical [P]</b>		<b>Project [R]</b>		<b>Total Marks</b>		
<b>Course Structure [L-T-P-R]</b>	<b>Attendance</b>	<b>Assignment</b>	<b>Test-1</b>	<b>Test-2</b>	<b>Class Work</b>	<b>Test</b>	<b>Evaluation 1</b>		<b>Evaluation-2</b>	<b>Report</b>
2-0-2-1	5	5	7.5	7.5	7.5	5		7.5	5	50
<b>Total Marks distribution</b>										
<b>Total Marks</b>		<b>CIA (Marks)</b>			<b>ESE (Mark)</b>		<b>ESE Duration</b>			
100		50			50		2 hrs			
<b>End Semester Examination [ESE]</b>										
<b>PATTERN</b>	<b>PART A</b>					<b>PART B</b>				
PATTERN 2	2 Questions from each module. Total of 8 Questions, Answer any 6 questions. Each carrying 3 marks (6x3 =18 marks)					2 questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 3 subdivisions. Each question carries 8 marks. (4x8 = 32 marks)				
<b>SYLLABUS</b>										

<b>MODULE I : Fundamentals of Algorithms (5 Hours)</b>
<p><b>Problem Solving strategies</b> — Problem analysis — formal definition of problem — Solution — top- down design — breaking a problem into sub problems- overview of the solution to the sub problems by writing step by step procedure (algorithm) - Implementation of algorithms — use of procedures to achieve modularity.</p> <p><b>Examples for algorithms</b> - At least 10 problems (starting with non-numerical examples, and numeric problems like factorial, largest among three numbers, largest among N, Fibonacci.</p>
<b>MODULE II: Variable Expression and Statements (6 Hours)</b>
<p><b>Introduction to Python</b>-variables, expressions and statements, evaluation of expressions, precedence, string operations</p> <p>Control statements, Boolean expressions and logical operators, conditional and alternative executions</p>
<b>MODULE III : Functions (6 Hours)</b>
<p>Functions, calling functions, Recursion, composition of functions, mathematical functions, user-defined functions, parameters and arguments.</p>
<b>MODULE IV : List, Dictionary Data Structures (6 Hours)</b>
<p>Strings and lists — string traversal and comparison with examples. List operations with examples tuples and dictionaries — operations and examples , Introduction to numpy, pandas, matplotlib , Files and exceptions - text files, directories, Introduction to classes and objects - attributes, instances(Basics Only)</p>
<p><b>Textbooks</b></p> <ol style="list-style-type: none"> <li>Downey, A. et al., How to think like a Computer Scientist: Learning with Python, John Wiley, 2022</li> <li>Reema Thereja., Computer Fundamentals and Programming in C, Oxford, 2023</li> <li>Lambert K. A., Fundamentals of Python - First Programs, Cengage Learning India, 2019</li> <li>Rajaraman, V., Computer Basics and C Programming, Prentice-Hall India</li> </ol>
<p><b>Reference books</b></p> <ol style="list-style-type: none"> <li>Barry, P., Head First Python, O' Reilly Publishers</li> <li>Dromy, R. G., How to solve it by Computer, Pearson India</li> <li>Guzdial, M. J., Introduction to Computing and Programming in Python, Pearson India</li> <li>Perkovic, L., Introduction to Computing Using Python, 2/e, John Wiley, 2015</li> <li>Sprankle , M., Problem Solving &amp; Programming Concepts, Pearson India</li> <li>Venit, S. and Drake, E., Prelude to Programming: Concepts &amp; Design, Pearson India</li> <li>Zelle, J., Python Programming: An Introduction to Computer Science, Franklin, Beedle &amp; Associates Inc.</li> </ol>

NPTEL/SWAYAM Courses for reference:		
1. The joy of Computing using Python - <a href="https://onlinecourses.nptel.ac.in/noc21_cs32/preview">https://onlinecourses.nptel.ac.in/noc21_cs32/preview</a>		
No.	COURSE CONTENTS AND LECTURE SCHEDULE	No. of Hours (24)
<b>MODULE I : Fundamentals of Algorithms (5 Hours)</b>		
1.1	Problem analysis — formal definition of problem	1
1.2	Solution — top- down design	1
1.3	breaking a problem into sub problems-	1
1.4	overview of the solution to the sub problems by writing step by step procedure (algorithm)	1
1.5	Examples	1
<b>MODULE II : Variable Expression and Statements (6 Hours)</b>		
2.1	variables, expressions	1
2.2	statements, evaluation of expressions	1
2.3	Precedence, string operations	1
2.4	Control statements	1
2.5	Boolean expressions and logical operators	1
2.6	conditional and alternative executions	1
<b>MODULE III : Functions (7 Hours)</b>		
3.1	Functions	1
3.2	Calling functions	1
3.3	Composition of functions	1
3.4	Recursion	1
3.5	Mathematical functions	1
3.6	User-defined functions	1
3.7	Parameters and arguments	1
<b>MODULE IV: List, Dictionary Data Structures (6 Hours)</b>		
4.1	Strings and lists, string traversal and comparison	1
4.2	List operations with examples	1
4.3	tuples and dictionaries, operations and examples	1
4.4	Files and exceptions - text files, directories	1
4.5	Introduction to numpy, pandas, matplotlib	1
4.6	Introduction to classes and objects - attributes, instances	1
<b>Project:</b> Mini projects can be done in the respective engineering domain.		

<b>LESSON PLAN FOR LAB COMPONENT (8 Experiments mandatory)</b>		
<b>No.</b>	<b>Topic</b>	<b>No. of Hours (12)</b>
1	Simple desktop calculator using Python. Only the five basic arithmetic operators	1
2	Create, concatenate, and print a string and access a sub-string from a given string.	1
3	Familiarize time and date in various formats (Eg. "Thu Jul 11 10:26:23 IST 2024").	1
4	Program to find the largest of three numbers.	1
5	Convert temperature values back and forth between Celsius (c), and Fahrenheit (f). [Formula: $c/5 = f-32/9$ ]	1
6	Program to find the factorial of a number	1
7	Write program to check whether the given number is Armstrong or not	1
8	Write various programs to implement numpy, Pandas and matplotlib	3
9	Write a program to implement file operations	1
10	Write a program to demonstrate OOPs concepts in python	1
<b>LESSON PLAN FOR PROJECT COMPONENT</b>		
<b>No.</b>	<b>Topic</b>	<b>No. of Hours (12)</b>
1	Introduction and awareness on various stages of a Mini Hackathon.	6
2	Final Mini Hackathon, Presentation and evaluation.	6
<b>CO Assessment Questions</b>		
C01	<ol style="list-style-type: none"> <li>1. Write an algorithm to compute sum of series <math>1 - x^2/2 + x^4/4 - x^6/6 + \dots + n</math></li> <li>2. Give the algorithm for finding the largest and smallest numbers in each list of N numbers</li> <li>3. Simple desktop calculator using Python. Only the five basic arithmetic operators</li> </ol>	
C02	<ol style="list-style-type: none"> <li>1. Evaluate the expression <math>x ** y ** z</math>. Given <math>x = 2, y = 3, z = 2</math></li> <li>2. Write a python program to display all Armstrong numbers in each range</li> <li>3. Write a python program to count the number of zeros and negative terms in each set of n numbers</li> <li>4. Familiarize time and date in various formats (Eg. "Thu Jul 11 10:26:23 IST 2024").</li> </ol>	

C03	<ol style="list-style-type: none"><li>1. Why do we need functions? What are the advantages of function</li><li>2. Write a python program to find the sum of digits of a number</li><li>3. What do you mean by mutability of data structure? Explain with example why we say that list is mutable while tuples are immutable</li><li>4. Program to find the factorial of a number</li></ol>
C04	<ol style="list-style-type: none"><li>1. Write a python program to create a text file and to input a line of text to it. Display the line of text with all punctuation mark removed.</li><li>2. Create a class rectangle with attributes length, breadth and method area () to calculate the area of the rectangle. Create two instances of the class and call the method for each instance.</li><li>3. Write a program to read numbers stored in one file and store the sorted numbers in another after deleting duplicates.</li><li>4. Write a program to implement file operations</li></ol>

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<b>24HUT006</b>	<b>PROFESSIONAL ETHICS AND SUSTAINABLE DEVELOPMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>R</b>	<b>C</b>	<b>Year of Introduction</b>
		1	0	2	0	2	2024

**Preamble:**

Engineering Ethics enables students to explore the ethical principles and responsibilities of engineers in their professional practice, using real-world case studies. Sustainable Development transform our world, recognize interdependence, enhance quality of life, enhance human responsibilities, eliminate pollution, conserve natural resources and uplift human-nature coexistence. Relevant case studies impart students, effective ways to practically apply their skills and their understanding of learned facts to a real-world situation. The presentation of case studies will provide an opportunity to read, understand and prepare technical report about sustainable, professional and socially responsible projects.

**Prerequisite:** NIL

**Course Outcomes:** After the completion of the course, the student will be able to

<b>C01</b>	Understand key ethical principles and moral development theories that shape the ethical behavior of a professional.
<b>C02</b>	Analyze the role and responsibility as engineers through real world case studies to solve moral and ethical problems.
<b>C03</b>	Appreciate the relevance and necessity of sustainable development and recognize good practices and opportunities for an integrated approach to sustainable development
<b>C04</b>	Understand case studies about sustainable and socially responsible projects which impart students an effective way to realize real-world situations

**CO – PO MAPPING**

<b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
<b>C01</b>			1			3	2	3	2			3
<b>C02</b>			1			3	2	3	2	3	2	3
<b>C03</b>			1			3	3	2	2			3
<b>C04</b>			1			3	3	2	2	3	2	3

**Assessment Pattern**

<b>Bloom's Category</b>	<b>Continuous Assessment Tools</b>			<b>Case studies</b>
	<b>Test 1</b>	<b>Test 2</b>	<b>Assignment</b>	
Remember	✓	✓		
Understand	✓	✓	✓	✓

Apply	✓	✓	✓	✓
Analyze				✓

**Mark Distribution of CIA**

Course Structure [L-T-P-R]	Attendance	Theory [L]			Practical [P]	Total Marks
		Assignment	Test-1	Test-2	Case Study	
1-0-2-0	5	5	20	20	50	100

**SYLLABUS**

**MODULE 1**

Introduction to Professional Ethics-Morals, Values and Ethics, Personal and Professional ethics  
 Key ethical Principles-Honesty, integrity, respect, responsibility  
 Moral Development Theories (Kohlberg's theory, Gilligan's theory)  
 Case studies on professional responsibility (Hyatt Regency Walkway Collapse, Ethical consideration in the design and deployment of autonomous vehicle)

**MODULE 2**

Engineering as Experimentation – Engineers as responsible Experimenters-Engineers as Managers, Consulting Engineers, Engineers as Expert witnesses and advisors  
 Codes of Ethics- Plagiarism-Professional Rights-Employee right- IPR Discrimination.  
 Ethical challenges posed by emerging technologies  
 Case Studies on emerging technologies (Artificial Intelligence)

**MODULE 3**

Introduction to Sustainable Development- Concept of Sustainability- pillars of sustainability- social- economic -environmental sustainability.  
 MDG - SDG- Nexus between Technology and sustainable development.  
 Case studies on SDGs. Case studies on Nexus between Technology and Sustainable development.

**MODULE 4**

Pathways for sustainable development - Social aspects - poverty- hunger - health - education- gender equality. Economic aspects- society- consumers - industries.  
 Environmental aspects - renewable energy- zero waste - Carbon emission- conservation of ecosystem- global environmental issues  
 Case studies on Sustainable habitat, Sustainable Industry

**Textbooks**

1. Mike W Martin and Roland Schinzinger, Ethics in Engineering, 4th edition, Tata McGraw Hill Publishing Company Pvt. Ltd, New Delhi, 2014.
2. Our Common Journey: A Transition Toward Sustainability. National Academy Press.
3. Sustainable Development., Susan Baker, Taylor and Francis
4. Elliott, Jennifer. 2012. An Introduction to Sustainable Development. 4th Ed. Routledge, London
5. Rogers, Peter P., Kazi F. Jalal, and John A. Boyd. "An introduction to sustainable
6. development." (2012).

**Reference books**

1. Charles D Fleddermann, Engineering Ethics, Pearson Education/ Prentice Hall of India, New Jersey, 2004.
2. Charles E Harris, Michael S Protchard and Michael J Rabins, Engineering Ethics- Concepts and cases, Wadsworth Thompson Learning, United states, 2005.
3. Guidelines for Professional Conduct for Civil Engineers ASCE, 2008
4. UN Millennium Project (2005) Investing in Development: A Practical Plan to Achieve the Millennium Development Goals, Overview.
5. World Bank (2006) Enhancing Agricultural Innovation: How to Go beyond the Strengthening of Research Systems, World Bank: Agriculture and Rural Development
6. World Commission on Environment and Development (1987) Our Common Future, Oxford, OUP.

**NPTEL Course**

1. Ethics in Engineering Practice  
[https://nptel.ac.in/noc/individual\\_course.php?id=noc18-mg25](https://nptel.ac.in/noc/individual_course.php?id=noc18-mg25)
2. Non-Conventional Energy Sources  
[https://nptel.ac.in/noc/individual\\_course.php?id=noc18-ge14](https://nptel.ac.in/noc/individual_course.php?id=noc18-ge14)
3. Education for Sustainable Development  
[https://onlinecourses.nptel.ac.in/noc22\\_hs61/preview](https://onlinecourses.nptel.ac.in/noc22_hs61/preview)

No.	COURSE CONTENTS AND LECTURE SCHEDULE	No. of Hours (36 hours)
<b>MODULE 1 (4 Hours)</b>		
1.1	Introduction to Professional Ethics-Morals, Values and Ethics	1
1.2	Personal and Professional ethics	1
1.3	Key ethical principles-Honesty, integrity, respect, responsibility. Moral Development Theories (Kohlberg's theory, Gilligan's theory)	1

1.4	Case studies on professional responsibility (Hyatt Regency Walkway Collapse, Ethical consideration in the design and deployment of autonomous vehicle)	1
<b>MODULE 2 (4 Hours)</b>		
2.1	Engineering as Experimentation – Engineers as responsible Experimenters-Engineers as Managers	1
2.2	Consulting Engineers, Engineers as Expert witnesses and advisors	1
2.3	Codes of Ethics- Plagiarism-Professional Rights-Employee right- IPR Discrimination.	1
2.4	Ethical challenges posed by emerging technologies. Case Studies on emerging technologies (Artificial Intelligence	1
<b>MODULE 3 (4 Hours)</b>		
3.1	Introduction to Sustainable Development- Concept of Sustainability- pillars of sustainability- social- economic -environmental sustainability	1
3.2	MDG - SDG- Nexus between Technology and sustainable development	1
3.3	Case studies on SDGs	1
3.4	Case studies on Nexus between Technology and Sustainable development	1
<b>MODULE 4 (4 Hours)</b>		
4.1	Pathways for sustainable development, social aspects - poverty- hunger - health -education- gender equality	1
4.2	Economic aspects- society- consumers - industries	1
4.3	Environmental aspects - renewable energy- zero waste - Carbon emission- conservation of ecosystem- global environmental issues	1
4.4	Case studies on Sustainable habitat, Sustainable Industry	1
<b>LESSON PLAN FOR CASE STUDIES</b>		
<b>No.</b>	<b>Topic</b>	<b>No. of Hours (20)</b>
1	Do Case studies of emerging trends in technology, sustainable, socially and professionally responsible projects	5
2	Selection of a case study for presentation and prepare a technical report	15

No.	Case Study Assessment	Marks
1	Selection of case study - Relevance of topic to the Course	10
2	Preparation of case study	15
3	Submission of Technical Report on case study	25
<b>CO Assessment Questions</b>		
CO1	<ol style="list-style-type: none"><li>1. Define integrity and point out ethical values.</li><li>2. Discuss in detail about moral development theories</li><li>3. Investigate the responsibilities of a professional with case studies</li></ol>	
CO2	<ol style="list-style-type: none"><li>1. Illustrate the role of engineers as experimenters.</li><li>2. Exemplify the engineers as managers.</li><li>3. Investigate the ethics in emerging technologies with case studies</li></ol>	
CO3	<ol style="list-style-type: none"><li>1. Explain the necessity for Sustainable Development.</li><li>2. Enumerate SDG. Describe the challenges and barriers to sustainable development</li><li>3. Give any three examples for Nexus between Technology and Sustainable development.</li></ol>	
CO4	<ol style="list-style-type: none"><li>1. Describe Sustainable practices for achieving Economic sustainability</li><li>2. Enumerate global environmental issues</li><li>3. Investigate the Sustainable practices for sustainable habitat with case studies</li></ol>	

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24ESL007	COMPUTER AIDED DRAWING (CAD) & MANUFACTURING WORKSHOP					L	T	P	R	C	Year of Introduction	
						0	0	2	0	1	2024	
<b>Preamble:</b> The course is designed to empower students to explore the full potential of computer-aided design, additive manufacturing, and other manufacturing techniques. Students will foster a team working environment to enhance the necessary skills for planning, preparing and executing an engineering project. In addition the students will be introduced to various tools, measuring devices, practices and different methods of manufacturing processes employed in industry for fabricating components.												
<b>Prerequisite:</b> NIL												
<b>Course Outcomes:</b> After the completion of the course the student will be able to												
C01	Identify mechanical operations in accordance with manufacturing of products. <b>[Understand]</b>											
C02	Application of advanced metrology instruments used in general workshop. Accomplish model making using modern manufacturing method. <b>[Apply]</b>											
C03	Execute 2D and 3D drawing using CAD software. <b>[Apply]</b>											
C04	Critically assess the advantages and limitations of 3D printing compared to traditional manufacturing methods. <b>[Understand]</b>											
<b>CO-PO MAPPING</b>												
CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	2								2			
C02					3				2			
C03					2					3		
C04					3							
<b>Assessment Pattern</b>												
<b>Bloom's Category</b>					<b>Continuous Assessment Tools</b>							
					<b>Classwork</b>					<b>Test1</b>		
Remember					√					√		
Understand					√					√		
Apply					√					√		
Analyze					√							
Evaluate					√							
Create												
<b>Mark Distribution of CIA</b>												
<b>Course Structure [L-T-P-R]</b>		<b>Attendance</b>		<b>Classwork</b>		<b>Lab Exam</b>		<b>Total Marks</b>				
0-0-2-0		5		35		10		50				
<b>Total Mark distribution</b>												
<b>Total Marks</b>		<b>CIA(Marks)</b>			<b>ESE(Marks)</b>			<b>ESE Duration</b>				

50	50	0	-
<b>SYLLABUS-DETAILS OF EXPERIMENTS</b>			
<b>SECTION – 1 (Manufacturing Lab Experiments)</b> <i>Minimum 5 experiments are mandatory</i>			
General study of manufacturing process – Foundry – Sheet metal – Fitting – Welding – Metrology – Modern manufacturing method – Power tools.			
<b>SECTION – 2 (CAD Lab Experiments)</b> <i>Minimum 5 experiments are mandatory</i>			
Introduction to Computer Aided Drawing (CAD) – 2D Drafting – 3D Modeling			
<b>Textbooks</b>			
1. Mechanical Workshop Practice, K C John PHI Learning Edition 2, 2010			
2. Engineering Materials, S C Rangwala Charotar Publishing House Pvt Limited Edition 43, 2019			
3. Engineering Graphics Essentials with AutoCAD 202x Instruction Kirstie Plantenberg ,SDC Publication 2023			
<b>Reference Books</b>			
1. Elements of Workshop Technology Vol-1-Manufacturing Processes S K Hajra Choudhury A K Hajra Choudhury Nirjhar Roy MPP Media Promoters and Publishers2008			
2. AutoCAD 3D Modeling: Exercise Workbook Steve Heather Industrial Press Inc.,U.S			
<b>LIST OF EXPERIMENTS</b>			
<b>Manufacturing - 12Hrs</b> <b>(Minimum 5 experiments are mandatory)</b>			
<b>No.</b>	<b>Experiments</b>		
1	General-Introduction to workshop practice – safety precautions – Basic first aid knowledge – Study of workshop tools		
2	Welding- Understanding arc welding process and components – Experiment on horizontal bead formation.		
3	Metrology- Common measuring instruments used in workshop, experiments to measure using instruments like Vernier Caliper, micrometer, Vernier Height Gauge (Ordinary & Digital).		
4	Modern manufacturing method-3D printing		
5	Power Tools-Demonstration of the following power tools – Portable DC inverter welding set, portable power planer, Portable jig saw machine, Portable circular saw, Portable Drilling machine, Angle grinder.		
6	Foundry- Understanding of foundry tools – Experiment on Bench moulding.		
7	Fitting- Understanding the tools used for fitting and knowledge of at least one model		
8	Sheet Metal: Understanding sheet metal working tools and knowledge of at least one model.		
<b>CAD LAB - 12Hrs</b> <b>(Minimum 5 experiments are mandatory)</b>			

1	Computer Aided Drawing (CAD): Introduction, Role of CAD in design and development of new products, Advantages of CAD. 2D Drawing Exercise I: Introduction to common drafting tools and annotations.
2	2D Drawing Exercise II: Introduction to common modification tools.
3	2D Drawing Exercise III: 2D drafting and property changing.
4	2D Drawing Exercise IV: 2D drafting using different drafting methods.
5	2D Drawing Exercise V: Drafting orthographic projection and isometric view.
6	3D Drawing: Introduction to different 3D modeling tools.
7	3D Drawing Exercise I: Introduction to solid editing.
8	3D Drawing Exercise II: Introduction to different modify tools.
<b>CO Assessment Questions</b>	
C01	1. Identify the tools given to you and demonstrate their proper use. 2. Choose a suitable manufacturing process to make the given model.
C02	1. Identify the given measuring instrument and demonstrate its proper use. 2. Take the 3D printout of the given drawing.
C03	1. Prepare 2D drawings using CAD software. 2. Prepare 3D drawings using CAD software.
C04	1. Find the advantages of 3D printing compared to traditional manufacturing processes. 2. Find the limitations of 3D printing compared to traditional manufacturing processes.

EDUCATION IS DEDICATION

Prepared by  
Mr. Anoop Lonappan, Asst. Prof., ASH  
Mr. Mathews V J, Asst. Prof, ASH  
Mr Jojo P J, Lab Instructor  
Mr Aashik P P, Lab Instructor





EDUCATION IS DEDICATION

**SEMESTER-II**  
**SYLLABUS**

24MAT211	LINEAR ALGEBRA	L	T	P	R	C	Year of Introduction
		3	0	0	0	3	2024

**Preamble:**

This course enables the students to understand the basic concept of Linear algebra involving solution of linear system of equations and diagonalization occurring in Computer Science and Engineering. This course introduces the concept of vector space which is an abstract framework for studying linear operations using basis and linear transformations. Students utilize inner product space to perform least square approximations and orthogonal projections. Through this course, students practice modern engineering and IT tools to solve complex problems.

**Prerequisite:** Basic concepts in matrix theory.

**Course Outcomes:** After the completion of the course the student will be able to

<b>CO 1</b>	Apply Gauss elimination method to solve given systems of linear equations and determine whether a matrix is diagonalizable. <b>[Apply]</b>
<b>CO 2</b>	Develop analytical and critical thinking skills through solving problems using vector spaces. <b>[Apply]</b>
<b>CO 3</b>	Apply the concept of inner product spaces to do least square approximations and orthogonal projections. <b>[Apply]</b>
<b>CO 4</b>	Compute linear transformations and compositions using their matrix representations. <b>[Apply]</b>

**CO - PO MAPPING**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3	2	3	3							
CO 2	3	3	3	2	3							
CO 3	3	3	3	2								
CO 4	3	3	3	2	3							

**Assessment Pattern**

Bloom's Category	Continuous Assessment Tools			End Semester Examination
	Test1	Test 2	Other tools	
Remember	√	√	√	√
Understand	√	√	√	√
Apply	√	√	√	√
Analyse				
Evaluate				
Create				

Mark Distribution of CIA					
Course Structure [L-T-P-R]	Attendance	Theory [L]			Total Marks
		Assignment	Test-1	Test-2	
3-0-0-0	5	10	12.5	12.5	40
Total Mark distribution					
Total Marks	CIA (Marks)	ESE (Marks)	ESE Duration		
100	40	60	2.5 hours		
End Semester Examination [ESE]: Pattern					
PATTERN	PART A	PART B			ESE Marks
PATTERN 1	8 Questions (2 Questions from each module), each question carries 3 marks Marks: (3x8 =24 marks)	2 questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 2 sub-divisions. Each question carries 9 marks. Marks: (9x4 = 36 marks) Time: 3 hours			60
SYLLABUS					
MODULE I: (Linear Algebra)					
<b>(Text 1: Relevant topics from sections 7.3,7.5,8.1,8.4)</b> Systems of linear equations, Solution by Gauss elimination. Row echelon form and rank of a matrix. Fundamental theorem for linear systems. Eigenvalues and eigenvectors. Diagonalization of matrices.					
MODULE II: (Vector Spaces)					
<b>(Text 2: Relevant topics from sections 4.1,4.3,4.4,4.5,4.7)</b> Vector Spaces ( $R^n$ , $m \times n$ ), Subspaces. Linear independence, Linear span, Basis and dimension, coordinates, and change of basis.					
MODULE III: (Inner product spaces)					
<b>(Text 2: Relevant topics from sections 6.1, 6.2,6.3,6.4,6.5)</b> Length and dot product in $R^n$ -Norm, length, distance, dot product, Angle, inner product spaces, Orthogonal projection, Orthogonal and Orthonormal sets, The least square problem, Orthogonal Subspaces.					
MODULE IV: (Linear Transformation)					
<b>(Text 2: Relevant topics from sections 1.8,1.9)</b> Linear transformations, Kernel of Linear transformation, Range of Linear transformation, matrices for linear transformation, Composition of linear transformations.					

<b>Textbooks</b>		
1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2016		
2. David C Lay, Linear Algebra and its Applications, 3 <sup>rd</sup> Edition, Pearson, 2006		
<b>Reference books</b>		
1. Gilbert Strang, Linear Algebra and its Applications, 4 <sup>th</sup> Edition, Cengage 2006		
2. Seymour Lipschutz, Marc Lipson, Schaum's outline of linear algebra, 3 <sup>rd</sup> Edition, McGraw-Hill, New Delhi, 2017.		
3. Peter V. O'Neil, Advanced Engineering Mathematics, Cengage, 7th Edition, 2012		
4. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 3 <sup>rd</sup> Edition, 2008		
5. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2015.		
6. Jimmie Gilbert and Linda Gilbert, Linear Algebra and Matrix Theory, University of South Carolina at Spartanburg, 1995		
<b>NPTEL/SWAYAM Courses for reference:</b>		
1. Prof. Arbind Kumar Lal. Linear Algebra, IIT Kanpur, [NPTEL], <a href="https://archive.nptel.ac.in/courses/111/104/111104137/">https://archive.nptel.ac.in/courses/111/104/111104137/</a> (Relevant sections)		
2. Prof. Pranav Haridas, Linear Algebra, IIT Madras, [NPTEL], <a href="https://archive.nptel.ac.in/courses/111/106/111106135/">https://archive.nptel.ac.in/courses/111/106/111106135/</a>		
3. Prof. Gilbert Strang, Linear Algebra [MITOPENCOURSEWARE] <a href="https://ocw.mit.edu/courses/18-06-linear-algebra-spring-2010/">https://ocw.mit.edu/courses/18-06-linear-algebra-spring-2010/</a> (Relevant sections)		
<b>No.</b>	<b>COURSE CONTENTS AND LECTURE SCHEDULE</b>	<b>No. of Hours [36 hours]</b>
<b>MODULE I [ 9 hours]</b>		
1.1	Systems of linear equations	1
1.2	Solution by Gauss elimination	2
1.3	Row echelon form and rank of a matrix	2
1.4	Fundamental theorem for linear systems, eigenvalues and eigenvectors	2
1.5	Diagonalization of matrices	2
<b>MODULE II [9 hours]</b>		
2.1	Vector Spaces ( $\mathbb{R}^n$ , $m \times n$ )	2
2.2	Subspaces	1
2.3	Linear independence	1
2.4	Linear span	1
2.5	Basis and dimension	2
2.6	Co-ordinates and change of basis	2
<b>MODULE III [10 hours]</b>		
3.1	Length and dot product in $\mathbb{R}^n$	1
3.2	Norm, length, distance	1
3.3	Dot product, Angle	1
3.4	Inner product spaces	2
3.5	Orthogonal projection	1

3.6	Orthogonal and Orthonormal sets	1
3.7	The least square problem	1
3.8	Orthogonal Subspaces	2
<b>MODULE IV [8 hours]</b>		
4.1	Linear transformations	2
4.2	Kernel of Linear transformation	1
4.3	Range of Linear transformation	1
4.4	Matrices for linear transformation	2
4.5	Composition of linear transformations	2
<b>CO Assessment Questions</b>		
C01	<p>1. Find the rank of the matrix</p> $\begin{bmatrix} 0 & 1 & 0 \\ -1 & 0 & -4 \\ 0 & 4 & 0 \end{bmatrix}$ <p>2. Find the eigenvalues of the matrix</p> $\begin{bmatrix} 1 & 2 \\ 0 & 3 \end{bmatrix}$ <p>3. Use a CAS(MATLAB/SCILAB) to find the matrix of transformation that diagonalizes the matrix <math>\begin{bmatrix} -5 &amp; 2 \\ 2 &amp; -2 \end{bmatrix}</math>. Also, write the diagonal matrix.</p> <p><b>Team Work:</b> Solve the following linear system of equations using the Gauss elimination method <math>x+2y-z=3</math>, <math>3x-y+2z=1</math>, <math>2x-2y+3z=2</math> (using any programming language).</p>	
C02	<p>1. Prove that the vectors (2,3,0), (1,2,0) and (8,13,0) are linearly dependent in <math>R^3</math></p> <p>2. Find the basis of the matrix</p> $\begin{bmatrix} 1 & 1 & -2 \\ -1 & 2 & 1 \\ 0 & 1 & -1 \end{bmatrix}$ <p>3. Use a CAS(MATLAB/SCILAB) to prove that the set of vectors <math>V = \{(v_1, v_2, v_3) \in R^3 : -v_1 + v_2 + 4v_3 = 0\}</math> is a vector space over the field R. Also find the dimension and the basis.</p> <p><b>Team Work:</b> Consider the following two bases of <math>R^3</math>, <math>S = \{(1, 1, 1), (0, 2, 3), (0, 2, -1)\}</math> and <math>T = \{(1, 1, 0), (1, -1, 0), (0, 0, 1)\}</math>. Find the coordinate vector of <math>x = (3, 5, -2)</math> relative to S and T. Illustrate your discussion with an example using any software. The team has to make a presentation elaborating the procedure.</p>	
C03	<p>1. Show that (1,1,1), (1,0,-1), (1,-2,1) are mutually orthogonal.</p> <p>2. For what values of k is the following an inner product in <math>R^3</math> <math>\langle x, y \rangle = x_1 y_1 - 3 x_1 y_2 - 3 x_2 y_1 + k x_2 y_2</math></p> <p>3. Find an orthonormal basis for the subspace spanned by the vectors (1,2,1), (1,0,1), (3,1,0) of <math>R^3</math></p> <p>4. Verify that the following is an inner product in <math>R^2</math> : <math>\langle x, y \rangle = x_1 y_1 - 2 x_1 y_2 - 2 x_2 y_1 + 5 x_2 y_2</math></p>	
	<p>1. Check which of the following is a linear transformation? (i) <math>T(x, y) = (x^2, y^2)</math> (ii) <math>T(x, y) = (2x - y, x + 3y)</math></p> <p>2. Let <math>T : R^3 \rightarrow R^2</math> be defined by <math>T((x, y, z)) = (x, x)</math>. Find Ker T and</p>	

CO4	<p>Range(T)</p> <p>3. Let <math>T : \mathbb{R}^3 \rightarrow \mathbb{R}^2</math> be a linear transformation and <math>T(e_1)=(2,-1)</math>, <math>T(e_2)=(1,3)</math>, <math>T(e_3)=(-1,2)</math>. Use a CAS(MATLAB/SCILAB) to find <math>L(-1,4,2)</math>, where <math>\{e_1, e_2, e_3\}</math> is the standard basis for <math>\mathbb{R}^3</math></p> <p>4. The transformation <math>T: P_3[x] \rightarrow P_3[x]</math> is defined by <math>T(p(x)) = \frac{d^2(p(x))}{dx^2}</math>. Find the matrix of T with respect to the basis <math>\{1, x, x^2, x^3\}</math>.</p>
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Prepared by  
Mrs Lickny I  
Asst Prof., ASH



24CYC012	ENGINEERING CHEMISTRY	L	T	P	R	C	Year of Introduction
		3	0	2	0	4	2024

**Preamble:**

Provide students with comprehensive exploration of electrochemistry, corrosion mechanisms, materials for electronic applications, molecular spectroscopy, analytical techniques, and environmental chemistry. Students will gain insights into the fundamental concepts, advanced methodologies, and practical applications essential for addressing contemporary challenges in materials science and environmental sustainability. This course equips learners with the knowledge and skills necessary to analyze, innovate, and implement solutions in diverse engineering fields, ensuring a robust foundation for tackling complex real-world problems.

**Prerequisite:** Basic knowledge in Chemistry and Physics

**Course Outcomes:** After the completion of the course the student will be able to

<b>CO1</b>	Employ the fundamental principles of electrochemistry and corrosion, to explore their potential applications across different engineering sectors. <b>[Apply]</b>
<b>CO2</b>	Apply knowledge of different engineering materials to select and integrate appropriate materials in various electronic sectors through practical experimentation in the laboratory. <b>[Apply]</b>
<b>CO3</b>	Interpret various analytical techniques effectively across different engineering domains. <b>[Apply]</b>
<b>CO4</b>	Understand and apply the principles of environmental chemistry and waste management. <b>[Apply]</b>

**CO - PO MAPPING**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO 1</b>	3	3	2	2					2			
<b>CO 2</b>	3	3		2					2			
<b>CO 3</b>	3	3		2					2			
<b>CO 4</b>	3	3	3	2		2	3		2			

**Assessment Pattern For Theory Component**

Bloom's Category	Continuous Assessment Tools			End Semester Examination
	Test1	Test 2	Other tools	
Remember	√	√	√	√
Understand	√	√	√	√
Apply	√	√	√	√
Analyse				
Evaluate				

Create							
<b>Assessment Pattern for the Lab component</b>							
<b>Bloom's Category</b>		<b>Continuous Assessment Tools</b>					
		<b>Class work</b>			<b>Test1</b>		
Remember		√			√		
Understand		√			√		
Apply		√			√		
Analyse							
Evaluate							
Create							
<b>Mark Distribution of CIA</b>							
<b>Course Structure [L-T-P-R]</b>	<b>Attendance</b>	<b>Assignment</b>	<b>Theory [L- T]</b>		<b>Practical [P]</b>		<b>Total Marks</b>
			<b>Test-1</b>	<b>Test-2</b>	<b>Continuous Assessment</b>	<b>Lab Exam</b>	
3-0-2-0	5	5	7.5	7.5	15	10	50
<b>Total Marks distribution</b>							
<b>Total Marks</b>	<b>CIA (Marks)</b>		<b>ESE (Marks)</b>		<b>ESE Duration</b>		
100	50		50		2 hours		
<b>End Semester Examination [ESE]: Pattern</b>							
<b>PATTERN</b>	<b>PART A</b>		<b>PART B</b>			<b>ESE Marks</b>	
PATTERN 2	2 Questions from each module. Total of 8 Questions, Answer any 6 questions. Each carrying 3 marks (6x3 =18 marks)		2 questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 2 subdivisions. Each question carries 8 marks. Marks: (4x 8 = 32 marks)			50	
<b>SYLLABUS</b>							
<b>MODULE I: Electrochemistry and Corrosion Science (9 Hours)</b>							
<p><b>Electrochemical Cell-</b> Electrode potential- Nernst equation for single electrode and cell (numerical problems), reference electrodes - SHE &amp; Calomel electrode - construction and working, Electrochemical series - applications, glass electrode &amp; pH measurement, conductivity- measurement. Li-ion battery: construction and working.</p> <p><b>Corrosion</b> -Electrochemical corrosion mechanism (acidic &amp; alkaline medium), Galvanic series, Corrosion control methods - cathodic protection, sacrificial anodic protection and impressed current cathodic protection, electroplating of copper, electroless plating of copper.</p>							



<b>MODULE II: Materials for Electronic Applications (9 Hours)</b>
<p><b>Nanomaterials</b> - Classification based on dimension &amp; materials, synthesis – sol gel &amp; chemical reduction, Applications of nanomaterials – carbon nanotubes, fullerenes, graphene &amp; carbon quantum dots – structure, properties &amp; application.</p> <p><b>Polymers</b> - Fire retardant polymers- halogenated &amp; non-halogenated polymers (examples only), Conducting polymers-classification, polyaniline &amp; polypyrrole-synthesis, properties and applications.</p> <p><b>Organic electronic materials and devices</b>- construction, working and applications of Organic Light Emitting Diode (OLED) &amp; dye-Sensitized Solar Cells (DSSC).</p>
<b>MODULE III: Molecular Spectroscopy and Analytical Techniques (9 Hours)</b>
<p><b>Spectroscopy</b>-Types of spectra- molecular energy levels, Beer lambert's law-numerical problems, Electronic spectroscopy – principle, types of electronic transitions, role of conjugation in absorption maxima, instrumentation, applications, Vibrational spectroscopy – principle, number of vibrational modes, vibrational modes of CO<sub>2</sub> and H<sub>2</sub>O – applications.</p> <p><b>Thermal analysis:</b> Dielectric Thermal Analysis (DETA) of polymers-working and application.</p> <p><b>Electron Microscopic Techniques:</b> SEM - principle, instrumentation and applications.</p>
<b>MODULE IV: Environmental Chemistry (9 Hours)</b>
<p><b>Water characteristics</b> - Hardness - types of hardness, temporary and permanent, disadvantages of hard water, degree of hardness (numericals). Water softening methods-ion exchange process-principle, procedure and advantages. Water disinfection methods – chlorination, break point chlorination, ozone and UV irradiation. Dissolved oxygen (DO), BOD and COD- definition &amp; significance.</p> <p><b>Waste Management:</b> Sewage water treatment- primary, secondary and tertiary, flow diagram, trickling filter and UASB process. E Waste, methods of disposal – recycle, recovery and reuse.</p> <p><b>Chemistry of climate change</b>- Greenhouse gases, Ozone depletion.</p>
<p><b>Text books</b></p> <ol style="list-style-type: none"> <li>1. Dr. Muhammad Arif M, Smt. Kavitha P Nair, Dr. Annette Fernandez“Engineering Chemistry”, Owl Books,2021</li> <li>2. Engineering Chemistry- B. L. Tembe, Kamaluddin, M. S. Krishnan-2018</li> <li>3. Instrumental Methods of Analysis- H. H. Willard, L. L. Merritt, CBS Publishers,7th Edition,2005</li> </ol>
<p><b>Reference books</b></p> <ol style="list-style-type: none"> <li>1. Fundamentals of Molecular Spectroscopy C. N. Banwell McGraw-Hill, 4<sup>th</sup> edn., 2017</li> <li>2. Principles of Physical Chemistry B. R. Puri, L. R. Sharma, M. S. Pathania Vishal Publishing Co 47<sup>th</sup> Edition, 2017</li> <li>3. Engineering Chemistry- Jain &amp; Jain, Dhanpath Rai Publishing Company,17<sup>th</sup> Edition, 2015</li> <li>4. Introduction to Spectroscopy Donald L. Pavia Cengage Learning India Pvt. Ltd</li> </ol>

2015

5. Polymer Chemistry: An Introduction Raymond B. Seymour, Charles E. Carraher Marcel Dekker Inc 4th Revised Edition, 1996
6. The Chemistry of Nanomaterials: Synthesis, Properties and Applications Prof. Dr. C. N. R. Rao, Prof. Dr. h.c. mult. Achim Müller, Prof. Dr. A. K. Cheetham Wiley-VCH Verlag GmbH & Co. KGaA 2014
7. Organic Electronics Materials and Devices Shuichiro Ogawa Springer Tokyo 2024
8. Instrumental Methods of Analysis- H. H. Willard, L. L. Merritt, CBS Publishers, 7th Edition, 2005

**NPTEL/SWAYAM Courses for reference:**

Module - I

1. <https://archive.nptel.ac.in/courses/104/106/104106137/> Elementary Electrochemistry
2. <https://archive.nptel.ac.in/courses/113/105/113105102/> Electrochemical Energy storage
3. <https://archive.nptel.ac.in/courses/113/104/113104082/> Corrosion

Module - II

1. <https://archive.nptel.ac.in/courses/113/104/113104102/> Nanomaterials and their properties
2. <https://archive.nptel.ac.in/courses/104/105/104105124/> Introduction to Polymer Science

Module III

1. <https://nptel.ac.in/courses/104106122/> Fundamentals of spectroscopy

Module IV

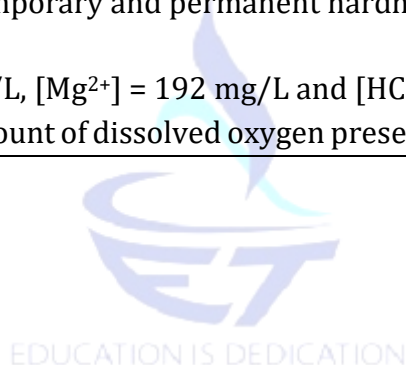
1. <https://archive.nptel.ac.in/courses/122/106/122106030/> Environmental chemistry and analysis

No.	COURSE CONTENTS AND LECTURE SCHEDULE	No. of Hours [36]
<b>MODULE 1: Electrochemistry and Corrosion Science (9 Hours)</b>		
1.1	Electrochemical Cell- Electrode potential- Nernst equation for single electrode and cell (numerical problems), reference electrodes – SHE & Calomel electrode –construction and working.	3
1.2	Electrochemical series – applications, glass electrode & pH measurement, conductivity- measurement.	2
1.3	Li-ion battery: construction and working,	1
1.4	Corrosion –Electrochemical corrosion mechanism (acidic & alkaline medium), Galvanic series,	1
1.5	Corrosion control methods - cathodic protection, sacrificial anodic protection and impressed current cathodic protection, electroplating of copper, electroless plating of copper.	2
<b>MODULE II: Materials for Electronic Applications (9 Hours)</b>		
2.1	Nanomaterials - Classification based on dimension & materials, synthesis – sol gel & chemical reduction, Applications of nanomaterials – carbon nanotubes, fullerenes, graphene & carbon quantum dots – structure, properties & application.	3

2.2	Polymers - Fire retardant polymers- halogenated & non-halogenated polymers (examples only),	2	
2.3	Conducting polymers-classification, polyaniline & polypyrrole-synthesis, properties and applications.	2	
2.4	Organic electronic materials and devices- construction, working and applications of Organic Light Emitting Diode (OLED) & Dye-Sensitized Solar Cells (DSSC)	2	
<b>MODULE III: Molecular Spectroscopy and Analytical Techniques (9 Hours)</b>			
3.1	Spectroscopy-Types of spectra- molecular energy levels, Beer lambert's law – numerical problems.	1	
3.2	Electronic spectroscopy – principle, types of electronic transitions, role of conjugation in absorption maxima, instrumentation, applications.	2	
3.3	Vibrational spectroscopy – principle, number of vibrational modes, vibrational modes of CO <sub>2</sub> and H <sub>2</sub> O – Applications.	2	
3.4	Thermal analysis: Dielectric Thermal Analysis (DETA) of polymers-working and application.	2	
3.5	Electron Microscopic Techniques: SEM - principle, instrumentation and applications.	2	
<b>MODULE IV: Environmental Chemistry (9 Hours)</b>			
4.1	Water characteristics - Hardness - types of hardness, temporary and permanent, disadvantages of hard water, degree of hardness (numericals).	2	
4.2	Water softening methods-ion exchange process-principle, procedure and advantages.	2	
4.3	Water disinfection methods – chlorination, break point chlorination, ozone and UV irradiation. Dissolved oxygen (DO), BOD and COD- definition & significance.	2	
4.4	Waste Management: Sewage water treatment- primary, secondary and tertiary, flow diagram, trickling filter and UASB process. E Waste, methods of disposal – recycle, recovery and reuse.	2	
4.5	Chemistry of climate change- Greenhouse gases, Ozone depletion	1	
<b>LESSON PLAN FOR LAB COMPONENT</b>			
No.	Topic	No. of Hours	Experiment (24 hrs)
1	Electrochemistry and Corrosion Science	4	1)Calibration of pH meter and determination of pH of a solution.
			2)Determination of cell constant and conductance of solutions

2	Materials for Electronic Applications	6	1) Synthesis of polymers a) Urea-formaldehyde resin b) Phenol-formaldehyde resin
			2) Estimation of copper in brass
3	Molecular Spectroscopy and Analytical Techniques	6	1) Determination of wavelength of absorption maximum and colorimetric estimation of $\text{Fe}^{3+}$ in solution
			2) Determination of molar absorptivity of a compound ( $\text{KMnO}_4$ or any water-soluble food colorant)
4	Environmental Chemistry	8	1) Estimation of dissolved oxygen by Winkler's method
			2) Estimation of total hardness of water-EDTA method
			3) Estimation of chloride content in water
(Any 2 experiments from each topic are to be completed)			
<b>CO Assessment Questions</b>			
CO1	<ol style="list-style-type: none"> <li>1. A zinc electrode is placed in a 1 M <math>\text{ZnSO}_4</math> solution at <math>25^\circ\text{C}</math>. Calculate the electrode potential given that <math>[\text{Zn}^{2+}] = 1 \text{ M}</math> and <math>E^\circ(\text{Zn}^{2+} \text{Zn}) = -0.76 \text{ V}</math>. Discuss how this potential change with temperature and concentration variations.</li> <li>2. Utilizing the electrochemical series, predict the feasibility of a reaction between iron metal and a copper(II) sulfate solution. Provide the relevant half-reactions and explain your reasoning.</li> <li>3. Give the construction of Li-ion cell. Give the reactions that take place at the electrodes during charging and discharging. What happens to anodic material when the cell is 100% charged.</li> <li>4. Calibrate the pH meter and determine pH of a given solution.</li> </ol>		
CO2	<ol style="list-style-type: none"> <li>1. Explain three important applications of nanomaterials.</li> <li>2. Discuss the structural differences between Graphene and Carbon Quantum Dots (CQDs). Explain how their unique properties such as conductivity and optical behavior influence their applications in electronics and biomedical fields.</li> <li>3. Evaluate the conductivity and stability differences between Polyaniline and Polypyrrole. Discuss their synthesis methods and applications in electronic devices such as sensors and actuators.</li> <li>4. Explain the construction and working principle of an Organic Light Emitting Diode (OLED). Compare OLEDs with traditional LED technologies in terms of energy efficiency.</li> </ol>		

	5. Synthesize Urea-formaldehyde resin and find its yield.
CO3	<ol style="list-style-type: none"> <li>1. A dye solution of concentration 0.08M shows absorbance of 0.012 at 600 nm; while a test solution of same dye shows absorbance of 0.084 under same conditions. Calculate the concentration of the test solution.</li> <li>2. Explain the working principle of Dielectric Thermal Analysis (DETA) in analyzing polymers. Describe how DETA measures changes in dielectric properties with temperature and frequency. Provide a schematic diagram illustrating the key components and their functions in a DETA setup.</li> <li>3. Determine the wavelength of absorption maximum and colorimetric estimation of <math>Fe^{3+}</math> in solution.</li> </ol>
CO4	<ol style="list-style-type: none"> <li>1. Determine the temporary, permanent and total hardness of water solution using EDTA method.</li> <li>2. Explain the ion exchange resins and the process for removal of hardness of water? How exhausted resins are regenerated?</li> <li>3. Sketch the flow diagram of the different steps in sewage treatment. Explain the Each step.</li> <li>4. Calculate the temporary and permanent hardness of a water sample which contains  <math>[Ca^{2+}] = 160 \text{ mg/L}</math>, <math>[Mg^{2+}] = 192 \text{ mg/L}</math> and <math>[HCO_3^-] = 122 \text{ mg/L}</math>.</li> <li>5. Estimate the amount of dissolved oxygen present in the given water sample.</li> </ol>



Prepared by  
 Dr Sukhila Krishnan  
 Asst.Prof. ASH

24EST023	FUNDAMENTALS OF ELECTRICAL & ELECTRONICS ENGINEERING					L	T	P	R	C	Year of Introduction		
						4	0	0	0	4	2024		
<b>Preamble:</b>													
This course enables the students to understand the basic concepts of Electrical and Electronics Engineering. This course covers the topics related to analysis of various electrical circuits, elementary concepts of magnetic circuits, concepts behind the generation of alternating current, fundamental electronic devices and an overview of the evolution of modern electronics and its applications.													
<b>Prerequisite:</b> Physics and Mathematics (Higher secondary level)													
<b>Course Outcomes:</b> After the completion of the course the student will be able to													
CO 1	Apply the concepts and laws to solve DC and AC electric circuits theoretically and using simulation tools <b>[Apply]</b>												
CO 2	Apply the fundamental concepts and theorems to solve magnetic circuits <b>[Apply]</b>												
CO 3	Analyze the principles of diodes, transistors, and FETs to make basic electronic circuits <b>[Analyze]</b>												
CO 4	Understand communication systems, mobile technologies, and modern electronic applications <b>[Understand]</b>												
<b>CO - PO MAPPING</b>													
CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PO9	PO1 0	PO1 1	PO1 2	
CO 1	3	3			3							2	
CO 2	3	3										2	
CO 3	3	3										2	
CO 4	2											2	
<b>Assessment Pattern</b>													
<b>Bloom's Category</b>		<b>Continuous Assessment Tools</b>							<b>End Semester Examination</b>				
		<b>Test1</b>		<b>Test 2</b>		<b>Other tools</b>							
Remember		✓		✓					✓				
Understand		✓		✓					✓				
Apply		✓		✓		✓			✓				
Analyse		✓		✓		✓			✓				
Evaluate						✓							
Create													
<b>Mark Distribution of CIA</b>													
<b>Course Structure [L-T-P-R]</b>		<b>Attendance</b>		<b>Theory [L- T]</b>					<b>Total Marks</b>				
				<b>Assignment</b>		<b>Test-1</b>		<b>Test-2</b>					
4-0-0-0		5		10		12.5		12.5	40				
<b>Total Mark distribution</b>													
<b>Total Marks</b>		<b>CIA (Marks)</b>			<b>ESE (Marks)</b>			<b>ESE Duration</b>					
100		40			60			2.5 hours					
<b>End Semester Examination [ESE]: Pattern</b>													
<b>PATTERN</b>	<b>PART A</b>				<b>PART B</b>				<b>ESE Marks</b>				

PATTERN 1	2 questions from each module.8 Questions. Answer any 6 questions Each question carries 3 marks Marks: (3x8 =24 marks)	2 questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 2 sub divisions. Each question carries 9 marks. Marks: (9x4 = 36 marks)	60
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**SYLLABUS**

**MODULE I: Analysis of DC circuits and Fundamentals of Magnetism (12 hours)**

**Elementary concepts of DC electric circuits:** Ideal and non-ideal voltage and current sources; Ohm's law and Kirchhoff's laws; Resistances in series and parallel; Current and voltage division rules; Capacitors & Inductors: V-I relations and energy stored. Star-delta conversion (resistive networks only-derivation not required)-numerical problems

**Analysis of DC Electric circuits:** Mesh current method - matrix representation - Solution of network equations. Node voltage methods-matrix representation-solution of network equations - numerical problems and verification through simulation software.

**Elementary Concepts of Magnetic circuits:** Magnetic Circuits: Basic Terminology: MMF, field strength, flux density, reluctance - Comparison between electric and magnetic circuits.

**Electromagnetic Induction:** Faraday's laws, Lenz's law- statically induced and dynamically induced emf - Self-inductance and mutual inductance, coefficient of coupling - numerical problems.

**MODULE II: Analysis of AC circuits (9 hours)**

**Alternating Current fundamentals:** Generation of alternating voltages - Representation of sinusoidal, square and sawtooth waveforms: frequency, period, average value, RMS value, peak factor and form factor - numerical problems

**Analysis of simple AC circuits:** Purely resistive, inductive & capacitive circuits; Inductive and capacitive reactance, concept of impedance; RL, RC and RLC series circuits- power factor, active, reactive and apparent power - numerical problems and verification through simulation software.

**Three phase AC systems:** Generation of three phase voltages, advantages of three phase systems, star and delta connections (balanced only), relation between line and phase voltages, line and phase currents, 3-phase power (numerical problems excluded)

**MODULE III: Introduction to Electronic devices (11 hours)**

**Passive and active components in electronics**

Working of PN junction diode, V-I characteristics of PN Junction diode, Zener diode and avalanche breakdown. Basics of Zener voltage regulator, Block diagram of DC power supply, circuit and working of half wave and bridge rectifiers (with and without capacitor filters), Construction and working of BJT, Transistor as a switch, Transistor as an amplifier (Circuit Diagram and working) Introduction to FET, Construction and working of N-channel and P-Channel MOSFETs Simscape Onramp, Input output characteristics of CE configuration, Comparison of CE, CB and CC configurations, Simscape Onramp, Circuit Simulation Onramp



<b>MODULE IV: Modern Electronics and its applications (10 hours)</b>
<p><b>Communication Systems:</b> General block diagram of a Communication system, Block diagram of Fiber optic Communication system, Concept of AM and FM (No derivation required), Block diagram of FM superheterodyne receiver, Basic concepts of Wired and Wireless communication</p> <p><b>Mobile Communication:</b> Block diagram of GSM, Comparison of 3G, 4G and 5G communication technologies</p> <p><b>Block diagrams of Electronic instrumentation system:</b> Digital Multimeter, Function generator, CRO</p> <p><b>Applications of modern electronics</b> – IoT based smart homes, healthcare and agriculture (Case study only)</p>
<p><b>Text books</b></p> <ol style="list-style-type: none"> <li>1. D P Kothari and I J Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.</li> <li>2. D C Kulshreshtha, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.</li> <li>3. ChinmoySaha, Arindham Halder and Debarati Ganguly, Basic Electronics - Principles and Applications, Cambridge University Press, 2018.</li> <li>4. M.S.Sukhija and T.K.Nagsarkar, Basic Electrical and Electronics Engineering, Oxford University Press, 2012.</li> <li>5. Wayne Tomasi and Neil Storey, A Textbook On Basic Communication and Information Engineering, Pearson, 2010.</li> </ol>
<p><b>Reference books</b></p> <ol style="list-style-type: none"> <li>1. Del Toro V, “Electrical Engineering Fundamentals”, Pearson Education.</li> <li>2. T. K. Nagsarkar, M. S. Sukhija, “Basic Electrical Engineering”, Oxford Higher Education.</li> <li>3. Hayt W H, Kemmerly J E, and Durbin S M, “Engineering Circuit Analysis”, Tata McGraw-Hill</li> <li>4. Hughes, “Electrical and Electronic Technology”, Pearson Education.</li> <li>5. V. N. Mittle and Arvind Mittal, “Basic Electrical Engineering,” Second Edition, McGraw Hill.</li> <li>6. Parker and Smith, “Problems in Electrical Engineering”, CBS Publishers and Distributors.</li> <li>7. S. B. Lal Seksena and Kaustuv Dasgupta, “Fundamentals of Electrical Engineering”, Cambridge University Press.</li> <li>8. Anant Agarwal, Jeffrey Lang, Foundations of Analog and Digital Electronic Circuits, Morgan Kaufmann Publishers, 2005.</li> <li>9. Bernard Grob, Basic Electronics, McGraw Hill.</li> <li>10. A. Bruce Carlson, Paul B. Crilly, Communication Systems: An Introduction to Signals and Noise in Electrical Communication, Tata McGraw Hill, 5th Edition.</li> </ol>
<p><b>NPTEL/SWAYAM Courses for reference:</b></p> <ol style="list-style-type: none"> <li>1. Prof. Ashok Kumar Pradhan, A Basic Course on Electric and Magnetic Circuits, IIT Kharagpur, [NPTEL], <a href="https://nptel.ac.in/courses/108105479">https://nptel.ac.in/courses/108105479</a> (Relevant sections)</li> <li>2. Dr. Nagendra Krishnapura, Basic Electrical Circuits, IIT Madras, [NPTEL], <a href="https://nptel.ac.in/courses/108106172">https://nptel.ac.in/courses/108106172</a> (Relevant sections)</li> <li>3. Mr. Abhijeet Lal &amp; Dr. Onika Parmar, Fundamental of Electronic Engineering Chhattisgarh Swami Vivekanand Technical University (CSVTU) <a href="https://onlinecourses.swayam2.ac.in/nou24_ec08/preview">https://onlinecourses.swayam2.ac.in/nou24_ec08/preview</a></li> <li>4. Prof. Sudeb Dasgupta, microelectronics: Devices to Circuits, IIT Roorkee, <a href="https://onlinecourses.nptel.ac.in/noc24_ee139/preview">https://onlinecourses.nptel.ac.in/noc24_ee139/preview</a></li> </ol>



No.	COURSE CONTENTS AND LECTURE SCHEDULE	No. of Hours [45 hours]
<b>MODULE 1 [13 hours]</b>		
1.1	Ideal and non-ideal voltage and current sources; Ohm's law and Kirchhoff's laws	1
1.2	Resistances in series and parallel; Current and voltage division rules	1
1.3	Capacitors & Inductors: V-I relations and energy stored	1
1.4	Star-delta conversion (resistive networks only-derivation not required)-numerical problems	2
1.5	Mesh current method - matrix representation - Solution of network equations - numerical problems and verification through simulation software.	2
1.6	Node voltage methods-matrix representation-solution of network equations - numerical problems and verification through simulation software.	2
1.7	Magnetic Circuits - Basic Terminology: MMF, field strength, flux density, reluctance - Comparison between electric and magnetic circuits	2
1.8	Faraday's laws, Lenz's law- statically induced and dynamically induced emf - Self-inductance and mutual inductance, coefficient of coupling - numerical problems.	2
<b>MODULE II [9 hours]</b>		
2.1	Generation of alternating voltages - Representation of sinusoidal waveforms: frequency, period, average value, RMS value and form factor - numerical problems	2
2.2	Analysis of simple AC circuits: Purely resistive, inductive & capacitive circuits; Inductive and capacitive reactance, concept of impedance	2
2.3	RL, RC and RLC series circuits- power factor, active, reactive and apparent power - numerical problems and verification through simulation software.	3
2.4	Generation of three phase voltages, advantages of three phase systems, star and delta connections (balanced only), relation between line and phase voltages, line and phase currents	2
<b>MODULE III [ 13 hours]</b>		
3.1	Working of PN junction diode, V-I characteristics of PN Junction diode	1
3.2	Basics of Zener diode, Zener and avalanche breakdown. Basics of Zener voltage regulator	2
3.3	Block diagram of DC power supply	1
3.4	Circuit and working of half wave and bridge rectifiers (with and without capacitor filters)	2
3.5	Construction and working of BJT, Input output characteristics of CE configuration	2
3.6	Comparison of CE, CB and CC configurations	1

3.7	Transistor as a switch, Transistor as an amplifier (Circuit Diagram and working)	1
3.8	Introduction to FET, Construction and working of N-channel and P-Channel MOSFETs	2
3.9	Simscape Onramp, Circuit Simulation Onramp	1
<b>MODULE IV [ 10 hours]</b>		
4.1	General block diagram of a Communication system, Block diagram of Fiber optic Communication system	1
4.2	Concept of AM and FM (No derivation required), Block diagram FM super heterodyne receiver	2
4.3	Basic concepts of Wired and Wireless communication	1
4.4	Block diagram of GSM, Comparison of 3G, 4G, 5G and 6G communication technologies	2
4.5	Block diagrams of Electronic instrumentation system: Digital Multi-meter	1
4.6	Function generator, CRO	1
4.7	IoT based smart homes	1
4.8	IoT based healthcare and agriculture	1

**CO Assessment Questions**

CO1

- Solve for the mesh currents in the given circuit.?
- Find the node voltages  $v_1$  and  $v_2$  in the circuit given in Fig theoretically. Also find the power dissipated in the  $4\Omega$  resistor. Verify the same using any simulation tool.
- Determine the equivalent resistance between terminal X-Y in the network
- When applied across an L-R series circuit, A sinusoidal voltage of  $V = 325 \sin 314t$  causes a current of  $I = 14.14 \sin (314t - 60^\circ)$  flowing through the

	<p>circuit. Calculate (i) the Impedance of the circuit, (ii) the value of L and R, (iii) the power consumed</p> <p>5. A resistor of <math>10\ \Omega</math>, an inductor of <math>0.3\ \text{H}</math> and a capacitor of <math>100\ \mu\text{F}</math> are connected in series across a <math>230\ \text{V}</math>, <math>50\ \text{Hz}</math>, single-phase AC supply. Determine (a) impedance, (b) current, (c) power in watts, (d) circuit power factor, (e) voltage across the inductor, and (f) apparent power. Verify the same through any simulation software.</p> <p>6. Explain Kirchhoff's laws with suitable examples.</p> <p>7. Derive the expression for energy stored in an inductor and a capacitor</p> <p>8. An alternating current is represented by <math>i(t)=14.14\ \sin(377t)</math>. Find (i)rms value, (ii) frequency, (iii)time period, and (iv)instantaneous value of the current at <math>t=3\text{ms}</math>.</p>
<p>CO2</p>	<p>1. Distinguish between statically induced EMF and dynamically induced EMF.</p> <p>2. State and explain Faraday's laws of electromagnetic induction.</p> <p>3. A coil of 200 turns carries a current of 4A. The magnetic flux linkage with the coil is <math>0.02\text{Wb}</math>. Calculate the self-induced emf in the coil.</p> <p>4. Explain the generation process of 3-phase alternating current</p> <p>5. Two coils, A and B, of 500 and 750 turns, respectively, are connected in series on the same magnetic circuit of reluctance <math>1.55\times 10^6\ \text{AT/Wb}</math>. Assuming no flux leakage exists, calculate (i) the self-inductance of each coil and (ii) the mutual inductance between coils.</p> <p>6. Find the average and rms values of the given triangular signal.</p> <div data-bbox="686 1153 1053 1444" data-label="Figure"> </div> <p>7. A conductor of length <math>0.5\text{m}</math> kept at right angles to a uniform magnetic field of flux density <math>2\text{Wb/m}^2</math> moves with a velocity of <math>75\ \text{m/s}</math> at an angle of <math>60^\circ</math> to the field. Calculate the emf induced in the conductor.</p>
<p>CO3</p>	<p>1. Analyze the frequency response of an RC-coupled amplifier. Identify the factors determining the lower and upper cutoff frequencies and explain their significance in the amplifier's bandwidth.</p> <p>2. Analyze the output characteristics of a BJT and find out the significance of the BJT's operating regions and their impact on the transistor's functionality in different circuit applications.</p> <p>3. Illustrate with the neat diagram the working of a zener voltage regulator.</p> <p>4. Analyze potential barrier formation and current in a forward biased pn junction diode.</p>
<p>CO4</p>	<p>1. Compare and contrast between AM and FM.</p>

- |   |
|---|
| <ol style="list-style-type: none"><li>2. Draw and explain the block diagram of FM superheterodyne receiver.</li><li>3. Explain with a neat diagram the working of the function generator.</li><li>4. Compare the different types of communication technologies.</li></ol> |
|---|

Prepared by,  
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24ESC204	PROGRAMING IN C					L	T	P	R	C	Year of Introduction	
						2	1	2	0	4	2024	
<p><b>Preamble:</b> The syllabus is prepared with the view of preparing the Engineering Graduates capable of writing readable C programs to solve computational problems that they may have to solve in their professional life. The course content is decided to cover the essential programming fundamentals which can be taught within the given slots in the curriculum.</p>												
<p><b>Prerequisite:</b> NIL</p>												
<p><b>Course Outcomes:</b> After the completion of the course the student will be able to</p>												
CO 1	Analyze a computational problem and develop an algorithm/flowchart to find its solution. <b>[Analyze]</b>											
CO 2	Develop readable C programs with branching and looping statements, which uses Arithmetic, Logical, Relational or Bitwise operators. <b>[Understand]</b>											
CO 3	Write readable C programs with arrays, string, structure or union for storing the data to be processed and develop a readable multi-function C program by using recursion if required, to find the solution to the computational problem <b>[Apply]</b>											
CO 4	Write readable C programs which use pointers for array processing and parameter passing and operation in files. <b>[Apply]</b>											
<b>CO - PO MAPPING</b>												
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3	3	2								2
CO 2	3	3	3	3								2
CO 3	3	3	3	3							2	2
CO 4	3	3	3	3							3	3
<b>Assessment Pattern for Theory Component</b>												
<b>Bloom's Category</b>		<b>Continuous Assessment Tools</b>			<b>End Semester Examination</b>							
		<b>Test 1</b>	<b>Test 2</b>	<b>Other tools</b>								
Remember		√	√		√							
Understand		√	√		√							
Apply		√	√		√							
Analyze		√	√		√							
Evaluate												
Create												
<b>Assessment Pattern for Lab Component</b>												
<b>Bloom's Category</b>		<b>Continuous Assessment Tools</b>										
		<b>Evaluation 1</b>	<b>Evaluation 2</b>	<b>Report</b>								
Remember		√	√	√								
Understand		√	√	√								
Apply		√	√	√								
Analyze												
Evaluate												
Create												

Mark Distribution of CIA							
Course Structure [L-T-P-R]	Attendance	Theory [L- T]			Practical [P]		Total Marks
		Assignment	Test-1	Test-2	Continuous Assessment	Lab Exam	
2-1-2-0	5	5	7.5	7.5	15	10	50
Total Marks distribution							
Total Marks		CIA (Marks)		ESE (Marks)		ESE Duration	
100		50		50		2 hours	
End Semester Examination [ESE]							
PATTERN	PART A			PART B		ESE Marks	
PATTERN 2	2 Questions from each module. Any full 6 Questions, each carrying 3 marks (6x3 =18 marks)			2 questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 3 subdivisions. Each question carries 8 marks. (4x8 = 32 marks)		50	
SYLLABUS							
MODULE I: Basics of Computer Hardware and Software							
<b>Processor, Memory, Input&amp; Output devices</b> <b>Application Software &amp; System software:</b> Compilers, interpreters, High level and low-level languages Introduction to structured approach to programming, Flow chart Algorithms, Pseudo code ( <i>bubble sort, linear search - algorithms and pseudocode</i> )							
MODULE II: Program Basics							
<b>Basic structure of C program:</b> Character set, Tokens, Identifiers in C, Variables and Data Types, Constants, Console IO Operations, printf and scanf <b>Operators and Expressions:</b> Expressions and Arithmetic Operators, Relational and Logical Operators, Conditional operator, size of operator, Assignment operators and Bitwise Operators. Operators Precedence <b>Control Flow Statements:</b> If Statement, Switch Statement, Unconditional Branching using goto statement, While Loop, Do While Loop, For Loop, Break and Continue statements. (Simple programs covering control flow)							
MODULE III: Arrays, Strings and Functions							
<b>Arrays:</b> Arrays Declaration and Initialization ,1-Dimensional Array, 2-Dimensional Array <b>String processing:</b> In built String handling functions (strlen, strcpy, strcat and strcmp, puts, gets) <b>Introduction to modular programming:</b> writing functions, formal parameters, actual parameters Pass by Value, Recursion, Arrays as Function Parameters structure, union, Storage Classes, Scope and lifetime of variables, <i>simple programs using</i>							

functions		
<b>MODULE IV: Pointers and Files</b>		
<b>Pointers:</b> Declaring pointers, accessing data through pointers, NULL pointer, array access using pointers, pass by reference effect		
<b>File Operations:</b> open, close, read, write, append, Sequential access and random access to files: In built file handling functions ( <i>rewind()</i> , <i>fseek()</i> , <i>ftell()</i> , <i>feof()</i> , <i>fread()</i> , <i>fwrite()</i> ), simple programs covering pointers and files.		
<b>Textbooks</b>		
1. Schaum Series, Gottfried B.S., Tata McGraw Hill, Programming with C, 1996		
2. E. Balagurusamy, McGraw Hill, Programming in ANSI C, 8/e, 2019		
3. Asok N Kamthane, Pearson, Programming in C, 3/e, 2015		
4. Anita Goel, Pearson, Computer Fundamentals, 2010.		
<b>Reference books</b>		
1. Anita Goel and Ajay Mittal, Pearson, Computer fundamentals and Programming in C		
2. Brian W. Kernighan and Dennis M. Ritchie, Pearson, C Programming Language		
3. Rajaraman V, PHI, Computer Basics and Programming in C		
4. Yashavant P, Kanetkar, BPB Publications, Let us C		
<b>NPTEL/SWAYAM Courses for reference:</b>		
1. Introduction to Programming in C - <a href="https://archive.nptel.ac.in/courses/106104128/">https://archive.nptel.ac.in/courses/106104128/</a>		
2. Problem solving through programming in C - <a href="https://archive.nptel.ac.in/courses/106105171/">https://archive.nptel.ac.in/courses/106105171/</a>		
3. C Programming and Assembly Language - <a href="https://archive.nptel.ac.in/courses/106106210/">https://archive.nptel.ac.in/courses/106106210/</a>		
<b>No.</b>	<b>COURSE CONTENTS AND LECTURE SCHEDULE</b>	<b>No. of Hours (36)</b>
<b>Module 1: Basics of Computer Hardware and Software (7 Hours)</b>		
1.1	Basics of Computer Architecture: Processor, Memory, Input & Output devices	2
1.2	Application Software & System software: Compilers, interpreters, High level and low-level languages	2
1.3	Introduction to structured approach to programming, Flow chart	1
1.4	Algorithms, Pseudo code (bubble sort, linear search - algorithms and pseudo code)	2
<b>MODULE II: Program Basics (8 Hrs)</b>		
2.1	<b>Basic structure of C program:</b> Character set, Tokens, Identifiers in C, Variables and Data Types, Constants, Console IO Operations, printf and scanf	2
2.2	<b>Operators and Expressions:</b> Expressions and Arithmetic Operators, Relational and Logical Operators, Conditional operator, sizeof operator, Assignment operators and Bitwise Operators. Operators Precedence	2
2.3	<b>Control Flow Statements:</b> If Statement, Switch Statement, Unconditional Branching using goto statement, While Loop, Do	4



	While Loop, For Loop, Break and Continue statements. <i>(Simple programs covering control flow)</i>		
<b>MODULE III: Arrays, Strings and Functions (11 Hours)</b>			
3.1	Arrays Declaration and Initialization, 1-Dimensional Array, 2-Dimensional Array		2
3.2	<b>String processing:</b> In built String handling functions ( <i>strlen, strcpy, strcat and strcmp, puts, gets</i> ), <i>Simple programs covering arrays and strings</i>		3
3.3	Introduction to modular programming, writing functions, formal parameters, actual parameters		2
3.4	Pass by Value, Recursion, Arrays as Function Parameters		3
3.5	Structure, union, Storage Classes, Scope and lifetime of variables, simple programs using functions		3
<b>MODULE IV: Pointers and Files (6 Hrs)</b>			
4.1	<b>Basics of Pointer:</b> declaring pointers, accessing data through pointers, NULL pointer, array access using pointers, pass by reference effect		3
4.2	<b>File Operations:</b> open, close, read, write, append		4
4.3	<b>Sequential access and random access to files:</b> In built file handling functions ( <i>rewind(), fseek(), ftell(), feof(), fread(), fwrite()</i> ), <i>simple programs covering pointers and files.</i>		2
<b>LESSON PLAN FOR LAB COMPONENT</b>			
No.	Topic	No. of Hours (24)	Experiment (8 Programs Mandatory)
1.	Familiarization of Hardware Components. Familiarization of Linux environment	2	1. Familiarization of Hardware Components of a Computer 2. Familiarization of Linux environment – How to do Programming in C with Linux
2.	Familiarization of console I/O and operators in C	2	Familiarization of console I/O and operators in C i) Display “Hello World” ii) Read two numbers, add them and display their sum iii) Read the radius of a circle, calculate its area and display it
3.	Basic structure of C program. Operators and Expressions	2	1. Read 3 integer values and find the largest among them. 2. Read a Natural Number and check whether the number is prime or not
4.	Arrays & Strings	4	Read n integers, store them in an array and find their sum and average Read two strings (each one ending with a \$ symbol), store them in arrays and concatenate them without using library functions.
5.	Structure, Union	3	1. Read two input each representing the distances between two points in the Euclidean space, store



			these in structure variables and add the two distance values. 2. Using structure, read and print data of n employees (Name, Employee Id and Salary)
6.	Simple programs using functions	3	Find the factorial of a given Natural Number n using recursive and non-recursive functions
7.	Simple programs using Pointer	4	Do the following using pointers i) add two numbers ii) swap two numbers using a user defined function
8.	File Operations	4	Create a file and perform the following i) Write data to the file ii) Read the data in each file & display the file content on console iii) append new data and display on console

**CO Assessment Questions**

1	<ol style="list-style-type: none"> <li>Write short note on processor and memory in a computer.</li> <li>What are the differences between compiled and interpreted languages? Give example for each.</li> <li>With the help of a flow chart, explain the bubble sort operation. Illustrate with an example Display "Hello World" Program</li> </ol>
2	<ol style="list-style-type: none"> <li>Write a C program to read a Natural Number through keyboard and to display the reverse of the given number. For example, if "3214567" is given as input, the output to be shown is "7654123".</li> <li>Is it advisable to use <i>goto</i> statements in a C program? Justify your answer.</li> <li>With suitable examples, explain various operators in C.</li> <li>Read the radius of a circle, calculate its area and display it</li> </ol>
3	<ol style="list-style-type: none"> <li>Write a function in C which takes a 2-Dimensional array storing a matrix of numbers and the order of the matrix (number of rows and columns) as arguments and displays the sum of the elements stored in each row.</li> <li>Write a C program to check whether a given matrix is a diagonal matrix.</li> <li>Without using any builtin string processing function like <i>strlen</i>, <i>strcat</i> etc., write a program to concatenate two strings</li> <li>Find the factorial of a given Natural Number n using recursive and non-recursive functions</li> </ol>
4	<ol style="list-style-type: none"> <li>With an example, explain the different modes of opening a file.</li> <li>Differentiate between sequential files and random-access files?</li> <li>Using the prototypes explain the functionality provided by the following functions. i) <i>(rewind(), ii) fseek() iii) ftell(), iv) fread(), v) fwrite()</i></li> </ol>

	<ol style="list-style-type: none"><li>4. With a suitable example, explain the concept of pass by reference.</li><li>5. Create a file and perform the following i) Write data to the file ii) Read the data from the file &amp; display the file content on console iii) append new data and display the file content on console</li></ol>
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Prepared By

Ms Minnuja S, Assistant Professor, CSE Department

Ms Anly A, Assistant Professor, CSE Department



24CSR205	Digital System Design	L	T	P	R	C	Year of Introduction
		3	0	0	1	4	2024

**Preamble:**

The objective of the course is to familiarize learners with the basic concepts of Boolean algebra and digital systems. This course covers the design of simple combinational and sequential logic circuits, representation and arithmetic algorithms for Binary, BCD (Binary Coded Decimal) and Floating point numbers which in turn are helpful in understanding organization & design of a computer system and understanding how patterns of ones and zeros can be used to store information on computers, including multimedia data.

**Prerequisite:** Nil

**Course Outcomes:** After the completion of the course the student will be able to

<b>CO 1</b>	Illustrate decimal, binary, octal, hexadecimal and BCD number systems, perform conversions among them and do the operations - complementation, addition, subtraction, multiplication and division on binary numbers[ <b>Understand</b> ]
<b>CO 2</b>	Simplify a given Boolean Function and design a combinational circuit to implement the simplified function using Digital Logic Gates[ <b>Apply</b> ]
<b>CO 3</b>	Design combinational circuits - Adders, Code Convertors, Decoders, Magnitude Comparators, Parity Generator/Checker and design the Programmable Logic Devices - ROM and PLA.[ <b>Apply</b> ]
<b>CO 4</b>	Design sequential circuits - Registers, Counters and Shift Registers[ <b>Apply</b> ]

**CO - PO MAPPING**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3										3
CO 2	3	3	3			3						2
CO 3	3	3	2			2						3
CO 4	3	3	3			3						3

**Assessment Pattern for Theory Component**

Bloom's Category	Continuous Assessment Tools			End Semester Examination
	Test1	Test 2	Other tools	
Remember	√	√	√	√
Understand	√	√	√	√
Apply	√	√	√	√
Analyze				
Evaluate				
Create				

**Assessment Pattern for Project Component**

Bloom's Category	Continuous Assessment Tools		
	Evaluation 1	Evaluation 2	Report
Remember	√	√	
Understand	√	√	

Apply		√		√				
Analyze		√		√				
Evaluate		√		√				
Create								
Mark Distribution of CIA								
Course Structure [L-T-P-R]	Attendance	Theory [L]			Project [R]		Total Marks	
		Assignment	Test-1	Test-2	Evaluation 1	Evaluation 2		Report
3-0-0-1	5	5	7.5	7.5	10	10	5	<b>50</b>

Total Marks distribution			
Total Marks	CIA (Marks)	ESE (Marks)	ESE Duration
100	50	50	2 hrs.

End Semester Examination [ESE]: Pattern			
PATTERN	PART A	PART B	ESE Marks
PATTERN 2	2 Questions from each module, 8 questions, each Question carries 3 marks. Answer any 6  Marks: (6x3 =18 marks)	2 questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 2 subdivisions. Each question carries 8 marks. Marks: (4x 8 = 32 marks)	50

SYLLABUS	
MODULE I: Number systems, Operations & Codes ( 7 Hours)	
Decimal, Binary, Octal and Hexadecimal Number Systems- Number Base Conversions. Addition, Subtraction, Multiplication and Division of binary numbers. Representation of negative numbers- Complements, Subtraction with complements. Addition and subtraction of BCD, Octal and Hexadecimal numbers. Binary codes- Decimal codes, Error detection codes, Reflected code, Character coding schemes – ASCII, EBCDIC.	
MODULE II : Boolean Algebra ( 9 Hours)	
Postulates of Boolean Algebra. Basic theorems and Properties of Boolean Algebra. Boolean Functions - Canonical and Standard forms. Simplification of Boolean Functions- Using Karnaugh- Map Method (upto five variables), Don't care conditions, Product of sums Total Marks CIE Marks ESE Marks ESE Duration 150 50 100 3 simplification, Tabulation Method. Digital Logic Gates- Implementation of Boolean functions using basic and universal gates.	
MODULE III : Combinational Logic Circuits( 9 Hours)	

Design Procedure & Implementation of combinational logic circuits- Binary adders and subtractors, Binary Parallel adder, Carry look ahead adder, BCD adder, Code converter, Magnitude comparator, Decoder, Demultiplexer, Encoder, Multiplexer, Parity generator/ Checker.		
<b>MODULE IV : Sequential logic circuits ( 9 Hours)</b>		
Flip-flops- SR, JK, T and D. Triggering of flip-flops- Master slave flip- flops, Edge-triggered flip- flops. Excitation table and characteristic equation. Registers- register with parallel load. Counter design: Asynchronous counters- Binary and BCD counters, timing sequences and state diagrams. Synchronous counters- Binary Up- down counter, BCD counter		
Shift registers – Serial In Serial Out, Serial In Parallel Out, Bidirectional Shift Register with Parallel load. Ring counter. Johnson counter- timing sequences and state diagrams.		
<b>Arithmetic algorithms</b>		
Algorithms for addition and subtraction of binary numbers in signed magnitude and 2's complement representations. Algorithm for addition and subtraction of BCD numbers. Representation of floating point numbers, Algorithm for addition and subtraction of floating point numbers		
<b>Programmable Logic devices</b>		
ROM. Programmable Logic Array(PLA)- Implementation of simple circuits using PLA		
<b>Textbooks:</b>		
1.M. Morris Mano, Digital Logic & Computer Design, 4/e, Pearson Education, 2013 2. 2.Thomas L Floyd, Digital Fundamentals, 10/e, Pearson Education, 2009. 3. M. Morris Mano, Computer System Architecture, 3/e, Pearson Education, 2007.		
<b>Reference books</b>		
1. M. Morris Mano, Michael D Ciletti , Digital Design With An Introduction to the Verilog HDL, 5/e, Pearson Education, 2013. 2. Donald D Givone, Digital Principles and Design, Tata McGraw Hill, 2003		
<b>NPTEL/SWAYAM Courses for reference:</b>		
<b>No.</b>	<b>COURSE CONTENTS AND LECTURE SCHEDULE</b>	<b>No. of Hours (34)</b>
<b>MODULE 1: Number systems, Operations &amp; Codes (7 Hours)</b>		
1.1	Number Systems: Decimal, Binary, Octal and Hexadecimal number systems, Number Base Conversions.	1
1.2	Binary Arithmetic: Addition, Subtraction, Multiplication & Division of Binary Numbers. (Lecture 1)	1
1.3	Addition, Subtraction, Multiplication & Division of Binary Numbers. (Lecture 2)	1
1.4	Representation of Negative Numbers- Complements, subtraction with complements.	1
1.5	BCD Arithmetic: Addition and Subtraction of BCD Numbers	1
1.6	Octal and Hexadecimal Arithmetic: Addition & Subtraction of Octal	1

	and Hexadecimal Numbers.	
1.7	Binary Codes: Decimal Codes, Error detection codes, Reflected code, Character Coding Schemes-ASCII, EBCDIC	1
<b>MODULE II: Boolean Algebra (9 Hours)</b>		
2.1	Introduction to Boolean Algebra: Postulates of Boolean Algebra	1
2.2	Basic theorems and Properties of Boolean Algebra	1
2.3	Boolean Functions: Canonical and Standard Forms	1
2.4	Simplification of Boolean Functions: Karnaugh -Map Method (upto five variables), Don't care conditions (Lecture 1)	1
2.5	Simplification of Boolean Functions: Karnaugh -Map Method (upto five variables), Don't care conditions (Lecture 2)	1
2.6	Product of sums simplification	1
2.7	Tabulation method	1
2.8	Digital Logic Gates: AND, OR, NOT, NAND, NOR, XOR, XNOR, Implementation of Boolean functions using basic and universal gates. (Lecture 1)	1
2.9	Digital Logic Gates: AND, OR, NOT, NAND, NOR, XOR, XNOR, Implementation of Boolean functions using basic and universal gates. (Lecture 2)	1
<b>MODULE III : Combinational Logic Circuits (9 Hours)</b>		
3.1	Design Procedure & Implementation of Combinational Circuits	1
3.2	Binary Adders: Implementation of Half Adder, Full Adder	1
3.3	Binary Subtractors: Implementation of Half Subtractor, Full Subtractor	1
3.4	Implementation of Binary Parallel Adder ,Carry look ahead Adder, BCD Adder (Lecture 1)	1
3.5	Implementation of Binary Parallel Adder ,Carry look ahead Adder, BCD Adder (Lecture 2)	1
3.6	Implementation of Various Combinational Circuits: Code Converters, Magnitude Comparator	1
3.7	Implementation of Decoder, Demultiplexer	1
3.8	Implementation of Encoder, Multiplexer	1
3.9	Implementation of Parity Generator/Checker	1
<b>MODULE IV: Sequential logic circuits: (9 Hours)</b>		
4.1	Flip flops: SR, JK, T and D flip- flops (Lecture 1)	2
4.2	SR, JK, T and D flip- flops (Lecture 2)	1
4.3	Triggering of flip-flops- Master slave flip- flop, Edge- triggered flip-flops (Lecture 1)	1
4.4	Triggering of flip-flops- Master slave flip- flop, Edge- triggered flip-flops (Lecture 2)	2
4.5	Excitation table and characteristic equations of flip- flops	2
4.6	Registers- Register with parallel load	1
4.7	Counter Design: Asynchronous counters- Binary and BCD	

	counters- timing sequences and state diagrams. (Lecture 1)	
4.8	Asynchronous counters- Binary and BCD counters- timing sequences and state diagrams. (Lecture 2)	
4.9	Synchronous counters- Binary Up- down counter, BCD counter	
<b>LESSON PLAN FOR PROJECT COMPONENT</b>		
<b>Topic</b>		<b>No. of Hours (12)</b>
Students will be divided in to batches (3-4) and do projects on Design of different logic gates ,half adder, full adder, counters and shift registers in a span of 2 phases		
<b>Phase 1</b> : First review will be conducted to assess the design of each project.		5
<b>Phase 2</b> : Final review of the project with a demonstration of the complete design and execution.		7
<b>CO Assessment Questions</b>		
CO1	<ol style="list-style-type: none"> <li>1. Perform the following conversion                             <ol style="list-style-type: none"> <li>a) Decimal to Binary <math>(57.375)_{10}</math></li> <li>b) Binary to Hexadecimal <math>(1001111011110011100)_2</math></li> <li>c) Octal to decimal <math>(2374.325)_8</math></li> </ol> </li> <li>2. Subtract 24.75 from 16.5 using 2's complement</li> <li>3. Perform the following operations                             <ol style="list-style-type: none"> <li>a) Perform the bcd addition of the given number 596 and 386</li> <li>b) Perform the bcd subtraction of the given number using 9's complement <math>679.6-885.9</math></li> </ol> </li> <li>4. Perform the following operations                             <ol style="list-style-type: none"> <li>a) Perform the hexadecimal addition of the given number <math>(DF)_{16} + (AC)_{16}</math> <math>(98F.82)_{16} + (B11.94)_{16}</math></li> <li>b) Using 8's complement subtract <math>(144)_8</math> from <math>(372)_8</math></li> </ol> </li> </ol>	
CO2	<ol style="list-style-type: none"> <li>1. Simplify the following expressions using K-Map i) <math>F(X,Y,Z)=XYZ+XY'Z+XYZ'+X'Y'Z</math> ii) <math>F(A,B,C,D)=\sum(2,5,6,9,12,13)</math></li> </ol>	

	<p>2. Express the following function as sum of minterms i)  <math>F(XYZ)=X'+YZ+XZ'+XY'Z'+XYZ'</math>                  ii) <math>F(ABC)=B'+AC'+AB'C</math></p> <p>3. Simplify the Boolean expression <math>Y(A,B,C,D)=\prod M (0, 1, 3, 5, 6, 7, 10, 14, 15)</math> using K-map in Product of Sums form.</p> <p>4. Simplify the boolean function using tabulation method <math>F(W,X,Y,Z)=\sum(0,5,7,8,9,10,11,14,15)</math></p>
C03	<p>1. Implement a full adder circuit using 3*8 decoder</p> <p>2. Draw and explain the logic circuit of 4 bit full adder with look ahead carry.</p> <p>3. Implement the following boolean functions using PLA  <math>F1=\sum(0,1,3,4)</math>  <math>F2=\sum(1,2,3,4,5)</math></p> <p>4. Design a code converter for converting BCD TO Excess 3 code</p>
C04	<p>1. Implement JK flip flop Using D flip flop</p> <p>2. Design a Synchronous counter with the following repeated binary sequence 000,110,111,010,011 using T flip flop</p> <p>3. Draw the block diagram of 4 bit ripple counter.</p> <p>4. Explain how shift register is used as a converter from i) serial to parallel data ii) parallel to serial data</p>

EDUCATION IS DEDICATION



<b>24ESL006</b>	<b>BASIC ELECTRICAL AND ELECTRONICS ENGINEERING WORKSHOP</b>						<b>L</b>	<b>T</b>	<b>P</b>	<b>R</b>	<b>C</b>	<b>Year of Introduction</b>	
	0	0	2	0	1	2024							
<p><b>Preamble:</b> Electrical Workshop is intended to impart skills to plan and carry out simple electrical wiring. It is essential for the practicing engineers to identify the basic practices and safety measures in electrical wiring.</p>													
<p><b>Prerequisite:</b> NIL</p>													
<p><b>Course Outcomes:</b> After the completion of course the student will be able to</p>													
<b>CO1</b>	Identify the tools and equipment used for electrical wiring and understand electrical safety measures. <b>[Understand]</b>												
<b>CO2</b>	Design and develop lighting and power circuits and distribution board arrangement under various conditions for domestic buildings. <b>[Apply]</b>												
<b>CO3</b>	Identify various electronic components. <b>[Understand]</b>												
<b>CO4</b>	Design simple electronic circuits on breadboard and PCB. <b>[Apply]</b>												
<b>CO - PO MAPPING</b>													
<b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	
<b>CO1</b>	2					2			2			3	
<b>CO2</b>	3	3	3	2		2			2			3	
<b>CO3</b>	3					2						3	
<b>CO4</b>	3		3	1	3	2	1		2			3	
<b>Assessment Pattern</b>													
Bloom's Category						Continuous Assessment Tools							
						Classwork				Test1			
Remember						EDUCATION'S DEDICATION							
Understand						√				√			
Apply						√				√			
Analyse						√							
Evaluate						√							
Create						√							
<b>Mark Distribution of CIA</b>													
<b>Course Structure [L-T-P-R]</b>			<b>Attendance</b>			<b>Classwork</b>			<b>Lab Exam</b>		<b>Total Marks</b>		
0-0-2-0			5			25			20		50		
<b>Total Mark distribution</b>													
<b>Total Marks</b>			<b>CIA (Marks)</b>			<b>ESE (Marks)</b>			<b>ESE Duration</b>				
50			50			0			-				
<b>SYLLABUS- DETAILS OF EXPERIMENTS</b>													

<b>SECTION – 1 (Electrical Engineering Experiments)</b> <i>Minimum 5 experiments are mandatory</i>	
Familiarize with tools and equipment required for wiring; Understand the electrical safety precautions; Identify different types of cables, wires, switches, fuses, fuse carriers, MCB, ELCB and MCCB, familiarize the ratings; Demonstrate the Pipe and Plate Earthing Schemes using Charts/Site Visit	
Wiring of light circuits (light/ fan point and a 6A plug socket with individual control, Staircase wiring, fluorescent lamp) and power circuit (16 A Power plug socket with a control switch)	
Wiring of power distribution arrangement using single phase MCB distribution board with ELCB, main switch and Energy meter.	
Familiarization of Rheostat, Step-down Transformers, Measurement and representation of voltage and waveform to scale in graph sheet with the help of CRO; measurement of potential across resistance elements and introducing the concept of relative potential using a DC circuit; Identify battery specifications using different types of batteries	
<b>SECTION – 2 (Electronics Engineering Experiments)</b> <i>Minimum 5 experiments are mandatory</i>	
Familiarization/Identification of electronic components with specification, Drawing of electronic circuit diagrams using BIS/IEEE symbols, Familiarization/Application of testing instruments and commonly used tools, Testing of electronic components using multimeter .	
Printed circuit boards (PCB) - Types, Single sided, Double sided, PTH, Processing methods. Design and fabrication of a single sided PCB for a simple circuit. Inter-connection methods and soldering practice. Assembling of electronic circuit/system on general purpose PCB, test and show the functioning.	
<b>Text books</b>	
<ol style="list-style-type: none"> <li>1. V N Mittal and Rohit Gupta, “Basic Electrical Engineering”</li> <li>2. National Electric Code (NEC) by National Fire Protection Association</li> <li>3. E A Reeves, “Electric Wiring Practices”</li> <li>4. Basic Electronics: Principles and Applications, Chinmoy Saha, Arindham Halder and Debarati Ganguly</li> <li>5. Basic Electronics and Linear Circuits, N N Bhargava D C Kulshreshtha and S. C. Gupta</li> </ol>	
<b>Reference books</b>	
<ol style="list-style-type: none"> <li>1. “Wiring Practices Manual” by International Brotherhood of Electrical Workers</li> <li>2. “Electrical Wiring: A Practical Guide” by J F McPartland</li> </ol>	

**LIST OF EXPERIMENTS**

<b>Electrical - 12 Hrs</b> <i>(Minimum 6 experiments are mandatory)</i>	
No	Experiments

1	1. Identify different types of cables, wires, switches, fuses, fuse carriers, familiarize the ratings. Identify the various protection equipment used in electrical wiring (MCB, ELCB/RCCB and MCCB).
2	Wiring of a simple light circuit for two light/ fan points (PVC conduit wiring) with individual control.
3	Wiring of light/fan circuit using two way switches. (Staircase wiring)
4	Wiring of fluorescent lamp and a plug (6 A) socket with individual control.
5	Wiring of a simple power circuit for 16A power socket with a control switch.
6	Wiring of power distribution arrangement using single phase MCB distribution board with ELCB, main switch and Energy meter.
7	Familiarisation of step up and step down transformers, (use low voltage transformers) Measurement and representation of voltage and waveform to scale in graph sheet with the help of CRO
8	Familiarization of rheostats, measurement of potential across resistance elements and introducing the concept of relative potential using a DC circuit.
9	a) Identify battery specifications using different types of batteries.(Lead acid, Li Ion, NiCd etc.) b) Demonstrate the Pipe and Plate Earthing Schemes using Charts/Site Visit.
<b>Electronics -12 Hrs</b> <b>(Minimum 5 experiments are mandatory)</b>	
1	Familiarization/Identification of electronic components with specification (Functionality, type, size, colour coding, package, symbol and cost of -Active, Passive, Electrical, Electronic, Electro-mechanical, Wires, Cables, Connectors, Fuses, Switches, Relays, Crystals, Displays, Fasteners, Heat sink etc.)
2	Drawing of electronic circuit diagrams using BIS/IEEE symbols and Interpret data sheets of discrete components and IC's.
3	Familiarization/Application of testing instruments and commonly used tools. - Multimeter, Function generator, Power supply, CRO, DSO. - Soldering iron, Desoldering pump, Pliers, Cutters, Wire strippers, Screw drivers, Tweezers, Crimping tool, Hot air soldering and de- soldering station.
4	Testing of electronic components using multimeter - Resistor, Capacitor, Diode, Transistor and JFET.
5	Printed circuit boards (PCB) - Types, Single sided, Double sided, PTH, Processing methods. Design and fabrication of a single sided PCB for a simple circuit.

6	Inter-connection methods and soldering practice. Bread board, Wrapping, Crimping, Soldering - types - selection of materials and safety precautions. Soldering practice in connectors and general purpose PCB, Crimping.
7	Assembling of electronic circuit/system on general purpose PCB, test and show the functioning (Any two)- <ul style="list-style-type: none"> <li>• Fixed voltage power supply with transformer</li> <li>• Rectifier using diode</li> <li>• Capacitor filter</li> <li>• Zener/IC regulator</li> <li>• Square wave generation using IC 555 timer in IC base.</li> </ul>
8	Introduction to EDA tools.
<b>CO Assessment Questions</b>	
CO1	Identify the tools given with you and demonstrate its proper use
CO1	Demonstrate the electrical safety precautions as a team
CO2	Design and develop the wiring as per the given layout and obtain the output
CO3	A team work to fabricate the component as per the given design using available manufacturing methods and submit the report
CO3	Identify the electronic components in the given figure and assemble the component on a circuit board to enable the required function
CO4	Implement a simple circuit in a PCB and obtain the output.

Prepared by,  
 Ms. Drisya K Sasi, Assistant Professor, Department of EEE  
 Mr. Sebin Davis K, Assistant Professor, Department of EEE  
 Ms. Anju Babu, Assistant Professor, Department of ECE  
 Ms. Reshma P S, Assistant Professor, Department of ECE

24HUT007	COMMUNICATIVE ENGLISH	L	T	P	R	C	Year of Introduction
		0	0	2	0	1	2024

**Preamble:** This course aims to enhance the communicative English skills of engineering students. The course will cover the four main language skills: listening, reading, writing, and speaking. Students will engage in various activities, including practical sessions in the language lab, to improve their proficiency in English.

**Prerequisite:** NIL

**Course Outcomes:** After the completion of the course, the student will be able to

CO 1	Improve Listening Skills in English [Apply]
CO 2	Enhance Students' Reading Skills in English [Analyze]
CO 3	Develop Writing Skills in English [Create]
CO 4	Improve Speaking Skills in English [Evaluate]

**CO - PO MAPPING**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	1								2	3		
CO 2	1	2								3		
CO 3	1		2	3					2	3		
CO 4	1								3	3		

**Assessment Pattern for Lab Component**

Bloom's Category	Continuous Assessment Tools	
	Classwork	Test
Remember		
Understand		
Apply	√	√
Analyze	√	√
Evaluate	√	√
Create	√	√

**Mark Distribution of CIA**

Attendance	Lab [P]				Total Marks
	Reading Test	Writing Test	Listening Test	Speaking Test	
5	25	25	20	25	100

**Total Marks distribution**

Total Marks	CIA (Marks)	ESE (Marks)	ESE Duration
100	100	0	-

**SYLLABUS**

**MODULE I: Introduction and Listening Skills (4 hours)**

<p>Introduction To the Theory of Communication: Types of Communication, Modes of Communication</p> <p><b>Listening Skills:</b> Listening: Importance and Benefits of Listening Skill, Different Types of Listening, understanding different accents and dialects, Note-taking strategies, Strategies for Improving Listening</p>
<p><b>MODULE II: Reading Skills (4 hours)</b></p>
<p>Reading: A Passive Skill – Its Importance, Ten Important Reading Strategies and their Benefits, Skimming and scanning techniques, identifying main ideas and supporting details</p>
<p><b>MODULE III: Writing Skills (4 hours)</b></p>
<p>Different Styles of Writing, Fundamentals of English Usages, understanding different types of charts, graphs, and diagrams, describing trends and comparing data Structuring an essay, developing arguments and supporting them with examples, Making Notes and Resumes, Report Writing, Fundamentals of Intonation, Correspondence Writing, Means to Enhance Vocabulary, Content Writing</p>
<p><b>MODULE IV: Speaking Skills and Integrated Review (8 hours)</b></p>
<p><b>Speaking Skills:</b> The Importance of Speaking as an active skill; Grammar, Vocabulary, and Phonetics: Tools of Communicative English Developing fluency and coherence; Pronunciation and stress; Techniques for Effective Public Speaking; Group Discussion and Interview Skills; Presentation Skills; People Skills.</p> <p><b>Integrated Skills and Review:</b> Business English, Comprehension, Summary and Paraphrasing, Research Methodology and Documentation</p>
<p><b>Textbooks</b></p> <ol style="list-style-type: none"> <li>1. Effective Communication Skills/Kul Bhushun Kumar, P S Salaria, Khanna Book Publishing Co (P) Ltd, New Delhi</li> <li>2. Communication Skills For Engineers &amp; Scientists/ Sangeeta Sharma, Binod Mishra, PHI Learning Pvt Ltd, New Delhi</li> <li>3. Humanities &amp; Communication Skills/Pearson Education India Pvt Ltd, New Delhi</li> <li>4. Adler B. Ronald and Russell F. Proctor II. Looking Out, Looking In. Cengage Learning.2017.</li> <li>5. Dianna L.Vanblerkom. College Study Skills.Wadsworth.2003</li> <li>6. Aggarwal, R. (2003). Effective Communication Skills. Jaipur: Sublime Publications</li> <li>7. Davies, F. 1995, Introducing Reading. Penguin Books.</li> <li>8. Downs, Lisa. Listening Skills Training. USA; ASTD, 2008. Print.</li> </ol>
<p><b>Reference books</b></p> <ol style="list-style-type: none"> <li>1. Dawes, L. The Essential Speaking and Listening. Routledge, 2008.</li> <li>2. Cornbleet, S., and Carter, R. The Language of Speech and Writing. Routledge, 2001.</li> <li>3. Harvey, I. (1951). The Technique of Persuasion. London: The Falcon Press.</li> <li>4. Anderson, A. and Lynch, T. (1988) Listening, Oxford: Oxford University, Press.</li> <li>5. Riggenbach, Heidi. Perspectives on Fluency.University of Michigan Press, 2000.</li> <li>6. Dianna L.Vanblerkom. College Study Skills.Wadsworth.2003</li> <li>7. Crystal, D. (2003). English as a Global Language. 2nd edition. Cambridge: Cambridge University Press</li> <li>8. Anderson, Marilyn, Pramod K. Nayar. Critical Thinking, Academic Writing and Presentation Skills. Dorling Kindersley. India 2010</li> <li>9. David Crystal Mother-tongue India Talk for Lingua Franca (ABC, Australia), January 2005 <a href="http://www.globalenglish.com/blog/2014/06/10/indian-employers-report-">http://www.globalenglish.com/blog/2014/06/10/indian-employers-report-</a></li> </ol>

business-english-is-essential-totheir-workforce/ by 12/3/14 at 6:15 pm  
 10. Crystal, David (2003). The Cambridge Encyclopedia of the English Language (2nd Ed.). Cambridge University Press. ISBN 0-521-53033-4.

**NPTEL/SWAYAM Courses for reference:**

1. [https://onlinecourses.swayam2.ac.in/cec24\\_lg08/preview::](https://onlinecourses.swayam2.ac.in/cec24_lg08/preview::) Communicative English By Dr. Salia Rex

**LESSON PLAN FOR LAB COMPONENT**

No. Topic	Topic	No. of Hours (24)
1	Listening practice using audio resources	4
2	Reading comprehension exercises and quizzes	4
3	Writing practice and peer review	4
4	Essay writing/Resume writing/Report writing and feedback sessions	4
5	Speaking practice with peers and recording for self-assessment	8

**CO Assessment Questions**

CO1	<p>Listening Test: You will have to listen to four recordings (conversations and monologues) and then answer the questions asked. The recordings are of native English speakers, and various accents are used. Remember, you can hear each recording only once.</p> <ul style="list-style-type: none"> <li>• <b>Recording 1:</b> You will listen to a dialogue in daily life and context.</li> <li>• <b>Recording 2:</b> You will listen to a monologue about everyday life or social context. For instance, a talk on the condition of streets in an area.</li> <li>• <b>Recording 3:</b> You will listen to a conversation between more than two people placed in a training or educational context. For instance, a teacher discusses an assignment with students.</li> <li>• <b>Recording 4:</b> You will listen to a monologue on any academic subject, such as a college lecture.</li> </ul> <p>Answer 6 question types, including:</p> <ul style="list-style-type: none"> <li>• Multiple choice</li> <li>• Matching</li> <li>• Plan/map/diagram labelling</li> <li>• Note completion</li> <li>• Short answer questions</li> </ul>
CO 2	<p>The Reading test is divided into three parts, each featuring a comprehensive passage from contemporary books, journals, magazines, and newspapers. These passages reflect topics relevant to academic and professional environments in English-speaking contexts.</p> <p>Answer 11 question types, including:</p> <ul style="list-style-type: none"> <li>• Multiple choice</li> <li>• Identifying information</li> <li>• Note completion</li> <li>• Matching headings</li> <li>• Matching sentence endings</li> </ul>



	<ul style="list-style-type: none"> <li>• Summary completion</li> <li>• Sentence completion</li> <li>• Flow-chart completion</li> </ul>
CO 3	<p><b>Part 1:</b> You are presented with a graph, table, chart, or diagram and asked to describe, summarize, or explain the information in your own words. You may be asked to describe and explain data, describe the stages of a process, explain how something works, or describe an object or event.</p> <p><b>Part 2:</b> You are asked to write an essay responding to a point of view, argument or problem.</p>
CO 4	<p><b>Part 1:</b> (4–5 minutes) Introduction and interview. The examiner will ask you to introduce yourself and confirm your identity. Then, the examiner will ask you generic questions about family, studies, work, and interests.</p> <p><b>Part 2:</b> (3–4 minutes) Individual long turn. The examiner will give you a task card with a topic written on it, with some points you may cover in your speech. You will have one minute to think and prepare the topic; a paper and pencil will be provided to jot down your notes. Once done ideating, you will have a time of one to two minutes to speak on the subject, followed by some questions on the same by the examiner.</p> <p><b>Part 3:</b> (4–5 minutes) Two-way discussion. The examiner will ask more questions related to the topic provided in Part 2 of the Speaking test. You can use this opportunity to talk about more ideas.</p>

