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:
Estd.2002

B. Tech

Curriculum and Syllabus (2024) - Semester I & II

Electrical and Electronics Engineering

Branch Code: EEE

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

Recommended by BoS on 30/08/2024

Approved by Academic Council on 31/08/2024

Preface to the Curriculum

The B.Tech. Electrical and Electronics Engineering (EEE) curriculum is meticulously drafted to cultivate industry-ready professionals endowed with creativity and innovative thinking. This comprehensive curriculum includes 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 Electrical and Electronics. 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 creativity, 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 Practicals**: The curriculum includes theory courses embedded with practicals and projects, ensuring 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 and social 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 fulfill 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 seamlessly blends theoretical knowledge with practical experience, fosters interdisciplinary learning, and enhances employability through hands-on projects and internships, preparing students for successful Electrical and Electronics Engineering careers.

General Course Structure

1. Credit and Courses:

Credits are a unit of measurement for coursework 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*

2. Course Category and Credits

The B.Tech. program curriculum has 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
	Total Mandatory Credits	**170**	

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.	0-0-3-0	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
Mandatory Courses			
15.	0-0-2-0	1	Skill Enhancement Courses
Minor/ Honors Course			
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	T-Theory L-Laboratory R-Theory Embedded with			

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

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	26	69
Fourth	24	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	24MAT121	BSC	Linear Algebra, Differential Equations & Laplace transforms	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	24EST113	ESC	Engineering Mechanics	3	0	0	0	40	60	3	3
4	D	24EST114	ESC	Introduction to Electrical & Electronics Engineering	4	0	0	0	40	60	4	4
5	F	24ESR105	ESC-PBL	Algorithmic Thinking with Python	2	0	2	1	50	50	4	5
6	L	24ESL006	ESC	Basic Electrical and Electronics Engineering Workshop	0	0	2	0	50	---	1	2
7	I*	24HUT007	HMC	Communicative English	0	0	2	0	100	---	1	2
8	J*	24SEK10N	SEC	Skill Enhancement Course -1							1	
Total											**21**	**24**

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	24MAT221	BSC	Infinite series, Multiple integrals & Vector Calculus	3	0	0	0	40	60	3	3
2	B	24PHC222	BSC-CLT	Physics for Electrical Science	3	0	2	0	50	50	4	5
3	C	24EST003	ESC	Engineering Graphics	3	0	0	0	40	60	3	4
4	D	24ESC204	ESC-CLT	Programming in C	3	0	2	0	50	50	4	5
5	E	24EER205	PCC-PBL	Measurements and Instrumentation	3	0	0	1	50	50	4	4
6	I*	24HUT006	HMC	Professional Ethics and sustainable development	1	0	2	0	100	--	2	3
7	L	24ESL007	ESC	Computer Aided Drawing & Manufacturing Workshop	0	0	2	0	50	---	1	2
8	J*	24SEK10N	SEC	Skill Enhancement Course-2							1	
Total											**22**	**26**

**** No Grade Points will be awarded for the MOOC and 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

24MAT121	LINEAR ALGEBRA, DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS	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 Linear Algebra, Differential equations and Laplace Transforms. Topics like Ordinary Differential Equations, Multivariable Calculus and Laplace Transform are included. This course helps the learners in modeling and analyzing physical phenomena involving continuous changes of variables or parameters with the help of modern tools and has applications across all engineering domains.

Prerequisite: Single variable calculus and matrix theory.

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

CO 1	Apply the Gauss elimination method to solve the system of linear equations and to determine whether the matrix is diagonalizable. **[Apply]**
CO 2	Apply super position principle and method of undetermined coefficients, for solving homogeneous and non-homogeneous linear differential equations with constant coefficients. **[Apply]**
CO 3	Apply the concept of partial derivatives to evaluate the extrema of two variable functions.**[Apply]**
CO 4	Apply Laplace transform to solve second order ordinary differential equation with constant coefficients. **[Apply]**

CO - PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	2							
CO2	3	3	2	3								
CO3	3	3	2	3	2							
CO4	3	2	2	2								

Assessment Pattern

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

Mark Distribution of CIA					
Course Structure [L-T-P-R]	**Lecture [L]**				
	Attendance	**Assignment**	**Test-1**	**Test-2**	**Total Marks**
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 two sub divisions. Each question carries 9 marks. Marks: (9x4 = 36 marks)	60

SYLLABUS

MODULE I: Linear Algebra (9 Hours)

(Text 2: Relevant topics from section 7.3, 7.4, 7.5, 8.1, 8.4)
Linear systems of equations, Solution by Gauss elimination, Row echelon form and rank of a matrix, Fundamental theorem for linear systems - homogeneous and non-homogeneous (without proof), Eigen values and Eigen vectors, Diagonalization of matrices.

MODULE II: Ordinary Differential Equations (9 Hours)

(Text 2: Relevant topics from section 2.1, 2.2, 2.6, 2.7)
Homogeneous linear ODEs of second order, Superposition principle, General solution, Homogeneous linear ODEs of second order with constant coefficients (Method to find general solution, solution of linear Initial Value Problem). Non homogeneous ODEs (with constant coefficients)- General solution, Particular solution by the method of undetermined coefficients (Particular solutions for the functions ke^{ax}, kx^n). Initial value Problem for Non Homogeneous Second order linear ODE (with constant coefficients).

MODULE III: Multi variable Calculus -Partial derivatives (9 Hours)

(Text 1: Relevant topics from section 13.2, 13.3, 13.4, 13.5,13.8)
Limits and continuity, Partial derivatives, Partial derivatives viewed as rate of change and slopes, Second order and higher order partial derivatives, Local Linear

approximations, Chain rule, total derivative, Implicit differentiation, relative maxima and minima.

MODULE IV: Laplace Transform (9 Hours)

(Text 2: Relevant topics from section 6.1, 6.2, 6.3, 6.5)

Laplace Transform, Inverse Laplace Transform, Linearity property, First shifting theorem, Transform of derivatives, Solution of Initial value problems by Laplace transform (Second order linear ODE with constant coefficients with initial conditions at t=0), Unit step function and its transform (without solution of ordinary differential equation involving unit step function), Second shifting theorem, Convolution theorem (without proof) and its application to finding inverse Laplace transform of products of functions.

Text books

1. H. Anton, I. Biven, S. Davis, "Calculus", Wiley, 10th edition, 2015.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10thEdition, John Wiley & Sons, 2016.

Reference books

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36 Edition,2010.
2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
3. Peter V. O'Neil, Advanced Engineering Mathematics, Cengage, 7th Edition, 2012.
4. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th th Edition, Pearson, Reprint,2002.
5. Louis C Barret, C Ray Wylie, Advanced Engineering Mathematics, Tata McGraw Hill, 6th edition, 2003.
6. J. Stewart, Essential Calculus, Cengage, 2nd edition, 2017.

NPTEL/SWAYAM Courses for reference:

1. NPTEL :: Advanced Linear Algebra https://archive.nptel.ac.in/courses/111/107/111107164/
2. NPTEL :: Mathematics - Ordinary Differential Equations https://archive.nptel.ac.in/courses/111/108/111108081/
3. NPTEL :: Mathematics - NOC: Laplace Transform https://archive.nptel.ac.in/courses/111/106/111106139/

No.	COURSE CONTENTS AND LECTURE SCHEDULE	No. of Hours [36 hours]
	MODULE 1 [9 hours]	
1.1	Linear systems of equations	1
1.2	Solution by Gauss elimination	2
1.3	Row echelon form and rank of a matrix	1
1.4	Fundamental theorem for linear systems	1
1.5	Homogeneous and non-homogeneous linear systems (without proof)	1

1.6	Eigen values and Eigen vectors	1
1.7	Diagonalization of matrices	2
MODULE II [9hours]		
2.1	Homogeneous linear ODEs of second order	1
2.2	Superposition principle and General solution	2
2.3	Homogeneous linear ODEs of second order with constant coefficients (Method to find general solution, solution of linear Initial Value Problem)	1
2.4	Non homogenous ODEs (with constant coefficients)	1
2.5	Particular solution by the method of undetermined coefficients (Particular solutions for the functions ke^{ax}, kx^n).	2
2.6	Initial value Problem for Non Homogeneous Second order linear ODE (with constant coefficients)	2
MODULE III [9 hours]		
3.1	Limits and continuity	1
3.2	Partial derivatives	1
3.3	Partial derivatives viewed as rate of change and slopes	1
3.4	Second-order and higher order partial derivatives	1
3.5	Local Linear approximations	1
3.6	Chain rule	1
3.7	Total derivative	1
3.8	Implicit differentiation	1
3.9	Relative maxima and minima	1
MODULE IV [9 hours]		
4.1	Laplace Transform	1
4.2	Inverse Laplace Transform	1
4.3	Linearity property	1
4.4	First shifting theorem	1
4.5	Transform of derivatives	1
4.6	Solution of Initial value problems by Laplace transform (Second order linear ODE with constant coefficients with initial conditions at t=0)	1
4.7	Unit step function and its transform (without solution of ordinary differential equation involving unit step function)	1
4.8	Second shifting theorem	1
4.9	Convolution theorem (without proof) and its application to finding inverse Laplace transform of products of functions.	1
CO Assessment Questions		
	1. Find the rank, eigen values and eigen vectors of the given matrix. $\begin{bmatrix} -1 & 2 & 22 \\ 6 & 8 & 26 \\ -8 & 20 & 16 \end{bmatrix}$ 2. Diagonalize the matrix	

CO 1	$\begin{bmatrix} 1 & 2 & 3 \\ 6 & 8 & 6 \\ 8 & 2 & 1 \end{bmatrix}$ 3. Solve the following linear system of equations using Gauss elimination Method: x + y - z = 9, 8y + 6z = -6, -2x + 4y- 6z= 40. **Teamwork** Use a CAS to write a program for Gauss elimination and back substitution (a) that does not include pivoting and (b) that does include pivoting.
CO 2	1. Find a general solution of y^{II}-25y=0.Check your answer by substitution. 2. Solve the IVP, y^{II}+16y=17e^x,y(0) =6, y^{I}(0)=-2. 3. Find a general solution of 4y^{II}+32y^{I}+63y=0. Show the details of your calculation.
CO3	1. Find $f_x(x,y)$ and $f_y(x,y)$ for $f(x,y)=2x^3y^2+2y+4x$ and use those partial derivatives to Compute $f_x(1,3)$ and $f_y(1,3)$. 2. Locate all relative extrema and saddle points of $f(x, y) = 3x^2 - 2xy + y^2 - 8y$. **Teamwork** Use a graphing tool or software to visualize the function $g(x,y)=x^3-3xy^2+y^3$. Identify and classify the extrema.
CO 4	1. Solve the IVP by the Laplace transform y^{I}+2y=0, y (0) =1.5 2. Find L(f), if f(t) = t cos4t. 3. Sketch the graph of f(t) if F(s)= $\frac{1}{S^3}$

Prepared by
Mrs.Savitha Paul
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

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

CO - PO MAPPING

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

Assessment Pattern for the Lab component		
Bloom's Category	**Continuous Assessment Tools**	
	Class work	**Test1**
Remember	√	√
Understand	√	√
Apply	√	√
Analyse		
Evaluate		
Create		

Mark Distribution of CIA

Course Structure [L-T-P-R]	**Attendance**	**Assignment**	**Theory [L- T]**		**Practical [P]**		**Total Marks**
			Test-1	**Test-2**	**Continuous Assessment**	**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. 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

SYLLABUS

MODULE I: Electrochemistry and Corrosion Science (9 Hours)

Electrochemical Cell- Electrode potential- Nernst equation for single electrode and cell (numerical problems), reference electrodes – SHE & Calomel electrode – construction and working, Electrochemical series – applications, glass electrode & pH measurement, conductivity- measurement. Li-ion battery: construction and working.

Corrosion –Electrochemical corrosion mechanism (acidic & alkaline medium), Galvanic series, Corrosion control methods - cathodic protection, sacrificial anodic protection and impressed current cathodic protection, electroplating of copper, electroless plating of copper.

MODULE II: Materials for Electronic Applications (9 Hours)

Nanomaterials - Classification based on dimension & materials, synthesis – sol gel & chemical reduction, Applications of nanomaterials – carbon nanotubes, fullerenes, graphene & carbon quantum dots – structure, properties & application.

Polymers - Fire retardant polymers- halogenated & non-halogenated polymers (examples only), Conducting polymers-classification, polyaniline & polypyrrole-synthesis, properties and applications.

Organic electronic materials and devices- construction, working and applications of Organic Light Emitting Diode (OLED) & dye-Sensitized Solar Cells (DSSC).

MODULE III: Molecular Spectroscopy and Analytical Techniques (9 Hours)

Spectroscopy-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_2 and H_2O – applications.

Thermal analysis: Dielectric Thermal Analysis (DETA) of polymers-working and application.

Electron Microscopic Techniques: SEM - principle, instrumentation and applications.

MODULE IV: Environmental Chemistry (9 Hours)

Water characteristics - 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 & significance.

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.

Chemistry of climate change- Greenhouse gases, Ozone depletion.

Text books

1. Dr. Muhammad Arif M, Smt. Kavitha P Nair, Dr. Annette Fernandez"Engineering Chemistry", Owl Books,2021
2. Engineering Chemistry- B. L. Tembe, Kamaluddin, M. S. Krishnan-2018
3. Instrumental Methods of Analysis- H. H. Willard, L. L. Merritt, CBS Publishers,7th Edition,2005

Reference books

1. Fundamentals of Molecular Spectroscopy C. N. Banwell McGraw-Hill, 4th edn., 2017
2. Principles of Physical Chemistry B. R. Puri, L. R. Sharma, M. S. Pathania Vishal Publishing Co 47th Edition, 2017
3. Engineering Chemistry- Jain & Jain, Dhanpath Rai Publishing Company,17th Edition, 2015

4. Introduction to Spectroscopy Donald L. Pavia Cengage Learning India Pvt. Ltd 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]
	MODULE 1: Electrochemistry and Corrosion Science (9 Hours)	
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
	MODULE II: Materials for Electronic Applications (9 Hours)	

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
MODULE III: Molecular Spectroscopy and Analytical Techniques (9 Hours)		
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_2 and H_2O – 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
MODULE IV: Environmental Chemistry (9 Hours)		
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

LESSON PLAN FOR LAB COMPONENT			
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 Fe^{3+} in solution
			2)Determination of molar absorptivity of a compound ($KMnO_4$ 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)			
CO Assessment Questions			
CO1	1. A zinc electrode is placed in a 1 M $ZnSO_4$ solution at 25°C. Calculate the electrode potential given that $[Zn^{2+}]$ = 1 M and $E°(Zn^{2+}\|Zn)$ = -0.76 V. Discuss how this potential change with temperature and concentration variations. 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. 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. 4. Calibrate the pH meter and determine pH of a given solution.		
CO2	1. Explain three important applications of nanomaterials. 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. 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. 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. 5. Synthesize Urea-formaldehyde resin and find its yield.
CO3	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. 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. 3. Determine the wavelength of absorption maximum and colorimetric estimation of Fe^{3+} in solution.
CO4	1. Determine the temporary, permanent and total hardness of water solution using EDTA method. 2. Explain the ion exchange resins and the process for removal of hardness of water? How exhausted resins are regenerated? 3. Sketch the flow diagram of the different steps in sewage treatment. Explain the Each step. 4. Calculate the temporary and permanent hardness of a water sample which contains $[Ca^{2+}]$ = 160 mg/L, $[Mg^{2+}]$ = 192 mg/L and $[HCO_3^-]$ = 122 mg/L. 5. Estimate the amount of dissolved oxygen present in the given water sample.

Prepared by
Dr Sukhila Krishnan
Asst. Prof, ASH

24EST113	ENGINEERING MECHANICS	L	T	P	R	C	Year of Introduction
		3	0	0	0	3	2024

Preamble:
The objective of this course is to expose the students to the fundamental concepts of mechanics and enhance their problem-solving skills. It introduces students to the influence of applied force systems and the geometrical properties of rigid bodies. After this course students will be able to recognize similar problems in real-world situations and respond accordingly.

Prerequisite: Nil

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

CO 1	Use the applicable principles or theorems to solve problems of mechanics [Apply]
CO 2	Apply the conditions of equilibrium to various practical problems involving different force systems. [Apply]
CO 3	Determine the properties of distributed areas and masses [Apply]
CO 4	Develop the understanding of fundamental principles of rigid body dynamics [Apply]

CO - PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	2	2									
CO 2	3	3	2									
CO 3	3	3	2									
CO 4	3	3	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-T]			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 Hrs. 30 Mins

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 9marks. Marks: (9x 4 = 36 marks)	60

SYLLABUS

Module I:Resultant of Force Systems, Equilibrium of Rigid Bodies

Introduction to statics: introduction to branches of mechanics, concept of rigid body, scalars and vectors, vector operations, forces in space.

Force systems: rectangular components in 2D and 3D, moment and couple, resultants Support reactions of beams

Equilibrium: system isolation and the free-body diagram, equilibrium conditions 2D

Module II: Friction, Centroid and Moment of Inertia

Friction: -laws of friction – analysis of blocks and ladder

Centroid of composite areas- – moment of inertia- parallel axis and perpendicular axis theorems. Polar moment of inertia, radius of gyration, mass moment of inertia- ring and disc

Module III: Dynamics of Rigid Bodies

Dynamics – rectilinear translation - equations of motion in kinematics and kinetics – D'Alembert's principle. – motion on horizontal and inclined surfaces, motion of connected bodies

Module IV:Curvilinear translation, Rotation

Curvilinear translation - equations of kinematics –projectile motion

Rotation – kinematics of rotation- equation of motion for a rigid body rotating about a fixed axis –rotation under a constant moment

Text Books:

1. Timoshenko and Young, Engineering Mechanics, McGraw Hill Publishers.
2. Shames, I. H., Engineering Mechanics - Statics and Dynamics, Prentice Hall of India.
3. R. C. Hibbeler and Ashok Gupta, Engineering Mechanics, Vol. I statics, Vol II Dynamics, Pearson Education.

Reference Books:

1. Merriam J. L and Kraige L. G., Engineering Mechanics - Vols. 1 and 2, John Wiley.
2. Tayal A K, Engineering Mechanics – Statics and Dynamics, Umesh Publications.

3. Bhavikkatti, S.S., Engineering Mechanics, New Age International Publishers
4. F.P.Beer abd E.R.Johnston (2011), Vector Mechanics for Engineers, Vol.I- Statics, Vol.II-Dynamics, 9th Ed, Tata McGraw Hill
5. Rajasekaran S and Sankarasubramanian G, Engineering Mechanics – Statics and Dynamics, Vikas Publishing House Pvt Ltd.

NPTEL/SWAYAM Courses for reference:

1. PROF. K. RAMESH, ENGINEERING MECHANICS, IIT Madras, https://archive.nptel.ac.in/courses/112/106/112106286/#
2. PROF. ANUBHAB ROY, ENGINEERING MECHANICS - STATICS AND DYNAMICS, IIT Madras https://archive.nptel.ac.in/courses/112/106/112106180/

No.	COURSE CONTENTS AND LECTURE SCHEDULE	No. of Hours (36)
	Module 1 (10 Hours)	
1.1	Introduction to Mechanics–Mechanics of Rigid Bodies(EMS), Mechanics of deformable Bodies (MoS) and Mechanics of fluids (FM). Relevance of Engineering Mechanics, introduction to studies of bodies at rest (Statics) and studies of bodies in motion (Dynamics). Rigid bodies, Principle of transmissibility of forces, scalars and vectors, vector operations,	1
1.2	Vector operations, forces in space– vectorial representation of forces, simple problems to illustrate vector representations of forces,	1
1.3	Support reactions of beams - Simple beam subject to concentrated vertical loads and UDL.	1
1.4	Force systems: rectangular components in 2D and 3D - composition and resolution of forces, resultant of forces	1
1.5	moment and couple - methods of moment-Varignon's Theorem of Moments -resultant of parallel forces	1
1.6	System isolation and Free body diagrams	1
1.7	analysis of concurrent forces - resultant and equilibrium equations - – extended problem solving	1
1.8	General coplanar force system -resultant and equilibrium equations - – extended problem solving	1
1.9	Solution to practice problems - resultant for concurrent forces in space– extended problem solving	1
1.10	resultant and equilibrium equations - – extended problem solving	1
	Module II (10 Hours)	

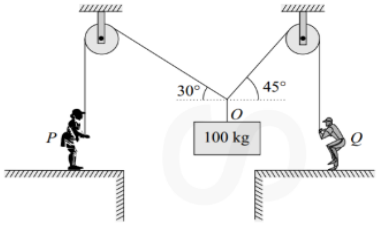
2.1	Friction – sliding friction - Coulomb's laws of friction – analysis of single bodies	1
2.2	Analysis of ladder -–illustrative examples ladder friction	1
2.3	Problems on friction-extended problem solving.	1
2.4	Centroid – Concept, Centroid of simple and regular geometrical shapes – Rectangle, right-angled triangle, circle, semi-circle.	1
2.5	Location of centroids using the principle of moments. Centroid of composite areas- examples for illustration – problems	1
2.6	Moment of inertia- parallel axis theorem –examples for illustration	1
2.7	Moment of inertia - perpendicular axis theorem - example for illustration	1
2.8	Solutions to practice problems – problems related to centroid	1
2.9	Solutions to practice problems – problems related to moment of inertia	1
2.10	Polar moment of inertia, Radius of gyration. Mass moment of inertia of ring, and disc.	1
Module III (8 Hours)		
3.1	Introduction to dynamics –kinematics and kinetics.	1
3.2	Dynamics – review of rectilinear translation	1
3.3	Equations of kinematics – problems to review the concepts	1
3.4	D'Alembert's principle- illustration of the concepts using numerical exercise	1
3.5	Motion on horizontal surfaces – Problems	1
3.6	Motion on inclined surfaces - Problems	1
3.7	Motion of connected bodies – problems.	1
3.8	Motion of connected bodies-extended problem solving.	1
Module IV (Hours)		
4.1	Curvilinear translation - Review of kinematics	1
4.2	projectile motion – simple problems to review the concepts – introduction to kinetics – equation of motion	1
4.3	Extended problem solving – rectilinear and curvilinear translation.	1
4.4	Rotation – kinematics of rotation	1
4.5	Equation of motion for a rigid body rotating about a fixed axis – simple problems for illustration.	1

4.6	Equation of motion for a rigid body rotating about a fixed axis – simple problems for illustration.	1
4.7	Rotation under a constant moment – teacher assisted problem solving.	1
4.8	Rotation under a constant moment - extended problem solving.	1

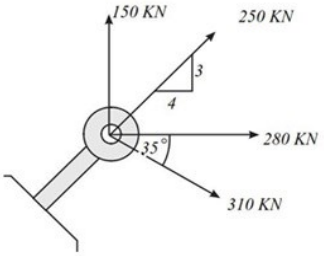
CO Assessment Questions

CO1

1. Two persons lift a mass of 100 kg by cables passing over two pulleys as shown in figure. Determine the forces P and Q that must be applied by the two persons if the body is in equilibrium at the position shown.

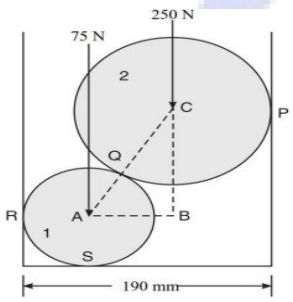


2. Four forces are acting on a bolt as shown in Figure. Determine the magnitude and direction of the resultant force.

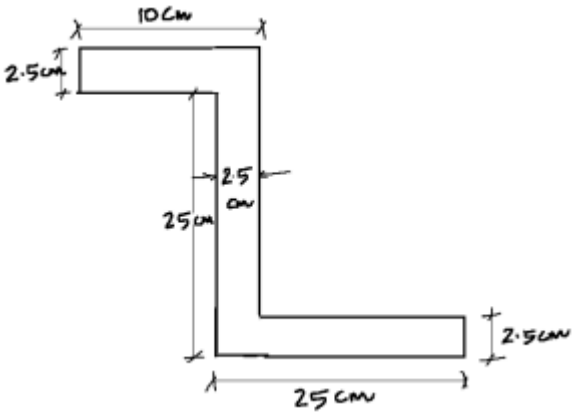
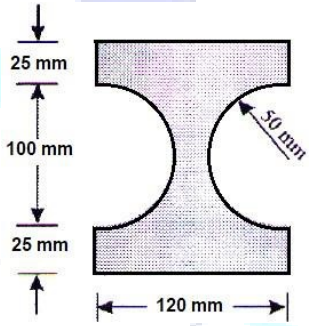
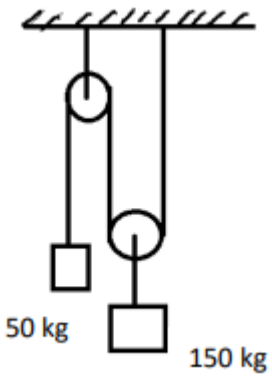


CO2

1. Determine the reactions at contact points P, Q, R, and S for the system shown in Figure. The radii of spheres 1 and 2 are, respectively, 40 mm and 60 mm.



2. A uniform ladder of 4 m length rests against a vertical wall with which it makes an angle of 45°. The coefficient of friction between the ladder and the wall is 0.4 and that between ladder and the floor is 0.5. At what position along the ladder from the bottom end does the ladder slips, if a man, whose weight is one-half of that of the ladder, ascends it.

CO 3	1. Find the centroid of the cross-sectional area of the section shown in figure.  2. The cross section of a beam is shown in figure. Determine the moments of inertia of the section about its horizontal and vertical axes passing through the centroid. 
CO 4	1. Determine the tension in the strings and accelerations of two blocks of mass 150 kg and 50kg connected by a string and a frictionless and weightless pulley as shown in figure.  2. A wheel accelerates from rest to a speed of 180 rpm uniformly in 0.4 seconds. It then rotates at that speed for 2s and then decelerates and comes to rest in 0.3s. Determine the total revolutions made by the wheel.

Prepared by
Mr. Anoop Lonappan
Asst. Prof, ASH

24EST114	INTRODUCTION TO ELECTRICAL & ELECTRONICS ENGINEERING	L	T	P	R	C	Year of Introduction
		4	0	0	0	4	2024

Preamble:
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 and magnetic circuits, concepts behind the generation of alternating current, fundamental electronic devices and circuits and an overview of evolution of communication systems.

Prerequisite: Nil

Course Outcomes: 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 **[Apply]**
CO 2	Apply the fundamental concepts and theorems to solve magnetic circuits **[Apply]**
CO 3	Analyze the principles of diodes, transistors, and FETs to make basic electronic circuits **[Analyze]**
CO 4	Understand communication systems, mobile technologies, and modern electronic applications **[Understand]**

CO - PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3			3							2
CO 2	3	3										2
CO 3	3	3										2
CO 4	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- T]			Total Marks
		Assignment	Test-1	Test-2	
4-0-0-0	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, 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: Analysis of DC circuits and Fundamentals of Magnetism (14 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: 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 (10 hours)

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

AC Circuits: Phasor representation of sinusoidal quantities, Rectangular and Polar forms. 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, relation between line and phase voltages, line and phase currents (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, Input output characteristics of CE configuration, Comparison of CE, CB and CC configurations, Simscape Onramp, Circuit Simulation Onramp

MODULE IV: Modern Electronics and its applications (10 hours)

Communication Systems: 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 AM and FM superheterodyne receiver, Basic concepts of Wired and Wireless communication

Mobile Communication: Block diagram of GSM, Comparison of 3G, 4G, 5G and 6G communication technologies

Applications of modern electronics – IoT-based smart homes, healthcare and agriculture (Case study only)

Textbooks

1. D P Kothari and I J Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D C Kulshreshtha, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
3. ChinmoySaha, Arindham Halder and Debarati Ganguly, Basic Electronics - Principles and Applications, Cambridge University Press, 2018.
4. M.S.Sukhija and T.K.Nagsarkar, Basic Electrical and Electronics Engineering, Oxford University Press, 2012.
5. Wayne Tomasi and Neil Storey, A Textbook On Basic Communication and Information Engineering, Pearson, 2010.

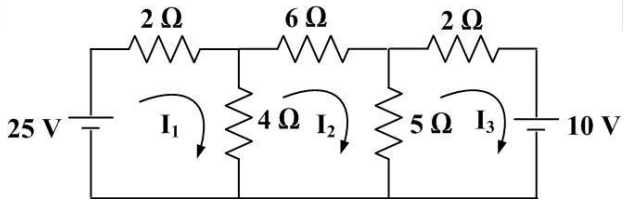
Reference books

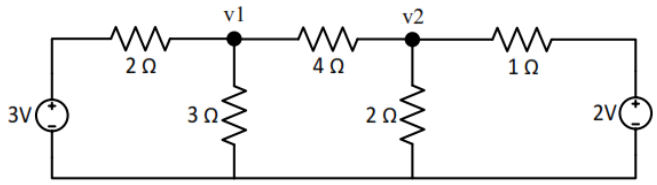
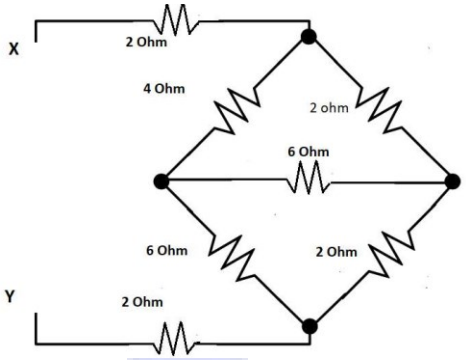
1. Del Toro V, "Electrical Engineering Fundamentals", Pearson Education.
2. T. K. Nagsarkar, M. S. Sukhija, "Basic Electrical Engineering", Oxford Higher Education.
3. Hayt W H, Kemmerly J E, and Durbin S M, "Engineering Circuit Analysis", Tata McGraw-Hill
4. Hughes, "Electrical and Electronic Technology", Pearson Education.
5. V. N. Mittle and Arvind Mittal, "Basic Electrical Engineering," Second Edition, McGraw Hill.
6. Parker and Smith, "Problems in Electrical Engineering", CBS Publishers and Distributors.
7. S. B. Lal Seksena and Kaustuv Dasgupta, "Fundamentals of Electrical Engineering", Cambridge University Press.
8. Anant Agarwal, Jeffrey Lang, Foundations of Analog and Digital Electronic Circuits, Morgan Kaufmann Publishers, 2005.
9. Bernard Grob, Ba sic Electronics, McGraw Hill.
10. A. Bruce Carlson, Paul B. Crilly, Communication Systems: An Introduction to Signals and Noise in Electrical Communication, Tata McGraw Hill, 5th Edition.

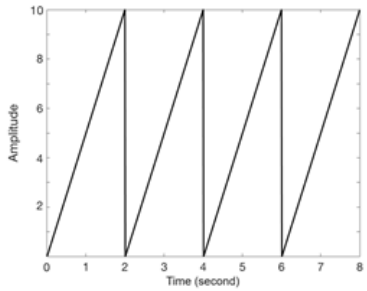
NPTEL/SWAYAM Courses for reference:

1. Prof. Ashok Kumar Pradhan, A Basic Course on Electric and Magnetic Circuits, IIT Kharagpur, [NPTEL], https://nptel.ac.in/courses/108105479 (Relevant sections)
2. Dr. Nagendra Krishnapura, Basic Electrical Circuits, IIT Madras, [NPTEL], https://nptel.ac.in/courses/108106172 (Relevant sections)
3. Mr. Abhijeet Lal & Dr. Onika Parmar, Fundamental of Electronic Engineering Chhattisgarh Swami Vivekanand Technical University (CSVTU) https://onlinecourses.swayam2.ac.in/nou24_ec08/preview
4. Prof. Sudeb Dasgupta, microelectronics: Devices to Circuits, IIT Roorkee, https://onlinecourses.nptel.ac.in/noc24_ee139/preview

No.	COURSE CONTENTS AND LECTURE SCHEDULE	No. of Hours [45 hours]
	MODULE 1 [14 hours]	
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.	3
1.6	Node voltage methods-matrix representation-solution of network equations - numerical problems and verification through simulation software.	3
1.7	Magnetic Circuits - Basic Terminology: MMF, field strength, flux density, reluctance - Comparison between electric and magnetic circuits	1
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
	MODULE II [10 hours]	
2.1	Generation of alternating voltages - Representation of sinusoidal waveforms: frequency, period, average value, RMS value and form factor - numerical problems	2
2.2	Phasor representation of sinusoidal quantities, Rectangular and Polar forms	1
2.3	Analysis of simple AC circuits: Purely resistive, inductive & capacitive circuits; Inductive and capacitive reactance, concept of	2

	impedance	
2.4	RL, RC and RLC series circuits- power factor, active, reactive and apparent power - numerical problems and verification through simulation software.	3
2.5	Generation of three-phase voltages, advantages of three-phase systems, star and delta connections, relation between line and phase voltages, line and phase currents	2
MODULE III [11 hours]		
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, working and V-I Characteristics of BJT, Input output characteristics of CE configuration	3
3.6	Comparison of CE, CB and CC configurations	1
3.7	Simscape Onramp, Circuit Simulation Onramp	1
MODULE IV [10 hours]		
4.1	General block diagram of a Communication system, Block diagram of Fiber optic Communication system	2
4.2	Concept of AM and FM (No derivation required), Block diagram FM superheterodyne receiver	2
4.3	Basic concepts of Wired and Wireless communication	2
4.4	Block diagram of GSM, Comparison of 3G, 4G, 5G and 6G communication technologies	2
4.5	IoT-based smart homes	1
4.6	IoT-based healthcare and agriculture	1
CO Assessment Questions		
CO1	1. Solve for the mesh currents in the given circuit.?  **2.** Find the node voltages v1 and v2 in the circuit given in Fig theoretically. Also find the power dissipated in the 4Ω resistor. Verify the same using any simulation tool.	

	 3. Determine the equivalent resistance between terminal X-Y in the network  4. 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°) to flow through the circuit. Calculate (i) the Impedance of the circuit, (ii) the value of L and R (iii) the power consumed 5. A resistor of 10 Ω, an inductor of 0.3 H and a capacitor of 100 μF are connected in series across a 230 V, 50 Hz, single-phase AC supply. Determine (a) impedance, (b) current, (c) power in watts, (d) circuit power factor, (e) voltage across the inductor (f) apparent power. Verify the same through any simulation software. 6. Explain Kirchhoff's laws with suitable examples. 7. Derive the expression for energy stored in an inductor and a capacitor 8. An alternating current is represented by i(t)=14.14 sin (377t). Find (i) RMS value, (ii) frequency, (iii)time period, and (iv)instantaneous value of the current at t=3ms.
CO2	1. Distinguish between statically induced EMF and dynamically induced EMF. 2. State and explain Faraday's laws of electromagnetic induction. 3. A coil of 200 turns carries a current of 4A. The magnetic flux linkage with the coil is 0.02Wb. Calculate the self-induced emf in the coil. 4. Explain the generation process of 3-phase alternating current 5. Two coils A and B of 500 and 750 turns respectively are connected in series on the same magnetic circuit of reluctance 1.55×10^6 AT/Wb. Assuming that there is no flux leakage, calculate (i) self-inductance of each coil and (ii) mutual inductance between coils. 6. Find the average and rms values of the given triangular signal.

	 7. A conductor of length 0.5m kept at right angles to a uniform magnetic field of flux density 2Wb/m^2 moves with a velocity of 75 m/s at an angle of 60^0 to the field. Calculate the emf induced in the conductor.
CO3	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. 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. 3. Illustrate with the neat diagram the working of a zener voltage regulator. 4. Analyze potential barrier formation and current in a forward biased pn junction diode.
CO4	1. Compare and contrast between AM and FM. 2. Draw and explain the block diagram of FM superheterodyne receiver. 3. With the help of a neat block diagram, explain the principle of operation of GSM. 4. Compare the different types of communication technologies.

Prepared by,

Ms. Drisya K Sasi, Assistant Professor, Department of EEE
Mr. Sebin Davis K, Assistant Professor, Department of EEE
Dr. Vishnu Rajan, Associate Professor, Department of ECE
Ms. Chinchu Jose, Assistant Professor, Department of ECE
Dr. Annet Antony, Assistant Professor, Department of ECE

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

CO 1	Analyze and develop an algorithm for solving computational problems. **[Apply]**
CO 2	Articulate in design programs with interactive input and output, utilizing arithmetic expression repetitions, and decision-making. **[Understand]**
CO 3	Utilize modular Python programs using functions and process stored data using List, Tuples, Sets, Dictionaries. **[Apply]**
CO 4	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
CO1	3	3	3									3
CO2	3	3	3	2			3	3				3
CO3	3											3
CO4	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		

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

		Theory [L]			**Practical [P]**		**Project [R]**			**Total Marks**
Course Structure [L-T-P-R]	**Attendance**	**Assignment**	**Test-1**	**Test-2**	**Class Work**	**Test**	**Evaluation 1**	**Evaluation-2**	**Report**	
2-0-2-1	5	5	7.5	7.5	7.5	5		7.5	5	50

Total Marks distribution

Total Marks	**CIA (Marks)**	**ESE (Mark)**	**ESE Duration**
100	50	50	2 hrs

End Semester Examination [ESE]

PATTERN	**PART A**	**PART 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)

SYLLABUS

MODULE I : Fundamentals of Algorithms (5 Hours)

Problem Solving strategies — 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) - representation of procedure by flowchart - Implementation of algorithms — use of procedures to achieve modularity.

Examples for algorithms - At least 10 problems (starting with non-numerical examples, and numeric problems like factorial, largest among three numbers, largest among N, Fibonacci.

MODULE II: Variable Expression and Statements (6 Hours)

Introduction to Python-variables, expressions and statements, evaluation of expressions, precedence, string operations

Control statements, Boolean expressions and logical operators, conditional and alternative executions

MODULE III : Functions (6 Hours)

Functions, calling functions, Recursion, composition of functions, mathematical functions, user-defined functions, parameters and arguments.

MODULE IV: List, Dictionary Data Structures (6 Hours)

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

Textbooks

1. Downey, A. et al., How to think like a Computer Scientist: Learning with Python, John Wiley, 2022
2. Reema Thereja., Computer Fundamentals and Programming in C, Oxford, 2023
3. Lambert K. A., Fundamentals of Python - First Programs, Cengage Learning India, 2019
4. Rajaraman, V., Computer Basics and C Programming, Prentice-Hall India

Reference books

1. Barry, P., Head First Python, , O' Reilly Publishers
2. Dromy, R. G., How to solve it by Computer, Pearson India
3. Guzdial, M. J., Introduction to Computing and Programming in Python, Pearson India
4. Perkovic, L., Introduction to Computing Using Python, 2/e, John Wiley, 2015
5. Sprankle , M., Problem Solving & Programming Concepts, Pearson India
6. Venit, S. and Drake, E., Prelude to Programming: Concepts & Design, Pearson India
7. Zelle, J., Python Programming: An Introduction to Computer Science, Franklin, Beedle & Associates Inc.

NPTEL/SWAYAM Courses for reference:

1. The joy of Computing using Python - https://onlinecourses.nptel.ac.in/noc21_cs32/preview

No.	COURSE CONTENTS AND LECTURE SCHEDULE	No. of Hours (24)
	MODULE I: Fundamentals of Algorithms (5 Hours)	
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
	MODULE II: Variable Expression and Statements (6 Hours)	
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
	MODULE III: Functions (6 Hours)	
3.1	Functions	1
3.2	Calling functions	1
3.3	Recursion	1
3.4	Composition of functions	1
3.5	Mathematical functions	1
3.6	User-defined functions, parameters and arguments.	1
	MODULE IV: List, Dictionary Data Structures (6 Hours)	
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
Project: Mini projects can be done in the respective engineering domain.		
LESSON PLAN FOR LAB COMPONENT (8 Experiments mandatory)		

No.	Topic	No. of Hours (12)
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

LESSON PLAN FOR PROJECT COMPONENT

No.	Topic	No. of Hours (12)
1	Introduction and awareness on various stages of a Mini Hackathon.	6
2	Final Mini Hackathon, Presentation and evaluation.	6

CO Assessment Questions

CO1	1.Write an algorithm to compute sum of series 1 – x2/2 +x4/4-x6/6+……. n 2. Give the algorithm for finding the largest and smallest numbers in each list of N numbers 3. Simple desktop calculator using Python. Only the five basic arithmetic operators
CO2	1. Evaluate the expression x ** y ** z. Given x = 2, y = 3, z=2 2. Write a python program to display all Armstrong numbers in each range 3. Write a python program to count the number of zeros and negative terms in each set of n numbers 4. Familiarize time and date in various formats (Eg. "Thu Jul 11 10:26:23 IST 2024").

CO3	1. Why do we need functions? What are the advantages of function 2. Write a python program to find the sum of digits of a number 3. What do you mean by mutability of data structure? Explain with example why we say that list is mutable while tuples are immutable 4. Program to find the factorial of a number
CO 4	1. Write a python program to create a text file and to input a line of text to it. Display the line pf text with all punctuation mark removed. 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. 3. Write a program to read numbers stored in one file and store the sorted numbers in another after deleting duplicates. 4. Write a program to implement file operations

Prepared By,

Dr Sreereaj R, Professor, Department of CSE
Ms Livya George, Assistant Professor, Department of CSE

24ESL006	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING WORKSHOP	L	T	P	R	C	Year of Introduction
		0	0	2	0	1	2024

Preamble: 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.

Prerequisite: NIL

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

CO1	Identify the tools and equipment used for electrical wiring and understand electrical safety measures.**[Understand]**
CO2	Design and develop lighting and power circuits and distribution board arrangement under various conditions for domestic buildings.**[Apply]**
CO3	Identify various electronic components.**[Understand]**
CO4	Design simple electronic circuits on breadboard and PCB. .**[Apply]**

CO - PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2					2			2			3
CO2	3	3	3	2		2			2			3
CO3	3					2						3
CO4	3		3	1	3	2	1		2			3

Assessment Pattern

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	Classwork	Lab Exam	Total Marks
0-0-2-0	5	25	20	50

Total Mark distribution

Total Marks	CIA (Marks)	ESE (Marks)	ESE Duration
50	50	0	-

SYLLABUS- DETAILS OF EXPERIMENTS

SECTION – 1 (Electrical Engineering Experiments)
Minimum 6 experiments are mandatory

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
SECTION – 2 (Electronics Engineering Experiments) ***Minimum 5 experiments are mandatory***
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
Text books 1. V N Mittal and Rohit Gupta, "Basic Electrical Engineering" 2. National Electric Code (NEC) by National Fire Protection Association 3. E A Reeves, "Electric Wiring Practices" 4. Basic Electronics: Principles and Applications, Chinmoy Saha, Arindham Halder and Debarati Ganguly 5. Basic Electronics and Linear Circuits, N N Bhargava D C Kulshreshtha and S. C. Gupta
Reference books 1. "Wiring Practices Manual" by International Brotherhood of Electrical Workers 2. "Electrical Wiring: A Practical Guide" by J F McPartland

LIST OF EXPERIMENTS

Electrical - 12 Hrs ***(Minimum 6 experiments are mandatory)***	
No.	Experiments
1	a) Identify different types of cables, wires, switches, fuses, fuse carriers, familiarize the ratings. b) 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	Familiarization 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.
Electronics -12 Hrs ***(Minimum 5 experiments are mandatory)***	
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)- • Fixed voltage power supply with transformer • Rectifier using diode

	• Capacitor filter • Zener/IC regulator • Square wave generation using IC 555 timer in IC base.
8	Introduction to EDA tools.
CO Assessment Questions	
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)

Introduction To the Theory of Communication: Types of Communication, Modes of Communication

Listening Skills: Listening: Importance And Benefits of Listening Skill, Different Types of Listening, Understanding different accents and dialects, Note-taking strategies, Strategies for Improving Listening

MODULE II: Reading Skills (4 hours)

Reading: A Passive Skill – Its Importance, Ten Important Reading Strategies and their Benefits, Skimming and scanning techniques, identifying main ideas and supporting details

MODULE III: Writing Skills (4 hours)

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

MODULE IV: Speaking Skills and Integrated Review (8 hours)

Speaking Skills: 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.

Integrated Skills and Review: Business English, Comprehension, Summary and Paraphrasing, Research Methodology and Documentation

Textbooks

1. Effective Communication Skills/Kul Bhushun Kumar, P S Salaria, Khanna Book Publishing Co (P) Ltd, New Delhi
2. Communication Skills For Engineers & Scientists/ Sangeeta Sharma, Binod Mishra, PHI Learning Pvt Ltd, New Delhi
3. Humanities & Communication Skills/Pearson Education India Pvt Ltd, New Delhi
4. Adler B. Ronald and Russell F. Proctor II. Looking Out, Looking In. Cengage Learning.2017.
5. Dianna L.Vanblerkom. College Study Skills.Wadsworth.2003
6. Aggarwal, R. (2003). Effective Communication Skills. Jaipur: Sublime Publications
7. Davies, F. 1995, Introducing Reading. Penguin Books.
8. Downs, Lisa. Listening Skills Training. USA; ASTD, 2008. Print.

Reference books

1. Dawes, L. The Essential Speaking and Listening. Routledge, 2008.
2. Cornbleet, S., and Carter, R. The Language of Speech and Writing. Routledge, 2001.
3. Harvey, I. (1951). The Technique of Persuasion. London: The Falcon Press.
4. Anderson, A. and Lynch, T. (1988) Listening, Oxford: Oxford University, Press.
5. Riggenbach, Heidi. Perspectives on Fluency. University of Michigan Press, 2000.
6. Dianna L.Vanblerkom. College Study Skills.Wadsworth.2003
7. Crystal, D. (2003). English as a Global Language. 2nd edition. Cambridge: Cambridge University Press
8. Anderson, Marilyn, Pramod K. Nayar. Critical Thinking, Academic Writing and Presentation Skills. Dorling Kindersley. India 2010
9. David Crystal Mother-tongue India Talk for Lingua Franca (ABC, Australia), January 2005 http://www.globalenglish.com/blog/2014/06/10/indian-employers-report-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:: 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	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. • **Recording 1:** You will listen to a dialogue in daily life and context. • **Recording 2:** You will listen to a monologue about everyday life or social context. For instance, a talk on the condition of streets in an area. • **Recording 3:** 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. • **Recording 4:** You will listen to a monologue on any academic subject, such as a college lecture. Answer 6 question types, including: • Multiple choice • Matching • Plan/map/diagram labelling • Note completion • Short answer questions
CO 2	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. Answer 11 question types, including: • Multiple choice • Identifying information • Note completion • Matching headings

	• Matching sentence endings • Summary completion • Sentence completion • Flow-chart completion
CO 3	**Part 1:** 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. **Part 2:** You are asked to write an essay responding to a point of view, argument or problem.
CO 4	**Part 1:** (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. **Part 2:** (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. **Part 3:** (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.

SEMESTER-II
SYLLABUS

24MAT221	INFINITE SERIES, MULTIPLE INTEGRALS AND VECTOR CALCULUS	L	T	P	R	C	Year of Introduction
		3	0	0	0	3	2024

Preamble:
This course introduces the concepts and applications of differentiation and integration of vector valued functions, differential equations, Fourier series and multiple integral. The objective of this course is to familiarize the prospective engineers with some advanced concepts and methods in Mathematics which include the Calculus of vector valued functions and has applications across all engineering domains with the help of modern tools.

Prerequisite: Calculus of single and multi-variable functions.

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

CO 1	Apply power series and Fourier series representations to express functions, and analyze their domains of convergence.**[Apply]**
CO 2	Solve double and triple integrals to find areas and volumes of geometrical shapes. **[Apply]**
CO 3	Evaluate derivatives and integrals of vector valued functions and explore their applications. **[Apply]**
CO 4	Compute line integrals, surface integral, volume integral and understand their inter relation and application. **[Apply]**

CO - PO MAPPING

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

Assessment Pattern

Bloom's Category	Continuous Assessment Tools			End Semester Examination
	Test1	Test 2	Other tools	
Remember	√	√	√	√
Understand	√	√	√	√
Apply	√	√	√	√
Analyses				
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 two sub divisions. Each question carries 9 marks. Marks: (9x4 = 36 marks)	60

SYLLABUS

MODULE I: Series representation of functions (9 Hours)

(Text 1: Relevant topics from section 9.3, 9.8
Text 2: Relevant topics from section 11.1,11.2)

Concept of convergence of an infinite series and region of convergence, Series representation of exponential, trigonometric, logarithmic functions (without proofs of convergence), Taylor series representation (without proof, assuming the possibility of power series expansion in appropriate domains), Maclaurin series representation, Fourier series, Euler formulae, Convergence of Fourier series (Dirichlet's conditions), Fourier series of 2π periodic functions, Fourier series of 2l periodic functions, Half range sine series expansion, Half range cosine series expansion .

MODULE II: Multivariable Calculus-Integration (9 Hours)

(Text 1: Relevant topics from section 14.1, 14.2, 14.3, 14.5, 14.6)

Double integrals, Reversing the order of integration in double integrals, Change of coordinates in double integrals (Cartesian to polar), Evaluating areas using Double integrals, finding volumes using double integration, Triple integrals, volume calculated as triple integral, Triple integral in cylindrical and spherical coordinates.

MODULE III: Calculus of vector functions (9 Hours)

(Text 1: Relevant topics from section 12.1, 12.2, 13.6, 15.1, 15.2, 15.3)

Vector valued function of single variable - derivative of vector valued function, Concept of scalar and vector fields, Gradient and its properties, Directional derivative,

Divergence and curl, Line integrals of vector fields, Work done as line integral, Conservative vector field, independence of path, Potential function (results without proof).

MODULE IV: Vector integral theorems (9 Hours)

(Text 1: Relevant topics from section 15.4, 15.5, 15.6, 15.7)

Green's theorem (for simply connected domains, without proof) and applications to evaluating line integrals, finding areas using Greens theorem. Surface integrals over surfaces of the form z=g(x,y) Flux integrals over surfaces of the form z= g(x,y), Divergence theorem (without proof), Using Divergence theorem to find flux.

Text books

1. H. Anton, I. Biven, S.Davis, "Calculus", Wiley, 10th edition, 2015.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10thEdition, John Wiley & Sons, 2016.

Reference books

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36 Edition,2010.
2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
3. Peter V. O'Neil, Advanced Engineering Mathematics, Cengage, 7th Edition, 2012.
4. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9 th Edition, Pearson, Reprint,2002.
5. Louis C Barret, C Ray Wylie, Advanced Engineering Mathematics, Tata McGraw Hill, 6th edition, 2003.
6. J. Stewart, Essential Calculus, Cengage, 2nd edition, 2017.

NPTEL/SWAYAM Courses for reference:

1. Multi Variable Calculus https://nptel.ac.in/courses/111107108 NPTEL ::
2. Taylor's Theorem, Line Integrals,Green's Theorem https://archive.nptel.ac.in/courses/122/104/122104017/

No.	COURSE CONTENTS AND LECTURE SCHEDULE	No. of Hrs [36]
	MODULE 1 [9 hours]	
1.1	Concept of convergence of an infinite series and region of convergence	1
1.2	Series representation of exponential, trigonometric, logarithmic functions(without proofs of convergence)	1
1.3	Taylor series representation (without proof, assuming the possibility of power series expansion in appropriate domains)	1
1.4	Maclaurin series representation	1
1.5	Fourier series, Euler formulae	1
1.6	Convergence of Fourier series (Dirichlet's conditions)	1
1.7	Fourier series of 2π periodic functions, Fourier series of 2l periodic functions	1
1.8	Half range sine series expansion	1
1.9	Half range cosine series expansion	1

MODULE II [9 hours]		
2.1	Double integrals	1
2.2	Reversing the order of integration in double integrals	2
2.3	Change of coordinates in double integral (Cartesian to polar)	1
2.4	Evaluating areas using double integrals	1
2.5	Finding volumes using double integration	1
2.6	Triple integrals and Volume calculated as triple integral	1
2.7	Triple integral in cylindrical coordinates	1
2.8	Triple integral in spherical coordinates	1
MODULE III [9 hours]		
3.1	Vector-valued function of single variable - derivative of vector valued function	1
3.2	Concept of scalar and vector fields	1
3.3	Gradient and its properties	1
3.4	Directional derivative	1
3.5	Divergence and curl	1
3.6	Line integrals of vector fields	1
3.7	Work done as line integral	1
3.8	Conservative vector field	1
3.9	Independence of path, Potential function (results without proof).	1
MODULE IV [9hours]		
4.1	Green's theorem (for simply connected domains, without proof) and applications to evaluating line integrals	2
4.2	Finding areas using Greens theorem	2
4.3	Surface integrals over surfaces of the form z=g(x, y) Flux integrals over surfaces of the form z = g(x, y)	2
4.4	Divergence theorem (without proof)	2
4.5	Flux using Divergence theorem.	1
CO Assessment Questions		
CO 1	1. Derive power series for sin x, cos x and analyze the domains where these series converge. 2. What do you mean by radius of convergence of a power series? How is it determined? 3. Find the Fourier series of the function f(x)=$\|x\|$, which is assumed to have the period 2π. Show the details of your work. Sketch or graph the partial sums up to that including cos 5x and sin 5x. **Teamwork:** Write a MATLAB script to generate the first 10 terms of the Maclaurin series for log(1+x). Discuss the behaviour of the series near the end points of its interval of convergence.	
CO 2	1. Use a triple integral to find the volume of the solid within the cylinder $x^2 + y^2 = 9$ and between the planes z = 1 and x + z = 5. 2. Outline the method for finding the volume of a solid using a double integral. Explain the difference between integrating over a region in the	

	xy-plane versus integrating over a region in the xyz-space. Provide an example of calculating volume using a double integral. 3. Use double integration to find the area of the plane region enclosed by the given curves $y = sinx,\ y = cosx\ for\ 0 \leq x \leq \pi/4$. **Teamwork:** Using MATLAB, calculate the area of a circle with a given radius using polar coordinates.
CO 3	1. Describe the parametric curve represented by the equations x = a cost, y = a sin t, z = ct where a and c are positive constants. 2. Sketch the graph and a radius vector of r(t) = cost i + sin t j , $0 \leq t \leq 2\pi$. 3. Given that $f_x(-5, 1) = -3$ and $f_y(-5, 1) = 2$, find the directional derivative of f at P (−5, 1) in the direction of the vector from P to Q(−4, 3). **Teamwork:** How do you find the tangent and normal vectors to a curve described by a vector valued function?
CO 4	1. Explain the conditions under which Green's Theorem is applicable 2. Use Divergence Theorem to find the outward flux of the vector field $F(x, y, z) = x^3\ \hat{\imath} + y^3\ \hat{\jmath} + z^2\ \hat{k}$ across the surface of the region that is enclosed by the circular cylinder $x^2 + y^2 = 9$ and the planes z = 0 and z = 2. 3. What is the difference between a scalar surface integral and a vector surface integral? **Teamwork:** Apply Greens theorem to calculate area of an ellipse (major axis-4units, minor axis-3units) in MATLAB.

Prepared by
Rani Thomas
Asst.Prof,ASH

24PHC 222	PHYSICS FOR ELECTRICAL SCIENCE	L	T	P	R	C	Year of Introduction
		3	0	2	0	4	2024

Preamble: Enable the students to explore advanced topics in modern physics, focusing on semiconductor behaviour, quantum mechanics, electromagnetic theory, dielectrics, superconductivity, lasers, and fibre optics. Students will delve into theoretical foundations, practical applications, and experimental techniques essential for understanding and contributing to cutting-edge technologies in physics and related disciplines.

Prerequisite: Basic knowledge in Physics and Mathematics.

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

CO 1	Apply the characteristics of intrinsic semiconductors in the derivation of electron and hole densities, intrinsic carrier concentration and formation of pn junctions. [Apply]
CO 2	Apply the knowledge of basic Quantum Mechanics in the behavior of matter and understand the fundamentals of electromagnetic theory. [Apply]
CO 3	Describe the fundamental principles of Dielectric, Polarisation and superconductivity. [Understanding]
CO 4	Apply the basic concepts of lasers and optical fibres to get theoretical foundations and practical aspects in various fields. [Apply]
CO5	Apply basic knowledge of principles and theories in physics to conduct experiments. [Apply]

CO - PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										2
CO2	3	3										2
CO3	3	3										2
CO4	3	3										2
CO5	3	3			2				2			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				

Assessment Pattern for the Lab component

Bloom's Category	**Continuous Assessment Tools**	
	Class work	**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

SYLLABUS

MODULE I : Semiconductor Physics (9 Hours)

Intrinsic semiconductor, Derivation of density of electron in conduction band and density of holes in 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 biased pn junctions, Diode equation (Derivation), I-V Characteristics of pn junction, Solar cells- IV Characteristics, Efficiency

MODULE II: Quantum Mechanics & Electromagnetic Theory (9 Hours)

Introduction to quantum Mechanics, Wave Nature of particles, Heisenberg's Uncertainty Principle-Applications, Absence of electron inside the nucleus, Formulation of time-dependent and time-independent Schrodinger equations, Particle in a one- dimensional box - Derivation of energy eigenvalues and normalised wave function,

Magnetic flux density, Magnetic Intensity, Intensity of magnetisation, Permeability, Susceptibility (Qualitative)Laws of magnetism, Classification of magnetic Materials- Para, Dia & Ferro Magnetism,Maxwell's Equations(No Derivation), Velocity of Electromagnetic waves in free space

MODULE III: Dielectrics & Superconductivity(9 Hours)

Dielectric constant, Polarisation, Permittivity & Relative permittivity, Relation between polarisation and dielectric constant, Types of Polarization, Internal fields in liquids and solids, Clausius Mossotti Relation, Dielectric loss(qualitative), Dielectric breakdown (qualitative).

Superconductivity, Transition temperature, Critical field, Meissner effect, Type I and Type II Superconductors. BCS Theory, Applications of Superconductors.

MODULE IV: Laser & Fibre Optics (9 Hours)

roperties 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, Applications of laser.

Optical fibre-Principle of propagation of light, Types of fibres-Step index and Graded index fibres, Multimode, Single mode; Acceptance angle, Numerical aperture – Derivation,Applications of optical fibres - Fibre optic communication system (block diagram)

Text books

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.

Reference books

1. Arthur Beiser, "Concepts of Modern Physics ", Tata McGraw Hill Publications, 6th Edition 2003.
2. D.K. Bhattacharya, Poonam Tandon, "Engineering Physics", Oxford University

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

NPTEL/SWAYAM Courses for reference:

Module I: Semiconductor Optoelectronics
https://nptel.ac.in/courses/115102103
Semiconductor Optoelectronics
https://nptel.ac.in/courses/115102026

Module II: Quantum Mechanics
https://nptel.ac.in/courses/115101107
Electromagnetism
https://nptel.ac.in/courses/115106122

Module III: Brief course on superconductivity
https://nptel.ac.in/courses/115103108

Module IV: Introduction to Laser
https://nptel.ac.in/courses/115102124

No.	COURSE CONTENTS AND LECTURE SCHEDULE	No.of Hours [36]
	MODULE I: Semiconductor Physics (9 Hours)	
1.1	Intrinsic semiconductor	1
1.2	Derivation of density of electron in conduction band and density of holes in valence band	1
1.3	Intrinsic carrier concentration, Variation of intrinsic carrier concentration with temperature	1
1.4	Extrinsic semiconductor(qualitative)	1
1.5	Formation of pn junction, Fermi level in semiconductors-intrinsic and extrinsic	1
1.6	Energy band diagram of pn junction - Qualitative description of charge flow across a pn junction	1
1.7	Forward and reverse biased pn junctions	1
1.8	Diode equation (Derivation)	1
1.9	I-V Characteristics of pn junction	1
	MODULE II: Quantum Mechanics & Electromagnetism(9 Hours)	
2.1	Introduction to Quantum mechanics,Wave nature of particles, Physical Significance of Wave Function	1
2.2	Heisenberg's Uncertainty Principle-Applications Absence of electron inside the nucleus	1

2.3	Formulation of time dependent Schrodinger equations	1
2.4	Formulation of time independent Schrodinger equations	1
2.5	Particle in a one- dimensional box - Derivation of energy eigenvalues and normalized wave function	1
2.6	Magnetic field and Magnetic flux density, Permeability and susceptibility	1
2.7	Gauss's law for Magnetic flux density, Ampere's Circuital law, Faraday's law	1
2.8	Classification of magnetic materials-Para, Dia and Ferro magnetic materials	1
2.9	Maxwell's Equations, Velocity of Electromagnetic waves in free space (Derivation)	1
MODULE III : Dielectrics & Superconductivity(9 Hours)		
3.1	The dielectric constant, Polarisation, Permittivity & Relative permittivity,	1
3.2	Relation between polarisation and dielectric constant, Types of Polarization.	2
3.3	Internal Fields in liquids and solids, Clausius Mussotti Relation	1
3.4	Dielectric loss(qualitative), Dielectric breakdown(qualitative),	1
3.5	Superconductivity, Transition temperature, Critical field,	1
3.6	Meissner effect	1
3.7	Type I and Type II superconductors	1
3.8	BCS Theory	1
3.9	Applications of Superconductors	
MODULE IV: Laser & Fibre Optics (9 Hours)		
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,	1
4.4	Construction and working of Ruby laser, Applications of laser.	1
4.5	Optical fibre-Principle of propagation of light	1
4.6	Types of fibres -Step index and Graded index fibre, Multimode, Single mode	1
4.7	Acceptance angle, Numerical aperture –Derivation,	1
4.8	Applications of optical fibres	1
4.9	Fibre optic communication system (block diagram)	1

LESSON PLAN FOR LAB COMPONENT

No.	Topic	No. of Hours	Experiment
	Semiconductor Physics	2	V-I characteristics of solar cells.

1		2	Diode characteristics.
		2	V-I characteristics of Zener diodes.
2	**Quantum Mechanics & Electromagnetic Theory**	2	Measure the size of lycopodium powder using a laser.
		2	Quantum mechanical tunnelling using simulation.
		2	Prove Faraday's law
3	**Dielectrics & Superconductivity**	2	Determination of the dielectric constant of solids and liquids
		2	Variation of the magnetic field with temperature using simulation.
4	**Laser & Fibre Optics**	2	Determination of wavelength of Laser using diffraction grating.
		2	CRO-Measurement of frequency and amplitude of wave forms.
		2	Determination of the Numerical Aperture and acceptance angle of an optic fibre cable.
(Any 2 experiments from each topic to be completed)			

CO Assessment Questions	
CO1	1. Explain the variation of intrinsic carrier concentration with temperature. 2. Derive the density of electrons in the conduction band and the density of holes in the valence band in the intrinsic semiconductor. 3. Explain the energy band diagram of the pn junction. 4. Apply the principle of pn junction and hence explain the construction and working of a solar cell
CO2	1. Apply Heisenberg's uncertainty principle to prove the absence of electrons inside the nucleus. 2.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. 3.Compare the properties of paramagnetic, diamagnetic and ferromagnetic materials with two examples for each. 4. A magnetizing field of 1800 A/m produces a magnetic flux of 3 x 10 -5 Wb in an iron bar with a cross-sectional area of 0.2 cm2. Calculate the permeability.
CO3	1.Define Dielectric constant and polarisation also derive the relation between them. 2. When NaCl crystal is subjected to an electric field of 50V/cm. the resulting polarization is 2.215 x 10 -7 C/cm^2.Calculate relative permittivity of NaCl. 3. Apply Meissner effect to prove that superconductor is perfectly diamagnetic.

	4.Distinguish between type I and type II superconductors with suitable diagrams and examples.
CO4	1. Distinguish between spontaneous and stimulated emission. 2. Explain the construction and working of a ruby laser with the help of energylevel diagrams by applying the concept of stimulated emission. 3. Determine the Numerical Aperture of an optic fibre cable. 4. The numerical aperture of an optic fibre is 0.295, and the refractive index of the core is 1.54. Calculate the refractive index of cladding and acceptance angle.
CO5	1. Draw the V-I Characteristics of Zener Diode 2. Determine the size of lycopodium powder using a laser. 3. By applying the principle of Diffraction determine the wavelength of a laser source using a diffraction grating arrangement. 4. Determination of the Numerical Aperture and acceptance angle of an optic fibre cable.

Prepared by
Ms. Jasmine Johny
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

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

CO-PO MAPPING

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

Total Marks distribution

Total Marks	CIA(Marks)	ESE(Marks)	ESE Duration
100	40	60	2hrs 30min

End Semester Examination [ESE]: Pattern

	PART A	PART B	ESE Marks
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

SYLLABUS

MODULE I: Introduction to Engineering Drawing and Orthographic Projection of Points and Lines (11 Hours)

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)

MODULE II: Orthographic Projections of Solids (10 Hours)

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.

MODULE III: Section of solids and Development of Surfaces (10 Hours)

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)

MODULE IV: Isometric Projection and Multi-view Projection (5 Hours)

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:

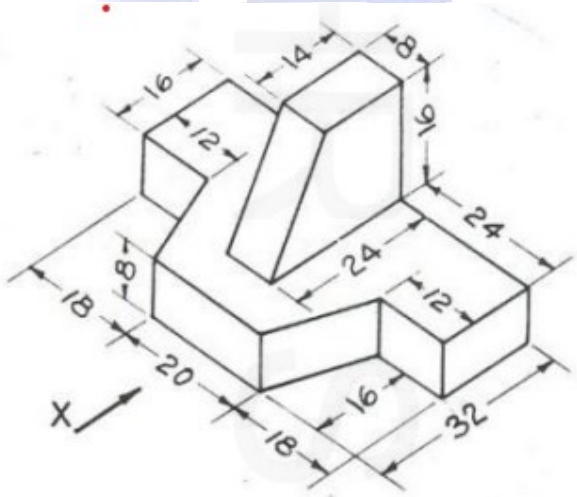
1. Engineering Drawing, Prof P.S. Robi, IIT Guwahati https://nptel.ac.in/courses/112103019
2. Engineering Graphics and Design, Naresh V Datla, Sunil R Kale, IIT Delhi https://archive.nptel.ac.in/courses/112/102/112102304/

No.	COURSE CONTENTS AND LECTURE SCHEDULE	No. of Hours (36)
	MODULE1(11 Hours)	
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
	MODULE II (10 Hours)	
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
	MODULE III (10 Hours)	
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
MODULE IV (5 Hours)		
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
Total Hours		**36**

CO Assessment Questions

CO1	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 40^0 and 45^0 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. 2. The front view of a line AB measures 70mm and makes an angle of 50^0 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 40^0 to the VP. Draw the projections of the line, find its true length and true inclination to HP, and locate its HT. 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. 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 30^0 to VP and the front view of its axis is inclined at 45^0 to XY line. Draw its projections. 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 30^0 to VP. Draw its projections. 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 45^0 with HP and the base edge on which it rests is inclined at 30^0 with VP. Draw the projections of the solid.

CO2	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 40^0 with HP. Draw the front view, sectional top view and true shape of the section. 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 30^0 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. 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 45^0 to HP, perpendicular to VP and passing through the midpoint of the axis. Draw the development showing the remaining portion of the solid.
CO3	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 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. 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 

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

24EST204	PROGRAMING IN C	L	T	P	R	C	Year of Introduction
		2	1	2	0	4	2024

Preamble: 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.

Prerequisite: NIL

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

CO 1	Analyze a computational problem and develop an algorithm/flowchart to find its solution. **[Analyze]**
CO 2	Develop readable C programs with branching and looping statements, which uses Arithmetic, Logical, Relational or Bitwise operators. **[Understand]**
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 **[Apply]**
CO 4	Write readable C programs which use pointers for array processing and parameter passing and operation in files. **[Apply]**

CO - PO MAPPING

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

Assessment Pattern for Theory Component

Bloom's Category	Continuous Assessment Tools			End Semester Examination
	Test 1	Test 2	Other tools	
Remember	√	√		√
Understand	√	√		√
Apply	√	√		√
Analyze	√	√		√
Evaluate				
Create				

Assessment Pattern for Lab 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- 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(7 Hours)

Processor, Memory, Input& Output devices

Application Software & System software: Compilers, interpreters, High level and low-level languages Introduction to structured approach to programming, Flow chart Algorithms, Pseudo code (*bubble sort, linear search - algorithms and pseudocode*

MODULE II: Program Basics(8 Hours)

Basic structure of C program: Character set, Tokens, Identifiers in C, Variables and Data Types, Constants, Console IO Operations, printf and scanf

Operators and Expressions: Expressions and Arithmetic Operators, Relational and Logical Operators, Conditional operator, size of operator, Assignment operators and Bitwise Operators. Operators Precedence

Control Flow Statements: 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(11 Hours)

Arrays: Arrays Declaration and Initialization ,1-Dimensional Array, 2-Dimensional Array

String processing: In built String handling functions (strlen, strcpy, strcat and strcmp, puts, gets) **Introduction to modular programming**: writing functions, formal parameters, actual parameters Pass by Value, Recursion, Arrays as Function Parameters

structure, union, Storage Classes, Scope and lifetime of variables, *simple programs using functions*

MODULE IV: Pointers and Files

Pointers: Declaring pointers, accessing data though pointers, NULL pointer, array access using pointers, pass by reference effect

File Operations: open, close, read, write, append, Sequential access and random access to files: In built file handling functions (*rewind() ,fseek(), ftell(), feof(), fread(), fwrite()*), *simple programs covering pointers and files.*

Textbooks

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.

Reference books

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

NPTEL/SWAYAM Courses for reference:

1. Introduction to Programming in C - https://archive.nptel.ac.in/courses/106104128/
2. Problem solving through programming in C - https://archive.nptel.ac.in/courses/106105171/
3. C Programming and Assembly Language - https://archive.nptel.ac.in/courses/106106210/

No.	COURSE CONTENTS AND LECTURE SCHEDULE	No. of Hours (36)
	Module 1: Basics of Computer Hardware and Software (7 Hours)	
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
	MODULE II: Program Basics (8 Hours)	
2.1	**Basic structure of C program:** Character set, Tokens, Identifiers in C, Variables and Data Types, Constants, Console IO Operations, printf and scanf	2
2.2	**Operators and Expressions:** Expressions and Arithmetic Operators, Relational and Logical Operators, Conditional operator, sizeof operator, Assignment operators and Bitwise Operators. Operators Precedence	2
2.3	**Control Flow Statements:** If Statement, Switch Statement,	4

	Unconditional Branching using go to statement, While Loop, Do While Loop, For Loop, Break and Continue statements. *(Simple programs covering control flow)*	
MODULE III: Arrays, Strings and Functions (11 Hours)		
3.1	Arrays Declaration and Initialization, 1-Dimensional Array, 2-Dimensional Array	2
3.2	**String processing:** In built String handling functions (*strlen, strcpy, strcat and strcmp, puts, gets*), *Simple programs covering arrays and strings*	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
MODULE IV: Pointers and Files (6 Hours)		
4.1	**Basics of Pointer**: declaring pointers, accessing data though pointers, NULL pointer,array access using pointers, pass by reference effect	3
4.2	**File Operations**: open, close, read, write, append	4
4.3	**Sequential access and random access to files:** In built file handling functions (*rewind (), fseek(), ftell(), feof(), fread(), fwrite()*, *simple programs covering pointers and files.*	2

LESSON PLAN FOR LAB COMPONENT

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	
CO1	1. Write short note on processor and memory in a computer. 2. What are the differences between compiled and interpreted languages? Give example for each. 3. With the help of a flow chart, explain the bubble sort operation. Illustrate with an example Display "Hello World" Program
CO2	1. 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". 2. Is it advisable to use *goto* statements in a C program? Justify your answer. 3. With suitable examples, explain various operators in C. 4. Read the radius of a circle, calculate its area and display it
CO3	1. 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. 2. Write a C program to check whether a given matrix is a diagonal matrix. 3. Without using any builtin string processing function like *strlen*, *strcat* etc., write a program to concatenate two strings 4. Find the factorial of a given Natural Number n using recursive and non-recursive functions
CO4	1. With an example, explain the different modes of opening a file. 2. Differentiate between sequential files and random-access files? 3. Using the prototypes explain the functionality provided by the followir

	functions. i)(*rewind(), ii)fseek() iii)ftell(), iv) fread(), v) fwrite()* 4. With a suitable example, explain the concept of pass by reference. 5. Create a file and perform the following i) Write data to the file ii) Read th in each file & display the file content on console iii) append new data and on console

Prepared By

Ms. Minnuja Shelly
Asst. Prof, CSE
Ms. Anly Antony
Asst. Prof, CSE

24EER205	MEASUREMENTS & INSTRUMENTATION	L	T	P	R	C	Year of Introduction
		3	0	0	1	4	2024

Preamble:
This course equips students with essential knowledge and skills in accurately measuring and analyzing various physical parameters. It covers fundamental concepts, error analysis, and the operation of key instruments. Students will explore power measurement, modern energy metering technologies, and advanced measurement techniques. The syllabus includes practical applications of resistance, inductance, and capacitance measurement, as well as the use of digital tools and transducers. By the end of the course, students will be well-prepared for engineering challenges in measurement and instrumentation

Prerequisite: NIL

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

CO 1	Identify the factors affecting the performance of measuring instruments **(understand)**
CO 2	Choose appropriate instruments and bridges for the measurement of electrical parameters by understanding the working principle **(Apply)**
CO 3	Understand the principles of operation of transducers **(Understand)**
CO 4	Understand the operating principles of basic building blocks of digital systems, recording and display units **(Understand)**
CO5	Apply theoretical knowledge of electrical measurements and instrumentation to solve real-world problems **(Apply)**

CO - PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3											2
CO 2	3	3	2									2
CO 3	3											2
CO 4	3											2
CO5	3	3	3	3	2	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	**50**

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 will be given from each module. Answer any 6 questions (6x 3 = 18 marks)	2 questions will be given from each module, of which 1 should be answered. Each question can have a maximum of 2 sub-divisions. Each question carries 8 marks. Marks: (4x 8 = 32 marks)	50

SYLLABUS

MODULE I: Measurement of Voltage and Current (10 hours)

Static and dynamic characteristics of instruments, definitions relating to measuring instruments, errors in measurement principle, Instruments- Classification, Operating Forces and Torques

Construction and working of moving coil instruments, principle, construction and working of moving iron instruments, principles shunts and multipliers – extension of range.

MODULE II: Measurement of Power and Energy (8 hours)

Dynamometer type wattmeter–Construction, Theory and operation, errors, power in three-phase systems, Blondel's theorem, measurement of power in three-phase balanced and unbalanced systems, measurement of reactive power.

Induction type single phase energy meters, Construction theory and operation-errors, compensation and adjustments-testing of energy meters, phantom loading Digital Energy Meter, TOD Meter, Smart Metering, Bidirectional Meters (Description Only)

MODULE III: Bridges and Instrument Transformers (8 hours)

Measurement of Resistance, Wheatstone's Bridge, Kelvin's Double Bridge (Simple Problems), Loss of Charge Method, Measurement of Earth Resistance. Measurement of Inductance- Maxwell's Inductance bridge, Measurement of Capacitance - Schering's Bridge, Measurement of Frequency- Wien Bridge

Current transformers and potential transformers – principle of working -ratio and phase angle errors. Extension of range using instrument transformers

MODULE IV: Transducers, Digital Meters and Signal Analyzers (10 hours)

Transducers - Definition and classification. LVDT, Load cell, Strain gauge, RTD, thermocouple, Digital voltmeters and frequency meters using electronic counters, DMM CRO Basic Principles and Block Diagram, DSO -Working Principle, Phasor Measurement Unit (Block Schematic) Harmonic Analyzers, Basic Description and Block Diagram Only

Textbooks

1. Sawhney A.K., A course in Electrical and Electronic Measurements & Instrumentation, Dhanpat Rai.
2. J. B. Gupta, A course in Electrical & Electronic Measurement & Instrumentation., S K Kataria & Sons

Reference books

1. Oliver & Cage, Electronic Measurements & Instrumentation, McGraw Hill
2. P.Purkait, B.Biswas, S.Das and C. Koley, Electrical and Electronics Measurements and Instrumentation, McGraw Hill Education (India) Pvt. Ltd.,2013
3. E.O Doebelin and D.N Manik, Doebelin's Measurements Systems, sixth edition, McGraw Hill Education (India) Pvt. Ltd.
4. Golding E.W., Electrical Measurements & Measuring Instruments, Wheeler Pub
5. P.Purkait, B.Biswas, S.Das and C. Koley, Electrical and Electronics Measurements and Instrumentation, McGraw Hill Education (India) Pvt. Ltd.

NPTEL/SWAYAM Courses for reference:

1. PROF. AVISHEK CHATTERJEE,ELECTRICAL MEASUREMENTS & ELECTRONIC INSTRUMENTS, IIT Kharagpur, https://archive.nptel.ac.in/courses/108/105/108105153/
2. PROF. ALOK BARUAIndustrial instrumentation, IIT Kharagpur, https://archive.nptel.ac.in/courses/108/105/108105064/

No.	COURSE CONTENTS AND LECTURE SCHEDULE	No. of Hours (36)
	MODULE I (10 hours)	
1.1	Static and dynamic characteristics of instruments	1
1.2	Definitions relating to measuring instruments, errors in measurement principle	1
1.3	Instruments- Classification, Operating Forces and Torques	2
1.4	Construction and working of moving coil instruments	2
1.5	Construction and working of moving iron instruments	2
1.6	Shunts and multipliers – extension of range	2
	MODULE II (8 hours)	
2.1	Dynamometer type wattmeter–Construction, Theory and operation, Errors	2
2.2	Power in three phase systems	1

2.3	Blondel's theorem, measurement of power in three phase balanced and unbalanced systems, measurement of reactive volt amperes	2
2.4	Induction type single phase energy meters, Construction theory and operation-errors, compensation and adjustments-testing of energy meters, phantom loading	3
MODULE III (8 hours)		
3.1	Measurement of Resistance, Wheatstone's Bridge, Kelvin's Double Bridge (Simple Problems), Loss of Charge Method, Measurement of Earth Resistance.	2
3.2	Measurement of Inductance- Maxwell's Inductance bridge	1
3.3	Measurement of Capacitance - Schering's Bridge, Measurement of Frequency- Wien Bridge	2
3.4	Current transformers and potential transformers – principle of working -ratio and phase angle errors. Extension of range using instrument transformers	3
MODULE IV (10 hours)		
4.1	Transducers - Definition and classification. LVDT, Load cell, Strain gauge	3
4.2	Basics of Thermal sensors, RTD, thermocouple, Digital voltmeters and frequency meters using electronic counters, DMM	3
4.3	CRO Basic Principles and Block Diagram, DSO -Working Principle	2
4.4	Phasor Measurement Unit (Block Schematic) Harmonic Analysers, Basic description and Block Diagram Only	2
PROJECT		
LESSON PLAN FOR PROJECT COMPONENT		
No.	**Topic**	**No. of Hours (12)**
1	Preliminary Design of the Project	2
2	Zeroth presentation (4th week)	2
3	Project work - First Phase	2
4	Interim Presentation	2
5	Project work - Final Phase & Report writing (discussions in class during project hours)	2
6	Final Evaluation, Presentation and Exhibition (11th and 12th weeks)	2
CO Assessment Questions		
CO1	1. Define the following terms in measurement (a)Accuracy (b) Precision (c)Resolution 2. Explain two mechanisms for producing control torque in electrical measuring instruments with neat diagrams. 3. Explain different torque associated with measuring instruments	

	4. Explain about different standards of measurements
CO2	1. Explain how low resistance is measured using Kelvins Double Bridge method. Derive the balance equation use. 2. With neat circuit diagram and phasor explain how capacitance is measured using Schering Bridge. Explain dissipation factor and derive its equation. 3. With neat sketch illustrate the working of PMMC instruments. 4. Explain the range extension process of ammeters and voltmeters.
CO3	1. Explain the basic principle and working of LVDT. 2. Illustrate the procedure of temperature measurement using thermocouple. 3. Compare the temperature measurement using RTD and thermistor. 4. With neat sketch explain the strain measurement using strain gauge.
CO4	1. Write short notes on a. I. Digital Multi Meter b. II. RTD 2. Draw a neat block diagram of a Cathode Ray Oscilloscope and describe the function of each block in detail. 3. With a neat circuit diagram explain the working principle of DSO. 4. Illustrate the working principle of phasor measurement unit.

Prepared by,

Mr. Sebin Davis K, Assistant Professor, Department of EEE
Mr. Adarsh S R, Assistant Professor, Department of EEE

24HUT006	PROFESSIONAL ETHICS AND SUSTAINABLE DEVELOPMENT	L	T	P	R	C	Year of Introduction
		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

CO1	Understand key ethical principles and moral development theories that shape the ethical behavior of a professional.
CO2	Analyze the role and responsibility as engineers through real world case studies to solve moral and ethical problems.
CO3	Appreciate the relevance and necessity of sustainable development and recognize good practices and opportunities for an integrated approach to sustainable development
CO4	Understand case studies about sustainable and socially responsible projects which impart students an effective way to realize real-world situations

CO – PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1			1			3	2	3	2			3
CO2			1			3	2	3	2	3	2	3
CO3			1			3	3	2	2			3
CO4			1			3	3	2	2	3	2	3

Assessment Pattern

Bloom's Category	Continuous Assessment Tools			Case studies
	Test 1	Test 2	Assignment	
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
2. Non-Conventional Energy Sources
   https://nptel.ac.in/noc/individual_course.php?id=noc18-ge14
3. Education for Sustainable Development
   https://onlinecourses.nptel.ac.in/noc22_hs61/preview

No.	COURSE CONTENTS AND LECTURE SCHEDULE	No. of Hours (36 hours)
	MODULE 1 (4 Hours)	
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
MODULE 2 (4 Hours)		
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
MODULE 3 (4 Hours)		
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
MODULE 4 (4 Hours)		
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
LESSON PLAN FOR CASE STUDIES		
No.	**Topic**	**No. of Hours (20)**
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
CO Assessment Questions		
CO1	1. Define integrity and point out ethical values. 2. Discuss in detail about moral development theories 3. Investigate the responsibilities of a professional with case studies	
CO2	1. Illustrate the role of engineers as experimenters. 2. Exemplify the engineers as managers. 3. Investigate the ethics in emerging technologies with case studies	
CO3	1. Explain the necessity for Sustainable Development. 2. Enumerate SDG. Describe the challenges and barriers to sustainable development 3. Give any three examples for Nexus between Technology and Sustainable development.	
CO4	1. Describe Sustainable practices for achieving Economic sustainability 2. Enumerate global environmental issues 3. Investigate the Sustainable practices for sustainable habitat with case studies	

Prepared by,

Ms. Mini M, Assistant Professor, Department of CE
Ms. Uma E S, Assistant Professor, Department of CSE
Ms. Elsa Raju A, Asst. Prof., CSE

24ESL007	COMPUTER AIDED DRAWING (CAD) & MANUFACTURING WORKSHOP	L	T	P	R	C	Year of Introduction
		0	0	2	0	1	2024

Preamble:
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.

Prerequisite: NIL

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

CO1	Identify mechanical operations in accordance with manufacturing of products. [Understand]
CO2	Application of advanced metrology instruments used in general workshop. Accomplish model making using modern manufacturing method.[Apply]
CO3	Execute 2D and 3D drawing using CAD software.[Apply]
CO4	Critically assess the advantages and limitations of 3D printing compared to traditional manufacturing methods. [Understand]

CO-PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2								2			
CO2					3				2			
CO3					2					3		
CO4					3							

Assessment Pattern

Bloom's Category	Continuous Assessment Tools	
	Classwork	Test1
Remember	√	√
Understand	√	√
Apply	√	√
Analyze	√	
Evaluate	√	
Create		

Mark Distribution of CIA

Course Structure [L-T-P-R]	Attendance	Classwork	Lab Exam	Total Marks
0-0-2-0	5	35	10	50

Total Mark distribution

Total Marks	CIA(Marks)	ESE(Marks)	ESE Duration

50	50	0	-

SYLLABUS-DETAILS OF EXPERIMENTS

SECTION – 1 (Manufacturing Lab Experiments)
Minimum 5 experiments are mandatory

General study of manufacturing process – Foundry – Sheet metal – Fitting – Welding – Metrology – Modern manufacturing method – Power tools.

SECTION – 2 (CAD Lab Experiments)
Minimum 5 experiments are mandatory

Introduction to Computer Aided Drawing (CAD) – 2D Drafting – 3D Modeling

Textbooks

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

Reference Books

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

LIST OF EXPERIMENTS

Manufacturing - 12Hrs
(Minimum 5 experiments are mandatory)

No.	Experiments
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.

CAD LAB - 12Hrs
(Minimum 5 experiments are mandatory)

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.
CO Assessment Questions	
C01	1. Identify the tools given to you and demonstrate their proper use. 2. Choose a suitable manufacturing process to make the given model.
CO2	1. Identify the given measuring instrument and demonstrate its proper use. 2. Take the 3D printout of the given drawing.
CO3	1. Prepare 2D drawings using CAD software. 2. Prepare 3D drawings using CAD software.
CO4	1. Find the advantages of 3D printing compared to traditional manufacturing processes. 2. Find the limitations of 3D printing compared to traditional manufacturing processes.

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