SYLLABUS

B. Tech.

MECHANICAL ENGINEERING

2024 SCHEME

Signed By:Devassia V P
Approved by SJCET Academic Council held on 29.11.2024

COURSES

SEMESTER – I

SEMESTER I COURSES

Sl. No:	Slot	Course Code	Course Type	Course Category	Course Title (Course Name)	Credit Structure				SS	Total Marks		Credits	Hrs./Week
						L	T	P	R		CIE	ESE		
1	A	24SJGYMAT101	BSC	GC	Mathematics for Electrical Science and Physical Science - 1	3	0	0	0	4.5	40	60	3	3
2	B S1/ S2	24SJGCPHT121	BSC	GC	Physics for Physical Science and Life Science	3	0	2	0	5.5	40	60	4	5
		24SJGCCYT122			Chemistry for Physical Science									
3	C	24SJGCEST103	ESC	GC	Engineering Mechanics	3	0	0	0	4.5	40	60	3	3
4	D	24SJGCEST104	ESC	GC	Introduction to Mechanical Engineering and Civil Engineering (Part1: Mechanical Engineering)	2	0	0	0	3	20	30	2+2 =4	4
					(Part 2: Civil Engineering)	2	0	0	0	3	20	30		
5	F	24SJICEST105	ESC	IC	Algorithmic Thinking with Python	3	0	2	0	5.5	40	60	4	5
6	L	24SJGCESL106	ESC	GC	Engineering Workshop	0	0	2	0	1	50	50	1	2
7	I* S1/ S2	24SJICHWT127	HWP	IC	Health and Wellness	1	0	1	0	0	50	0	1	2/3
		24SJICHUT128	HMC		Life Skills and Professional Communication	2	0	1	0	3.5	100			
8	S1/ S2	24SJICSEM129	SEC	IC	Skill Enhancement Course: *Digital 101(NASSCOM)*	MOOC				2			-	
Total										**30/ 32**			**20**	**24/ 25**

No Grade Points will be awarded for the MOOC course and I slot course.

MATHEMATICS FOR ELECTRICAL SCIENCE AND PHYSICAL SCIENCE - 1

Course Code	24SJGYMAT101	CIE Marks	40
Teaching Hours/Week (L:T:P:R)	3:0:0:0	ESE Marks	60
Credits	3	Exam Hours	2 Hrs. 30 Min.
Pre-requisites (if any)	Basic knowledge in single variable calculus and matrix operations.	Course Type	Theory

Course Objectives:

- To provide a comprehensive understanding and basic techniques of matrix theory to analyse linear systems.
- To offer advanced knowledge and practical skills in solving second-order ordinary differential equations, applying Laplace transforms and understanding Fourier series, enabling students to analyse and model dynamic systems encountered in engineering disciplines effectively.

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Solve systems of linear equations and diagonalize matrices.	K3
CO2	Solve homogeneous and non-homogeneous linear differential equations with constant coefficients.	K3
CO3	Compute Laplace transforms and apply it to solve ODEs arising in engineering.	K3
CO4	Determine the Taylor series and Fourier series expansion for different periodic functions and to apply in engineering Problems	K3

K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping:

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

SYLLABUS

Module	Syllabus Description	Contact Hours	CO
1	Linear systems of equations: Gauss elimination, Row echelon form, Linear independence: Rank of a matrix, Solutions of linear systems: Existence, Uniqueness (without proof), The matrix eigen value problem, Determining eigen values and eigen vectors, Diagonalization of matrices. **(Text 1: Relevant topics from sections 7.3, 7.4, 7.5, 8.1, 8.4)**	**9**	**1**
2	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-homogenous ODEs (with constant coefficients) - General solution, Particular solution by the method of undetermined coefficients (Particular solutions for the functions $ke^{\gamma x}$, kx^n, $kcos\omega x$, $ksin\omega x$, $ke^{\alpha x}cos\omega x$, $ke^{\alpha x}sin\omega x$), Initial value problem for Non-Homogeneous second order linear ODE (with constant coefficients), Solution by variation of parameters (second order). **(Text 1: Relevant topics from sections 2.1, 2.2, 2.7, 2.10)**	**9**	**2**
3	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 only), Unit step function, Second shifting theorem, Dirac delta function and its transform (initial value problems involving unit step function and Dirac delta function are excluded), Convolution theorem (without proof) and its application to finding inverse Laplace transform of products of functions. **(Text 1: Relevant topics from sections 6.1, 6.2, 6.3, 6.4, 6.5)**	**9**	**3**
4	Taylor series representation (without proof, assuming the possibility of power series expansion in appropriate domains), Maclaurin series representation, Fourier series, Euler formulas, 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. **(Text 1: Relevant topics from sections 11.1, 11.2,** **Text 2: Relevant topics from section 10.8)**	**9**	**4**

Course Assessment Method (CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Micro project	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total

5	**15**	**10**	**10**	**40**

End Semester Examination Marks (ESE):

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
2 Questions from each module. Total of 8 Questions, each carrying 3 marks **(8x3 = 24marks)**	Each question carries 9 marks. Two questions will be given from each module, out of which one question should be answered. Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

Text Books

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Advanced Engineering Mathematics	Erwin Kreyszig	John Wiley & Sons	10th edition, 2016
2	Calculus	H.Anton, I.Biven, S.Davis	Wiley	12th edition, 2024

Reference Books

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Thomas' Calculus	Maurice D. Weir, Joel Hass, Christopher Heil, Przemyslaw Bogacki	Pearson	15th edition, 2023
2	Essential Calculus	J. Stewart	Cengage	2nd edition, 2017
3	Elementary Linear Algebra	Howard Anton, Chris Rorres	Wiley	11th edition, 2019
4	Bird's Higher Engineering Mathematics	John Bird	Taylor & Francis	9th edition, 2021
5	Higher Engineering Mathematics	B. V. Ramana	McGraw-Hill Education	39th edition, 2023
6	Signals and Systems	Simon Haykin, Barry Van Veen	Wiley	2nd edition, 2002

Video Links (NPTEL, SWAYAM…)

Module No.	Link ID
1	https://archive.nptel.ac.in/courses/111/107/111107164/
2	https://archive.nptel.ac.in/courses/111/104/111104031/
3	https://archive.nptel.ac.in/courses/111/106/111106139/
4	https://archive.nptel.ac.in/courses/111/101/111101164/

CHEMISTRY FOR PHYSICAL SCIENCE

Course Code	24SJGCCYT122	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:0:2:0	ESE Marks	60
Credits	4	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	None	Course Type	Theory+ Lab

Course Objectives:

- To equip students with a thorough understanding of chemistry concepts relevant to engineering applications.
- To familiarize students with applied topics such as spectroscopy, electrochemistry, and instrumental methods.
- To raise awareness among students about environmental issues, including climate change, pollution, and waste management, and their impact on quality of life.

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Describe the use of various engineering materials in different industries.	K2
CO2	Explain the Basic Concepts of Electrochemistry and Corrosion to Explore the Possible Applications in Various Engineering Fields.	K2
CO3	Use appropriate analytical techniques for different engineering materials	K3
CO4	Outline various water treatment and waste management methods	K2

K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping:

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

SYLLABUS

Module	Syllabus Description	Contact Hours	CO
1	**Engineering Materials** **Fuels:** Calorific value – HCV and LCV – Experimental determinationof calorific value of solid fuels. Analysis of coal – Proximate analysis- Octane &Cetane Number. Biofuels- Biodiesel-Green Hydrogen. **Lubricants**: Classification - Solid, Semisolid and Liquid lubricants. Properties of lubricants - Viscosity Index, Flash point, Fire point, Cloud Point, Pour Point & Aniline Point. **Cement:** Manufacture of Portland cement – Theory of setting and hardening of cement. **Nanomaterials:** Classification based on dimension & materials- Synthesis – sol gel & chemical reduction - Applications of nanomaterials – Supercapacitor materials - Carbon nanotubes, Fullerenes & Graphene – structure, properties & application. **Polymers**: ABS & Kevlar - synthesis, properties and applications. Conducting polymers- classification – application.	9	1
2	**Electrochemistry and Corrosion Science** **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 using digital conductivity meter. L_i - ion battery & H_2-O_2 fuel cell (acid electrolyte only) 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	9	2
3	**Instrumental Methods of Analysis** **Molecular 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:** –TGA- Principle, instrumentation (block diagram) and applications–TGA of $CaC_2O_4.H_2O$ and polymers. DTA- Principle, instrumentation (block diagram) and applications - DTA of $CaC_2O_4.H_2O$. **Chromatography –** Gas Chromatography - Principle-instrumentation-application – Analysis of chemical composition of exhaust gases. **Electron Microscopic Techniques:** SEM - Principle, instrumentation and applications.	9	3

4	**Environmental Chemistry** **Water characteristics** - Hardness - Types of hardness - temporary and permanent - Disadvantages of hard water - Degree of hardness (Numerical). Water softening methods - Ion exchange process- Principle, procedure and advantages. Reverse osmosis – principle, process and advantages. Water disinfection methods – chlorination- break point chlorination, ozone and UV irradiation. DO, BOD and COD- definition & significance **Waste Management**: Air Pollution- Sources & Effects- Greenhouse Gases- Ozone depletion. Control methods. Sewage water treatment- primary, secondary and tertiary - flow diagram -Trickling filter and UASB process. Solid waste-disposal methods- Composting, Landfill & Incineration.	**9**	**4**

Course Assessment Method (CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Continuous Assessment	Internal Examination-1 (Written)	Internal Examination-2 (Written)	Internal Examination- 3 (Lab Examination)	Total
5	10	10	10	5	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
2 Questions from each module. Total of 8 Questions, each carrying 3 marks **(8x3 = 24 marks)**	Each question carries 9 marks. Two questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 3 subdivisions. **(4x9 = 36 marks)**	**60**

Continuous Assessment (10 Marks)

Continuous assessment evaluations are conducted based on laboratory associated with the theory.

Mark distribution

1. **Preparation and Pre-lab work (2 Marks)**
   - **Pre-lab assignments**: Assessment of pre-lab assignments or quizzes that test understanding of the upcoming experiment.
   - **Understanding of theory:** Evaluation based on students' preparation and understanding of the theoretical background related to the experiments

2. **Conduct of experiments (2 Marks)**
    - **Procedure and execution:** Adherence to correct procedures, accurate execution of experiments, and following safety protocols.
    - **Skill proficiency:** Proficiency in handling equipment, accuracy in observations, and trouble shooting skills during the experiments.
    - **Teamwork:** Collaboration and participation in group experiments.
3. **Lab reports and record keeping (3 Marks)**
    - **Quality of reports:** Clarity, completeness and accuracy of lab reports. Proper documentation of experiments, data analysis and conclusions.
    - **Timely submission:** Adhering to deadlines for submitting lab reports/rough record /maintaining a well-organized record.
4. **Viva voce (3 Marks)**

    Oral examination: Ability to explain the experiment, results and underlying principles during viva voce session.

Final marks averaging: *The final marks for preparation, conduct of experiments, viva, and record are the average of all the specified experiments in the syllabus.*

Evaluation Pattern for Lab Examination (5 Marks)

1. **Procedure/Preliminary work/Conduct of experiments (2 Marks)**
    - **Procedure understanding and description:** Clarity in explaining the procedure and understanding each step involved.
    - **Preliminary work and planning:** Thoroughness in planning and organizing materials / equipment.
    - **Setup and execution:** Proper setup and accurate execution of the experiment or programming task.
2. **Result (2 Marks)**

    Accuracy of results: Precision and correctness of the obtained results.
3. **Viva voce (1 Mark)**

    Proficiency in answering questions related to theoretical and practical aspects of the subject

Text Books

Sl.No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Engineering Chemistry	B. L. Tembe, Kamaluddin, M. S. Krishnan	NPTEL Web-book	2018
2	Physical Chemistry	P. W. Atkins	Oxford University Press	International Edition - 2018
3	Instrumental Methods of Analysis	H. H. Willard, L. L.Merritt	CBS Publishers	7th Edition - 2005
4	Engineering Chemistry	Jain & Jain	Dhanpath Rai PublishingCompany	17th Edition - 2015

Reference Books				
Sl.No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Fundamentals of Molecular Spectroscopy	C. N. Banwell	McGraw-Hill	4th Edn.,1995
2	Principles of Physical Chemistry	B. R. Puri, L. R.Sharma, M. S. Pathania	Vishal Publishing Co	47th Edition, 2017
3	Introduction to Spectroscopy	Donald L. Pavia	Cengage LearningIndia Pvt. Ltd	2015
4	Polymer Chemistry: An Introduction	Raymond B. Seymour, Charles E. Carraher	Marcel Dekker Inc	4th Revised Edition,1996
5	The Chemistry of Nanomaterials: Synthesis, Properties andApplications	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
6	Organic Electronics Materials and Devices	Shuichiro Ogawa	Springer Tokyo	2024
7	Principles and Applications of Thermal Analysis	Gabbot, P	Oxford: Blackwell Publishing	2008

Video Links (NPTEL, SWAYAM…)	
Sl No.	**Link ID**
1	https://archive.nptel.ac.in/courses/104/106/104106137/ https://archive.nptel.ac.in/courses/113/105/113105102/ https://archive.nptel.ac.in/courses/113/104/113104082/ https://www.youtube.com/watch?v=BeSxFLvk1h0
2	https://archive.nptel.ac.in/courses/113/104/113104102/ https://archive.nptel.ac.in/courses/104/105/104105124/ https://archive.nptel.ac.in/courses/105/104/105104157/

List of Experiments

(*Minimum 10 Experiments)

Expt. Nos.	Experiment	CO
1	Estimation of iron in iron ore	4
2	Estimation of copper in brass	4
3	Determination of cell constant and conductance of solutions	2
4	Calibration of pH meter and determination of pH of a solution	2
5	Synthesis of polymers (a) Urea-formaldehyde resin (b) Phenol-formaldehyde resin	1
6	Determination of wavelength of absorption maximum and colorimetric estimation of Fe^{3+} in solution	3
7	Determination of molar absorptivity of a compound ($KMnO_4$ or any water-soluble food colorant)	3
8	Analysis of IR spectra	3
9	Identification of drugs using TLC	3
10	Estimation of total hardness of water-EDTA method	4
11	Estimation of dissolved oxygen by Winkler's method	4
12	Determination of calorific value using Bomb calorimeter	1
13	Determination of saponification value of a given vegetable oil	1
14	Determination of acid value of a given vegetable oil	1
15	Verification of Nernst equation for electrochemical cell.	2

ENGINEERING MECHANICS

Course Code	**24SJGCEST103**	**CIE Marks**	40
Teaching Hours/Week (L: T:P: R)	3-0-0-0	**ESE Marks**	60
Credits	3	**Exam Hours**	2 Hrs. 30 Min.
Prerequisites (if any)	None	**Course Type**	Theory

Course Objectives:

The course aims to enable students to analyse and solve fundamental mechanics problems

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		**Bloom's Knowledge Level (KL)**
CO1	Recall principles and theorems related to rigid body mechanics and describe the components of forces acting on the rigid body	**K3**
CO2	Understand and apply the principles of friction and compute the centroid and moment of inertia of various composite areas	**K3**
CO3	Understand and apply the fundamental principles of rigid body dynamics in particular rectilinear translation	**K3**
CO4	Understand and solve problems on curvilinear and rotation motion	**K3**

K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping:

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

SYLLABUS

Module	Syllabus Description	Contact Hours	CO
1	**Introduction to statics:** Introduction to branches of mechanics, concept of rigid body scalars and vectors, vector operations, forces in space. Support reactions of beams (point load and UDL only) **Force systems:** rectangular components in 2D and 3D, moment and couple, resultants Equilibrium: system isolation and the free-body diagram, equilibrium conditions 2D and 3D	**10**	**1**
2	**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	**10**	**2**
3	**Dynamics** – rectilinear translation -equations of motion in kinematics and kinetics – D'Alembert's principle – motion on horizontal and inclined surfaces, motion of connected bodies	**8**	**3**
4	**Curvilinear translation** - equations of kinematics projectile motion (solution starting from differential equations) **Rotation** – kinematics of rotation- equation of motion for a rigid body rotating about a fixed axis –rotation under a constant moment	**8**	**4**

Course Assessment Method (CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	**15**	**10**	**10**	**40**

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any onefull question out of two questions

Part A	Part B	Total
2 Questions from each module. Total of 8 Questions, each carrying 3 marks **(8x3 = 24marks)**	Each question carries 9 marks. Two questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

Text Books				
Sl.No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Engineering Mechanics	Timoshenko and Young	McGraw Hill Publishers	5th Edition 2017
2	Engineering Mechanics: Combined Statics and Dynamics	Russell C. Hibbeler	Pearson Education,	14th Edition 2015
3	Engineering Mechanics - Statics and Dynamics,	Shames, I. H.	Prentice Hall of India.	4th Edition 2008
4	Textbook of Engineering Mechanics	R. K. Bansal	Laxmi publications Pvt. Ltd.	8th Edition 2016

Reference Books				
Sl. No	**Title of the Book**	**Name of theAuthor/s**	**Name of the Publisher**	**Edition and Year**
1	Engineering Mechanics Statics	J. L. Meriam, L. G.	Wiley	9th Edition 2020
2	Engineering Mechanics	Kraige	PHI Learning	2011

Video Links (NPTEL, SWAYAM…)
https://nptel.ac.in/courses/112106286

INTRODUCTION TO MECHANICAL ENGINEERING AND CIVIL ENGINEERING

Course Code	24SJGCEST104	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	4-0-0-0	ESE Marks	60
Credits	4	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	None	Course Type	Theory

Course Objectives:

- Understand thermodynamic cycles and working of IC engines.
- Understand the refrigeration cycles and psychrometric concepts.
- Understand the relevance of civil engineering and its various disciplines.
- Describe the relevance of various building codes and types of buildings as per NBC.
- Understand different building components and building materials.

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Learn the applications of thermodynamics through IC engines and refrigeration systems.	K2
CO2	Understand the various hydraulic machines, Power transmission elements and Manufacturing processes adapted by mechanical engineers.	K2
CO3	Understand the relevance of civil engineering, its various disciplines, relevance of various building codes and types of buildings.	K2
CO4	Understand different building components and building materials.	K2

K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping:

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

SYLLABUS

Module	Syllabus Description	Contact Hours	CO
1	**General introduction to Mechanical Engineering:** Thermodynamic cycles - Carnot Cycle -Derivation of efficiency (problems on efficiency) Otto, Diesel cycles (no derivation of efficiency and problems). **IC Engines**: CI & SI Engines, working of 2-Stroke & 4-Stroke engines. Listing the parts of IC Engines. Concept of CRDI, MPFI and hybrid engines. **Refrigeration:** Unit of refrigeration, reversed Carnot cycle, COP, vapour compression cycle (only description and no problems); Definitions of dry, wet & dew point temperatures, specific humidity and relative humidity, Psychrometric chart, Cooling and dehumidification, Layout of central air conditioning systems.	9	1
2	**Pumps:** Classification of pumps, Description about working with sketches of: Reciprocating pump, Centrifugal pump. Classification of Hydraulic Turbines. **Gears:** Different type of gears and its applications (spur, helical, bevel, worm and worm wheel), List types of clutches and their use, Bearings and their classification (Journal bearing and ball bearing) **Manufacturing Process**: Sand Casting, Forging, Rolling, Extrusion.Metal Joining Processes: List types of welding, Description with sketches of Arc Welding, SMAW, Soldering and Brazing and their applications. **Machining processes:** Description and operations performed on Lathe, Drilling machine, Milling machine, CNC machine, 3D printing.	9	2
3	**General Introduction to Civil Engineering**: Relevance of Civil Engineering in the overall infrastructural development of the country. Brief introduction to major disciplines of Civil Engineering like Structural Engineering, Geo-technical Engineering, Transportation Engineering, Water Resources Engineering and Environmental Engineering. **Introduction to buildings:** Types of buildings according to character of occupancy as per NBC, Load bearing and non-load bearing building structures, components of a residential building and their functions (concept only). Selection of site for a residential building. **Building Area Definitions**: Built up area, Plinth area, Floor area, Carpet area and Floor area ratio of a building as per KBR. Building rules and regulations: Relevance of NBC, KBR & CRZ norms (brief discussion of relevance only).	9	3
4	**Conventional construction materials:** Brick, stone, sand, cement and timber-Classifications, Qualities, Tests and Uses of construction materials. **Cement concrete:** Constituent materials, properties and types. **Tests on fresh and hardened concrete** - slump test, cubecompressive strength as per IS Codes. **Steel:** Structural steel sections and steel reinforcements – types anduses. **Soil** - Origin of soil-weathering of rocks, types of weathering	9	4

Course Assessment Method (CIE: 40 marks, ESE: 60 marks)

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Text Books

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition andYear
1	Basic Mechanical Engineering	Pravin Kumar	Pearson Education	1st Edition,2013
2	A Textbook of Basic Mechanical Engineering	R.K. Rajput	Laxmi Publications	3rd Edition,2017
3	Elements of Mechanical Engineering	K.P. Roy, S.K. Hajra Choudhury, A.K. Hajra Choudhury	Media Promoters & Publishers Pvt. Ltd.	Revised Edition, 2012
4	Fundamentals of Mechanical Engineering	G.S. Sawhney	PHI Learning Pvt. Ltd.	1st Edition,2013
5	Essentials of Civil Engineering	Dalal K R	Charotar Publishing house	1st Edition 2012
6	Engineering Materials (MaterialScience)	Rangwala S C	Charotar Publishing House Pvt Limited	43rd Edition2019
7	Building Materials	Duggal S K	New Age International	5thEdition2019

Reference Books				
Sl.No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Hybrid Electric Vehicles: Principles andApplications with Practical Perspectives	Chris Mi and M. Abul Masrur	John Wiley & Sons	2nd Edition,2017
2	Automotive Engineering Fundamentals	Richard Stone and Jeffrey K. Ball	SAE International	1st Edition, 2004
3	Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing	Ian Gibson, David W. Rosen, and Brent Stucker	Springer	2nd Edition, 2015
4	Heating, Ventilating, and Air Conditioning Analysis and Design	Faye C. McQuiston, Jerald D. Parker, and Jeffrey D. Spitler	John Wiley & Sons	6th Edition, 2005
5	Materials for Civil and Construction Engineering	Mamlouk, M.S.,and Zaniewski, J.P	Pearson Publishers	4th Edition, 2017
6	Building Construction	Rangwala, S.C and Dalal, KB	Charotar Publishing house	34th Edition 2022
7	Construction Technology Vol. I to IV	Chudley, R	Longman group, England Course Plan	2nd Edition 2014
8	Building Construction Volumes1to4	Mckay, W.B.and Mckay,J.K	Pearson India Education Services	5th Edition 2013
9	Engineering Geology	Duggal S. K., Pandey H.K. and Rawat N,	Mcgraw Hill Education, New Delhi	1st Edition 2017
10	Latest Building codes and related rules and regulations.			

Video Links (NPTEL, SWAYAM…)	
Module	**Link ID**
1	https://nptel.ac.in/courses/112/105/112105123/ https://nptel.ac.in/courses/112/106/112106133/ https://nptel.ac.in/courses/112/105/112105129/
2	https://nptel.ac.in/courses/112/105/112105171/ https://nptel.ac.in/courses/112/105/112105268/ https://archive.nptel.ac.in/courses/112/107/112107145
3	https://archive.nptel.ac.in/courses/105/106/105106201/
4	https://archive.nptel.ac.in/courses/105/106/105106206/

ALGORITHMIC THINKING WITH PYTHON

Course Code	24SJICEST105	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:0:2:0	ESE Marks	60
Credits	4	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	None	Course Type	Theory

Course Objectives:

- To provide students with a thorough understanding of algorithmic thinking and its practicalapplications in solving real-world problems.
- To explore various algorithmic paradigms, including brute force, divide-and-conquer, dynamicprogramming, and heuristics, in addressing and solving complex problems.

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Utilize computing as a model for solving real-world problems.	K2
CO2	Articulate a problem before attempting to solve it and prepare a clearand accurate model to represent the problem.	K3
CO3	Use effective algorithms to solve the formulated models and translatealgorithms into executable programs.	K3
CO4	Interpret the problem-solving strategies, a systematic approach to solving computational problems, and essential Python programming skills	K2

K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping:

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

SYLLABUS

Module	Syllabus Description	Contact Hours	CO
1	**PROBLEM-SOLVING STRATEGIES**: - Problem-solving strategies defined, Importance of understanding multiple problem-solving strategies, Trial and Error, Heuristics, Means-Ends Analysis, and Backtracking (Working backward). **THE PROBLEM-SOLVING PROCESS**: - Computer as a model of computation, Understanding the problem, formulating a model, Developing an algorithm, Writing the program, Testing the program, and Evaluating the solution. **ESSENTIALS OF PYTHON PROGRAMMING:** - Creating and using variables in Python, Numeric and String data types in Python, Using the math module, Using the Python Standard Library for handling basic I/O - print, input, Python operators and their precedence.	**7**	**1**
2	**ALGORITHM AND PSEUDOCODE REPRESENTATION**: - Meaning and Definition of Pseudocode, Reasons for using pseudocode, The main constructs of pseudocode - Sequencing, selection (if-else structure, case structure) and repetition (for, while, repeat-until loops), Sample problems* **FLOWCHARTS**** :- Symbols used in creating a Flowchart - start and end, arithmetic calculations, input/output operation, decision (selection), module name (call), for loop (Hexagon), flow-lines, on-page connector, off-page connector. --- ** - Evaluate an expression, **d=a+b*c**, find simple interest, determine the larger of two numbers, determine the smallest of three numbers, determine the grade earned by a student based on KTU grade scale (using if-else and case structures), print the numbers from 1 to 50 in descending order, find the sum of n numbers input by the user (using all the three loop variants), factorial of a number, largest of n numbers (**Not to be limited to these exercises. More can be worked out if time permits**).* *** **Only for visualizing the control flow of Algorithms. The use of tools like RAPTOR (https://raptor.martincarlisle.com/) is suggested**. **Flowcharts for the sample problems listed earlier may be discussed***	**9**	**2**
3	**SELECTION AND ITERATION USING PYTHON:** - if-else, elif, for loop, range, while loop. Sequence data types in Python - list, tuple, set, strings, dictionary, Creating and using Arrays in Python (using ***NumPy*** library). **DECOMPOSITION AND MODULARIZATION*:-** Problem decomposition as a strategy for solving complex problems, Modularization, Motivation for modularization, Defining and using functions in Python, Functions with multiple return values **RECURSION:** - Recursion Defined, Reasons for using Recursion, The Call Stack, Recursion and the Stack, Avoiding Circularity in Recursion, *Sample problems - Finding the **n**th Fibonacci number, greatest common divisor of two positive integers, the factorial of a positive integer, adding two positive integers, the sum of digits of a positive number **.* ** The idea should be introduced and demonstrated using Merge sort, the problem of returning the top three integers from a list of **n>=3** integers as examples.* (***Not to be limited to these two exercises. More can be worked out if time permits***). *** **Not to be limited to these exercises. More can be worked out if time permits**.*	**10**	**3**

4	**COMPUTATIONAL APPROACHES TO PROBLEM-SOLVING** (*Introductory diagrammatic/algorithmic explanations only. Analysis not required*) Brute-force Approach - *Example: Padlock, Password guessing* Divide-and-conquer Approach - *Example: The Merge Sort Algorithm* Advantages of Divide and Conquer Approach Disadvantages of Divide and Conquer Approach Dynamic Programming Approach *Example: Fibonacci series* Recursion vs Dynamic Programming Greedy Algorithm Approach • *Example: Given an array of positive integers each indicating the completion time for a task, find the maximum number of tasks that can be completed in the limited amount of time that you have.* • Motivations for the Greedy Approach • Characteristics of the Greedy Algorithm • Greedy Algorithms vs Dynamic Programming Randomized Approach • *Example 1: A company selling jeans gives a coupon for each pair of jeans. There are n different coupons. Collecting **n** different coupons would give you free jeans. How many jeans do you expect to buy before getting a free one?* • *Example 2: **n** people go to a party and drop off their hats to a hat-check person. When the party is over, a different hat-check person is on duty and returns the **n** hats randomly back to each person. What is the expected number of people who get back their hats* - Motivations for the Randomized Approach	**10**	**4**

Course Assessment Method (CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Continuous Assessment (Accurate Execution of Programming Tasks)	Internal Examination-1 (Written Examination)	Internal Examination-2 (Written Examination)	Internal Examination- 3 (Lab Examination)	Total
5	5	10	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any onefull question out of two questions

Part A	Part B	Total
2 Questions from each module. Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	Each question carries 9 marks. Two questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

Continuous Assessment (5 Marks)

Accurate Execution of Programming Tasks

- Correctness and completeness of the program
- Efficient use of programming constructs
- Handling of errors
- Proper testing and debugging

Evaluation Pattern for Lab Examination (10 Marks)

Algorithm (2 Marks)

Algorithm Development: Correctness and efficiency of the algorithm related to the question.

Programming (3 Marks)

Execution: Accurate execution of the programming task.

Result (3 Marks)

Accuracy of Results: Precision and correctness of the obtained results.

Viva Voce (2 Marks)

Proficiency in answering questions related to theoretical and practical aspects of the subject.

Sample Classroom Exercises:

1. Identify ill-defined problem and well-defined problems
2. How do you differentiate the methods for solving algorithmic problems: introspection, simulation, computer modelling, and experimentation?
3. Use cases for Trial and error, Algorithm, Heuristic and Means-ends analysis can be applied in proffering solution to problems
4. Use a diagram to describe the application of Tower of Hanoi in choosing and analysing inaction at a series of smaller steps to move closer to the goal
5. What effect will be generated if the stage that involves program writing is not observed in the problem-solving process?
6. What effect will be generated if the stage that involves program writing is not observed in the problem-solving process?
7. Evaluate different algorithms based on their efficiency by counting the number of steps.
8. Recursive function that takes a number and returns the sum of all the numbers from zero to that number.
9. Recursive function that takes a number as an input and returns the factorial of that number.
10. Recursive function that takes a number ‘n’ and returns the nth number of the Fibonacci number.
11. Recursive function that takes an array of numbers as an input and returns the product of all the numbers in the list.

LAB Experiments:

Exp. No.	Experiment Description	CO
1	Demonstrate about Basics of Python Programming	2
2	Demonstrate about fundamental Data types in Python Programming. (i.e., int, float, complex, bool and string types)	4
3	Create, concatenate, and print a string and access a sub-string from a given string.	4
4	Familiarize time and date in various formats (Eg. "Sun May 29 02:26:23 IST 2017")	3
5	Write a program to create, append, and remove lists in Python using ***numPy***.	1
6	Programs to find the largest of three numbers.	3
7	Convert temperatures to and from Celsius, and Fahrenheit. [Formula: c/5 = f-32/9]	1
8	Program to construct the stars (*) pattern, using a nested for loop	3
9	Program that prints prime numbers less than 20.	4
10	Program to find the factorial of a number using Recursion.	3
11	Recursive function to add two positive numbers.	4
12	Recursive function to multiply two positive numbers	1
13	Recursive function to the greatest common divisor of two positive numbers.	4
14	Program that accepts the lengths of three sides of a triangle as inputs. The program output should indicate whether or not the triangle is a right triangle (Recall from the Pythagorean Theorem that in a right triangle, the square of one side equals the sum of the squares of the other two sides). Implement using functions.	4
15	Program to define a module to find Fibonacci Numbers and import the module to another program.	4
16	Program to define a module and import a specific function in that module to another program.	2
17	Program to check whether the given number is a valid mobile number or not using functions ***Rules:*** Every number should contain exactly 10 digits; The first digit should be 7 or 8 or 9	2

Reference Books				
Sl. No	**Title of the Book**	**Name of theAuthor/s**	**Name of the Publisher**	**Edition and Year**
1	Problem solving & programming concepts	Maureen Sprankle, Jim Hubbard	Pearson	2012
2	How to Solve It: A New Aspect of Mathematical Method	George Pólya	Princeton University Press	2015
3	Creative Problem Solving: An Introduction	Donald Treffinger., Scott Isaksen, Brian Stead-Doval	Prufrock Press	2005
4	Psychology (Sec. Problem Solving.)	Spielman, R. M., Dumper, K., Jenkins, W., Lacombe, A., Lovett, M., & Perlmutter, M	H5P Edition	2021
5	Computer Arithmetic Algorithms	Koren, Israel	AK Peters/ CRC Press	2018
6	Introduction to Computation and Programming using Python	Guttag John V	PHI	2/e., 2016
7	Python for Everyone	Cay S. Horstmann, Rance D. Necaise	Wiley	3/e, 2024
8	Computational Thinking: A Primer for Programmers and Data Scientists	G Venkatesh Madhavan Mukund	Mylspot Education Services Pvt. Ltd.	2020

Video Links (NPTEL, SWAYAM…)	
Module	**Link ID**
1	https://opentextbc.ca/h5ppsychology/chapter/problem-solving/
2	https://onlinecourses.nptel.ac.in/noc21_cs32/preview

ENGINEERING WORKSHOP

Course Code	24SJGCESL106	CIE Marks	50
Teaching Hours/Week (L: T:P: R)	0-0-2-0	ESE Marks	50
Credits	1	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	None	Course Type	Lab

Course Objectives:

- To enable the student to familiarize various tools, measuring devices, practices and different methods employed in the industry.
- To enable the students to apply this experience while developing product/project for the benefit of society.

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcomes		Bloom's Knowledge Level (KL)
CO1	Identify workshop operations and instruments in accordance with the material and objects.	K3
CO2	Understand appropriate tools and instruments with respect to the workshop specializations.	K2
CO3	Apply various tools, measuring devices, practices and different methods employed in the industry.	K3
CO4	Examine the quality of common materials used in the industry.	K3
CO5	Conduct market study of various engineering materials and consumables available in the market.	K3

K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping:

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

Expt. No.	Experiments (Minimum 12 Exercises)	CO
1	**General:** Introduction to workshop practice, Safety precautions, Shop floor ethics, and Basic First Aid knowledge. Study of mechanical and measurement tools, components and their applications: (a) Tools: screw drivers, spanners, Allen keys, cutting pliers etc. and accessories (b) bearings, seals, O-rings, circlips, keys etc. (c)Vernier Calipers, Height Gauge, Depth Gauge, Micrometres, Bevel Protractor etc.	1, 2
2	**Carpentry:** Understanding carpentry tools and knowledge of at least one model 1. T –Lap joint 2. Cross lap joint 3. Dovetail joint 4. Mortise joints	1, 2, 3
3	**Foundry:** Understanding of foundry tools and knowledge of at least one model 1. Bench Moulding 2. Floor Moulding 3. Core making 4. Pattern making	1, 2, 3
4	**Sheet Metal:** Understanding sheet metal working tools and knowledge of at least one model 1. Cylindrical shape 2. Conical shape 3. Prismatic shaped job from sheet metal	1, 2, 3
5	**Fitting:** Understanding the tools used for fitting and knowledge of at least one model 1. Square Joint 2. V- Joint 3. Male and female fitting	1, 2, 3
6	**Plumbing:** Understanding plumbing tools and pipe joints, along with practicing one exercise on joining pipes using a minimum of three types of pipe joints	1, 2, 3
7	**Smithy:** Understanding the tools used in smithy. Demonstrating the forge- ability of different materials (MS, Al, alloy steel and cast steels) in both cold and hot states. Observing the qualitative difference in the hardness of these materials. One exercise on smithy (Square prism).	1, 2, 3
8	**Welding:** Understanding welding equipment and practicing at least one welding technique, such as making joints using electric arc welding. Bead formation in horizontal, vertical and overhead positions	1, 2, 3
9	**Rolling:** Objective of rolling, rolling process, practical on two high rolling mills	2, 3
10	**Electroplating**: Electroplating a given job	2, 3
11	**Metrology:** Common measuring instruments used in workshop, experiments to find the angle of a dovetail, angle of a taper and the radius of a circular surface. Introduction to instruments Vernier Bevel Protractor, Vernier Depth Gauge, Vernier Height Gauge.	1, 2
12	**Assembly:** Demonstration only Dissembling and assembling of 1. Cylinder and piston assembly 2. Tail stock assembly 3. Bicycle 4. Pump orany other machine	2, 3
13	**Machines:** Demonstration of the following machines: Shaping and slotting machine; Milling machine; Grinding Machine; Lathe; Drilling Machine.	2
14	Modern manufacturing methods (**Fab lab/IDEA** Lab - Demonstration only): Power tools, CNC machine tools, 3D printing, Soft Materials cutting using special machines	2
15	Use of proper Personal Protective Equipment. Measurements using Tape, Ruler, Vernier callipers, screw gauge	1, 2

16	Measuring the area of a plot with an irregular boundary using a chain and cross staff	1, 2, 3
17	Measuring the area of a building using Distomat	3
18	Finding the level difference between two points using dumpy level	1, 2, 3
19	Onsite quality assessment of brick, and cement	4
20	Construct a 1 and 1 ½ thick brick wall with a height of 50 cm and a minimum length of 60 cm using English bond. Check the verticality of the wall	1, 3
21	Construct a 1 and 1 ½ thick brick wall with a height of 50 cm and a minimum length of 60 cm using Flemish bond. Check the verticality of the wall	1, 3
22	Estimate the number of different types of building blocks needed to construct the walls of a room measuring 2m x 3m, accounting for standard-sized doors and windows.	3
23	Setting out of a two roomed building using thread, tape and water tube levelling.	1, 2, 3
24	Conduct a market study to understand the types, prices, and general specifications of at least three materials available in the market (such as bricks, cement, aggregates, steel, plumbing items, fixtures, welding rods, fasteners etc.).	5
25	Studying the tools and testing instruments for electrical works. Wiring a light or a fan circuit using one way and two-way switch.	1, 2, 3
26	Familiarization/Application of testing instruments and commonly used tools in electronic works. [Multi-meter, Soldering iron, De-soldering pump, Pliers, Cutters, Wire strippers, Screw drivers, Tweezers, Crimping tool, Hot air soldering and de-soldering station etc.]	1, 2
***Note:** Minimum of 12 experiments from among the 26 experiments listed, is to becompleted.*		

Course Assessment Method (CIE: 50 marks, ESE: 50 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Preparation/Pre-Lab Work, Experiments, Viva and Timely completion of Lab Reports / Record (Continuous Assessment)	Total
5	**45**	**50**

***End Semester Examination Marks (ESE):**

Procedure/ Preparatory work/Design/ Algorithm	Conduct of experiment/ Execution of work/ troubleshooting/ Programming	Result with valid inference/ Quality of Output	Viva voce	Record	Total
10	**15**	**10**	**10**	**5**	**50**

- *Submission of Record: Students shall be allowed for the end semester examination*

only upon submitting the duly certified record.

- *Minimum Pass Mark: The requirement for passing the lab course included in the first- year curriculum is that the student must score a minimum of 50% overall, combining marks from both Continuous Internal Evaluation (CIE) and End Semester Examination (ESE). There is no separate minimum requirement for each component.*
- *There will not be any relaxation in the attendance requirement.*

Continuous Assessment (45 Marks)

1. **Preparation and Pre-Lab Work (10 Marks)**
   - **Pre-Lab Assignments**: Assessment of pre-lab assignments or quizzes that test understanding of the upcoming experiment.
   - **Understanding of Theory:** Evaluation based on students' preparation and understanding of the theoretical background related to the experiments.
2. **Conduct of Experiments (15 Marks)**
   - **Procedure and Execution:** Adherence to correct procedures, accurate execution of experiments, and following safety protocols.
   - **Skill Proficiency:** Proficiency in handling equipment, accuracy in observations, and troubleshooting skills during the experiments.
   - **Teamwork:** Collaboration and participation in group experiments.
3. **Lab Reports and Record Keeping (10 Marks)**
   - **Quality of Reports:** Clarity, completeness and accuracy of lab reports. Properdocumentation of experiments, data analysis and conclusions.
   - **Timely Submission:** Adhering to deadlines for submitting lab reports/rough record and maintaining a well-organized fair record.
4. **Viva Voce (10 Marks)**

   Oral Examination: Ability to explain the experiment, results and underlyingprinciples during a viva voce session.

Evaluation Pattern for End Semester Examination (50 Marks)

ESE to be conducted by the course offering department based on the following evaluation criteria

1. **Procedure/Preliminary Work/Design/Algorithm (10 Marks)**
   - **Procedure Understanding and Description:** Clarity in explaining theprocedure and understanding each step involved.
   - **Preliminary Work and Planning:** Thoroughness in planning andorganizing materials/equipment.
   - **Algorithm Development:** Correctness and efficiency of the algorithm related to the experiment.
   - Creativity and logic in algorithm or experimental design.
2. **Conduct of Experiment/Execution of Work/Programming (15 Marks)**

   Setup and Execution: Proper setup and accurate execution of the experimentor programming task.
3. **Result with Valid Inference/Quality of Output (10 Marks)**
   - **Accuracy of Results:** Precision and correctness of the obtained results.
   - **Analysis and Interpretation:** Validity of inferences drawn from the experiment orquality of program output.
4. **Viva Voce (10 Marks)**
   - Ability to explain the experiment, procedure results and answer related questions

- Proficiency in answering questions related to theoretical and practical aspects of the subject.

5. **Record (5 Marks)**
   Completeness, clarity, and accuracy of the lab record submitted

Text Books				
Sl. No	**Title of the Book**	**Name of theAuthor/s**	**Name of the Publisher**	**Edition and Year**
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	Building Materials	S K Duggal	New Age International	Edition 6 2025
4	Indian Practical Civil Engineering Handbook	Khanna P.N,	UBS Publishers Distributers (P) Ltd.	Year 2012
5	Building Construction	Arora S.P and Bindra S. P	Dhanpat Rai Publications	Edition 5 Year 2022

Reference Books				
Sl. No	**Title of the Book**	**Name of theAuthor/s**	**Name of the Publisher**	**Edition and Year**
1	Elements of Workshop Technology Vol-1-Manufacturing Processes	S K Hajra ChoudhuryA K Hajra Choudhury Nirjhar Roy	MPP Media Promoters and Publishers	2008

Video Links (NPTEL, SWAYAM…)
https://archive.nptel.ac.in/courses/105/106/105106206/ https://archive.nptel.ac.in/courses/105/106/105106201/ https://archive.nptel.ac.in/courses/105/104/105104101/ https://archive.nptel.ac.in/courses/117/106/117106108/

LIFE SKILLS AND PROFESSIONAL COMMUNICATION

Course Code	**24SJICHUT128**	**CIE Marks**	100
Teaching Hours/Week (L: T:P: R)	2:0:1:0	**ESE Marks**	0
Credits	1	**Exam Hours**	-
Prerequisites (if any)	None	**Course Type**	Activity-based learning

Course objectives:

- To foster self-awareness and personal growth, enhance communication and interpersonal connection skills, promote effective participation in groups and teams, develop critical thinking, problem-solving, and decision-making skills, and cultivate the ability to exercise emotional intelligence.
- To equip students with the necessary skills to listen, read, write & speak, to comprehend and successfully convey any idea, technical or otherwise.
- To equip students to build their profile in line with the professional requirements and standards.

Course Outcomes (COs)

Course Outcome		**Bloom's Knowledge Level (KL)**
CO1	Develop the ability to know & understand oneself, show confidence in one's potential & capabilities, set goals and develop plans to accomplish tasks	**K2**
CO2	Develop the ability to communicate and connect with others, participate in groups/teams, empathise, respect diversity, be responsible and understand the need to exercise emotional intelligence	**K2**
CO3	Develop thinking skills, problem-solving and decision-making skills	**K3**
CO4	Develop listening, reading, writing & speaking skills, ability to comprehend & successfully convey any idea, and ability to analyse, interpret & effectively summarize textual, audio & visual content	**K2**
CO5	Develop the ability to create effective presentations through audio-visual mediums with the use of technology tools and initiate effective use of social media platforms & tech forums for content delivery and discussions	**K3**
CO6	Initiate profile-building exercises in line with the professional requirements, and start networking with professionals/academicians	**K3**

K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1									1		3
CO2					1		3		3		3
CO3		1	1		1				1		1
CO4					1				1		2
CO5					1	1			1		2
CO6					1				1		

K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

Continuous Internal Evaluation Marks (CIE):

- Continuous internal evaluation is based on the individual and group activities as detailed in the activity table given below.
- The students should be grouped into groups of size 4 to 6 at the beginning of the semester. They should use online collaboration tools for group activities, report/presentation making andwork management.
- Activities are to be distributed between 3 class hours (2L+1P) and 3.5 Self-study hours.
- Marks given against each activity should be awarded fully if the students successfully complete the activity.
- Students should maintain a portfolio file with all the reports and other textual materials generated from the activities. Students should also keep a journal related to the activities undertaken.
- Portfolio and journal are mandatory requirements for passing the course, in addition to the minimum marks required.
- The portfolio and journal should be carried forward and displayed during the 7th Semester Seminar course as a part of the experience sharing regarding the skills developed through the HMC courses and Mini project course.
- Self-reflection questionnaire shall be given at the beginning of the semester, in between and atthe end of the semester based on the guidelines in the manual of the course.

Table 1. Activity Table

Sl. No.	Activity	Class room (L) / Self Study (SS)	Week of completion	Group / Individual (G/I)	Marks	Skills	CO
1.1	Group formation and self-introduction among the group members	L	1	G	-	• Connecting with group members • Time management - Gantt Chart	
1.2	Familiarizing the activities and preparation of the time plan for the activities	L	1	G	-		
1.3	Preparation of Gantt chart based on the time plan	SS	1	G	2		
2.1	Take an online personality development test, self-reflect and report	SS	1	I	2	Self-awareness Writing	1
2.2	Role-storming exercise 1: Students assume 2 different roles given below and write about their 1. Strengths, 2. Areas for improvement, 3. Concerns, 4. Areas in which he/she hesitates to take advice, 5. Goals/Expectations, from the point of view of the following assumed roles • their parent/guardian/mentor • their friend/sibling/cousin	L	1	I	2	• Goal setting - Identification of skills and setting goal • Self-awareness • Discussion in groups • Group work- Compiling of ideas • Mind mapping	1
2.3	Role-storming exercise 2: Students assume the role of their teacher and write about the • Skills required as a B. Tech graduate • Attitudes, habits, approaches required and activities to be practised during their B.Tech years, in order to achieve the set goals	SS	1	I	2		1
2.4	Discuss the skills identified through role storming exercise by each one within their own group and improvise the list of skills	L	1	G	2		1

2.5	Prepare a mind map based on the role-storming exercise and exhibit/present it in class	SS	2	G	2		1
3	Prepare a presentation on instances of empathy they have observed in theirown life or in other's life	L	2 to 4	I	2	Empathy	2
4.1	Each student connects and networks with a minimum of 3 professionals from industry/ public sector organizations/other agencies/NGOs/ Academia (at least 1 through LinkedIn)	SS	3	I	2	• Workplace awareness • Listening • Communication - interacting with people • Networking through various media including LinkedIn • Discussion in groups • Report preparation • Creativity Goal setting - Preparation of action plan	
4.2	Interact with them to understand their workplace details including • workplace skills required • their work experiences • activities they have done to enhance their employability during their B. Tech years • suggestions on the different activities to be done during B. Tech years Prepare a documentation of this	SS	3	I	4		2
4.3	Discuss the different workplace details &work readiness activities assimilated by each through the interactions within theirgroup and compile the inputs collected by the individuals Prepare the Minutes of the discussions	SS	3	G	2		2
4.4	Reportpreparation based on the discussions	SS	4	G	3		4
4.5	Perform a role-play based on the workplace dynamics assimilated through interactions and group discussions	L	5	G	4		3
4.6	Identify their own goal and prepare an action plan for their undergraduatejourney to achieve the goal	SS	5	I	2		1

5.1	Select a real-life problem that requires atechnical solution and list the study materials needed	L	6	G	2		3
5.2	Listen to TED talks & video lectures from renowned Universities related to the problem and prepare a one-page summary (Each group member should select a different resource)	SS	6	I	2		4
5.3	Use any online tech forum to gather ideas for solving the problem chosen	SS	6	G	2		5
5.4	Arrive at a possible solution using six Thinking Hat exercise	L	7	G	3		3
5.5	Prepare a report based on the problem-solving experience	SS	7	G	2		4
6.1	LinkedIn profile creation	SS	1	I	2	Profile building	6
6.2	Resume preparation	SS	8	I	2		6
6.3	Self-introduction video	SS	8	I	3		6
7	Prepare a presentation on instances of demonstration of emotional intelligence	SS	9	I	2	Emotional intelligence	2
8	Prepare a short video presentation on diversity aspects observed in our society (3 to 5 minutes)	SS	10	G	3	Diversity	2,5
9	Take online Interview skills Development sessions like robotic interviews; self-reflect and report	SS	10	I	2	Interview skills	6
10	Take an online listening test, self- reflect and report	SS	11	I	2	Listening skills	6
11.1	Activities to improve English vocabulary of students	L	8	I/G	4	English vocabulary	4
11.2	Activities to help students identify errors in English language usage	L	9	I/G	2	• English language skills • Writing • Presentation • Group work • Self-reflection	4
11.3	Activity to help students identify commonly misspelled words, commonly mispronounced words and confusing words	L	10	I/G	2		4

11.4	Write a self-reflection report on the improvement in English language communication through this course	SS	12	I	2		4
11.5	Presentation by groups on the experience of using online collaboration tools in various group activities and time management experience as per the Gantt chart prepared	L	11 to 12	G	2		4, 5
12.1	Each group prepares video content forpodcasts on innovative technological interventions/research work tried out inKerala context by academician's/professionals/ Govt. agencies/research institutions/private agencies/NGOs/other agencies	SS	12	G	4	• Audio-visual presentations creations with theuse of technology tools • Effective use ofsocial media platforms • Profile building	2, 4, 5
12.2	Upload the video content to podcasting platforms or YouTube	SS	12	G	1		5
12.3	Add the link of the podcast in their LinkedIn profile	SS	12	G	1		5

Table 2. Lab hour Activities (P) (any 8 activities): 24 Marks

Sl No	Activity	Marks	Skill	CO
1	Hands-on sessions on day-to-day engineering skills and a self-reflection report on the experience gained: 1. Drilling practice using electric hand drilling machines. 2. Cutting of MS rod and flat using electric hand cutters. 3. Filing, finishing and smoothening usingelectrically operated hand grinders. 4. MS rod cutting using Hack saw by holding the work inbench wise. 5. Study and handling different types of measuring instruments. 6. Welding of MS, SS work pieces. 7. Pipe bending practice (PVC and GI). 8. Water tap fitting. 9. Water-tap rubber seal changing practice. 10. Union and valves connection practice in pipes. 11. Foot valve fitting practice. 12. Water pump seal and bearing changing practice.	**24**	Basic practical engineering skills	**3**
2	Language Lab sessions	**-**	Language Skills	**4**

Text Books				
Sl. No	**Title of the Book**	**Name of theAuthor/s**	**Name of the Publisher**	**Edition and Year**
1	Life Skills & Personality Development	Maithry Shinde et.al.	Cambridge University Press	First Edition, 2022
2	Emotional Intelligence: Why itcan matter more than IQ	Daniel Goleman	Bloomsbury, Publishing PLC	25th Anniversary Edition December 2020
3	Think Faster, Talk Smarter: How to speak successfully when you are put on the spot	Matt Abrahams	Macmillan Business	September2023
4	Deep Work: Rules for focused success in a distracted world	Cal Newport	PIATKUS	January 2016
5	Effective Technical Communication	Ashraf Rizvi	McGraw Hill Education	2nd Edition 2017
6	Interchange	Jack C.Richards, With Jonathan Hull, Susan Proctor	Cambridge publishers	5th Edition

Reference Books				
Sl.No	**Title of the Book**	**Name of theAuthor/s**	**Name of the Publisher**	**Edition and Year**
1	Life Skills for Engineers	Remesh S., Vishnu R.G.	Ridhima Publications	First Edition, 2016
2	Soft Skills & Employability Skills	Sabina Pillai andAgna Fernandez	Cambridge University Press	First Edition, 2018
3	Effective Technical Communication	Ashraf Rizvi	McGraw Hill Education	2nd Edition 2017
4	English Grammar in Use	Raymond Murphy,	Cambridge University Press India PVT LTD	5th Edition 2023
5	Guide to writing as an Engineer	David F. Beer and David McMurrey	John Willey. New York	2004

SEMESTER – II

SEMESTER II COURSES

Sl. No:	Slot	Course Code	Course Type	Course Category	Course Title (Course Name)	Credit Structure				SS	Total Marks		Credits	Hrs./Week
						L	T	P	R		CIE	ESE		
1	A	24SJGYMAT201	BSC	GC	Mathematics for Electrical Science and Physical Science - 2	3	0	0	0	4.5	40	60	3	3
2	B S1/ S2	24SJGCPHT121	BSC	GC	Physics for Physical Science and Life Science	3	0	2	0	5.5	40	60	4	5
		24SJGCCYT122			Chemistry for Physical Science									
3	C	24SJGCEST203	ESC	GC	Engineering Graphics and Computer Aided Drawing	2	0	2	0	4	40	60	3	4
4	D	24SJGCEST204	ESC	GC	Basic Electrical and Electronics Engineering (Part 1: Electrical Engineering)	2	0	0	0	3	20	30	2+2 =4	4
					(Part 2: Electronics Engineering)	2	0	0	0	3	20	30		
5	E	24SJPCMET205	PC	PC	Material Science and Engineering	3	1	0	0	5	40	60	4	4
6	F	24SJICEST206	ESC	IC	Engineering Entrepreneurship and IPR	3	0	0	0	4.5	60	40	3	3
7	I* S1/ S2	24SJICHWT127	HWP	IC	Health and Wellness	1	0	1	0	0	50	0	1	2/3
		24SJICHUT128	HMC		Life Skills and Professional Communication	2	0	1	0	3.5	100	0		
8	L	24SJGCESL208	ESC	GC	Basic Electrical and Electronics Engineering workshop	0	0	2	0	1	70	30	1	2
9	S1/ S2	24SJICSEM129	SEC	IC	Skill Enhancement Course: *Digital 101(NASSCOM)*	MOOC							1	
Total										**34**			**24**	**27/ 28**

No Grade Points will be awarded for the MOOC course and I slot course.

MATHEMATICS FOR ELECTRICAL SCIENCE AND PHYSICAL SCIENCE – 2

Course Code	24SJGYMAT201	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	ESE Marks	60
Credits	3	Exam Hours	2 Hrs. 30 Min.
Pre-requisites (if any)	Basic knowledge in single variable calculus.	Course Type	Theory

Course Objectives:

To provide a comprehensive understanding of partial derivatives, multiple integrals and the differentiation and integration of vector-valued functions, emphasizing their applications in engineering contexts.

Course Outcomes (COs)

At the end of the course students should be able to:

	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Compute the partial and total derivatives and maxima and minima of multivariable functions and to apply in engineering problems.	K3
CO2	Understand theoretical idea of multiple integrals and to apply them to find areas and volumes of geometrical shapes.	K3
CO3	Compute the derivatives and line integrals of vector functions and to learn their applications.	K3
CO4	Apply the concepts of surface and volume integrals and to learn their inter-relations and applications.	K3

K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping:

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

SYLLABUS

Module	Syllabus Description	Contact Hours	CO
1	Limits and continuity, Partial derivatives, Partial derivatives of functions with two variables, Partial derivatives viewed as rate of change and slopes, Partial derivatives of functions with more than two variables, Higher order partial derivatives, Local linear approximations, Chain rule, Implicit differentiation, Maxima and minima of functions of two variables - Relative maxima and minima **(Text 1: Relevant topics from sections 13.2, 13.3, 13.4, 13.5, 13.8)**	**9**	**1**
2	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 Cartesian and cylindrical coordinates. **(Text 1: Relevant topics from section 14.1, 14.2, 14.3, 14.5, 14.6)**	**9**	**2**
3	Vector valued function of single variable - derivative of vector valued function, Concept of scalar and vector fields, Gradient and its properties, Directional derivative, Divergent and Curl, Line integrals of vector fields, Work done as line integral, Conservative vector field, independence of path, Potential function (results without proof). **(Text 1: Relevant topics from section 12.1, 12.2, 13.6, 15.1, 15.2, 15.3)**	**9**	**3**
4	Green's theorem (for simply connected domains, without proof) and applications to evaluating line integrals, finding areas using Green's 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, Stokes' theorem (without proof) **(Text 1: Relevant topics from section 15.4, 15.5, 15.6, 15.7, 15.8)**	**9**	**4**

Course Assessment Method (CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Micro project	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24 marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which one question should be answered. • Each question can have a maximum of 3 sub divisions **(4x9 = 36 marks)**	**60**

Text Books

Sl. No	Title of the Book	Name of theAuthor/s	Name of the Publisher	Edition and Year
1	Calculus	H. Anton, I. Biven, S.Davis	Wiley	12th edition, 2024

Reference Books

Sl. No	Title of the Book	Name of theAuthor/s	Name of the Publisher	Edition and Year
1	Thomas' Calculus	Maurice D. Weir, JoelHass, Christopher Heil, Przemys law Bogacki	Pearson	15th edition, 2023
2	Essential Calculus	J. Stewart	Cengage	2nd edition, 2017
3	Advance Engineering Mathematics	Erwin Kreyszig	John Wiley & Sons	10th edition, 2016
4	Bird's Higher EngineeringMathematics	John Bird	Taylor & Francis	9th edition, 2021
5	Higher Engineering Mathematics	B. V. Ramana	McGraw-Hill Education	39th edition, 2023

Video Links (NPTEL, SWAYAM…)

Module	Link ID
1	https://nptel.ac.in/courses/111107108

PHYSICS FOR PHYSICAL SCIENCE AND LIFE SCIENCE

Course Code	24SJGCPHT121	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:0:2:0	ESE Marks	60
Credits	4	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	None	Course Type	Theory + Lab

Course Objectives:

- To provide students with a solid background in the fundamentals of Physics and impart this knowledge in Physical Science and Life Science disciplines.
- To develop scientific attitudes and enable students to correlate Physics concepts with their coreprograms.
- To equip students with practical knowledge that complements their theoretical studies and develop their ability to create practical applications and solutions in engineering based on theirunderstanding of Physics.

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Apply the comprehended knowledge about laser and fiber optics in various engineering applications.	K3
CO2	Apply the phenomena of interference and diffraction of light and gain practical knowledge to correlate theoretical studies.	K3
CO3	Describe the behaviour of matter in the atomic and subatomic level through the principles of quantum mechanics.	K2
CO4	Apply the knowledge of waves and acoustics in non-destructive testing and in the acoustic design of buildings.	K3

K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping:

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

SYLLABUS

Module	Syllabus Description	Contact Hours	CO
1	**Laser & Fibre Optics** Optical processes – Absorption-Spontaneous emission and stimulated emission, Principle of laser - conditions for sustained lasing – Population inversion - Pumping- Metastable states, Basic components of laser -Active medium - Optical resonant cavity, Construction and working of Ruby laser and CO2 laser, Construction and working Semiconductor laser (qualitative), Properties of laser, Applications of laser. Optic fibre-Principle of propagation of light, Types of fibres-Step index and Graded index fibres - Multimode and single mode fibers, Acceptance angle, Numerical aperture –Derivation, Applications of optical fibres - Fibre optic communication system (block diagram)	9	1
2	**Interference and Diffraction** Introduction, Principle of super position, Constructive and destructive interference, Optical path, Phase difference and path difference, Cosine law- reflected system- Condition for constructive and destructive interference, Colours in thin films, Newton's Rings-Determination of refractive index of transparent liquids and wavelength, Air wedge-Measurement of thickness of thin sheets. Diffraction-types of diffraction, Diffraction due to a single slit, Diffraction grating – Construction - grating equation, Dispersive and Resolving Power (qualitative).	9	2
3	**Quantum Mechanics** Introduction, Concept of uncertainty and conjugate observables (qualitative), Uncertainty principle (statement only), Application of uncertainty principle- Absence of electron inside nucleus - Natural line broadening, Wave function – properties - physical interpretation, Formulation of time dependent and time independent Schrodinger equations, Particle in a one- dimensional box - Derivation of energy eigen values and normalized wave function, Quantum Mechanical Tunnelling (qualitative)	9	3
4	**Waves & Acoustics** Waves- transverse and longitudinal waves, Concept of frequency, wavelength and time period (no derivation), Transverse vibrations in a stretched string- derivation of velocity and frequency - laws of transverse vibration. Acoustics- Reverberation and echo, Reverberation time and its significance - Sabine's Formula, Factors affecting acoustics of a building. Ultrasonics- Piezoelectric oscillator, Ultrasonic diffractometer, SONAR, NDT-Pulse echo method, medical application-Ultrasound scanning (qualitative)	9	4

Course Assessment Method (CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Continuous Assessment	Internal Examination-1 (Written)	Internal Examination-2 (Written)	Internal Examination- 3 (Lab Examination)	Total
5	10	10	10	5	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any onefull question out of two questions

Part A	Part B	Total
2 Questions from each module. Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	Each question carries 9 marks. Two questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 3 subdivisions. **(4x9 = 36 marks)**	**60**

Text Books

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	A Textbook of Engineering Physics	M N Avadhanulu, P G Kshirsagar & TVS Arun Murthy	S Chand & Co.	2nd Edition, 2019
2	Engineering Physics	H K Malik, A.K.Singh,	McGraw Hill Education	2nd Edition, 2017
3	Optics	Ajoy Ghatak	Mc GrawHill Education	6th Edition, 2017

Reference Books

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Engineering Physics	G Vijayakumari	Vikas Publications	8th Edition, 2014
2	Concepts of Modern Physics	Arthur Beiser	Tata McGraw Hill Publications	6th Edition 2003
3	Engineering Physics	Aruldhas G.	PHI Pvt. Ltd	2nd Edition, 2015
4	Fiber Optic Communications	Gerd Keiser	Springer	2021
5	A Text Book of Engineering physics	I. Dominic, A. Nahari	OWL Publications	2nd Edition, 2016
6	Advanced Engineering Physics	Premlet B	Phasor Books	1st Edition, 2001
7	Engineering Physics	Rakesh Dogra	Katson Books	1st Edition, 2019

Video Links (NPTEL, SWAYAM…)	
Module No	**Link ID**
1	https://nptel.ac.in/courses/115102124 https://nptel.ac.in/courses/104104085
2	https://nptel.ac.in/courses/115105537
3	https://nptel.ac.in/courses/115102023 https://nptel.ac.in/courses/115101107
4	https://nptel.ac.in/courses/112104212 https://nptel.ac.in/courses/124105004

Continuous Assessment (10 Marks)

1. **Preparation and Pre-Lab Work (2 Marks)**
   - **Pre-Lab Assignments:** Assessment of pre-lab assignments or quizzes thattest understanding of the upcoming experiment.
   - **Understanding of Theory:** Evaluation based on students' preparation and understanding of the theoretical background related to the experiments.
2. **Conduct of Experiments (2 Marks)**
   - **Procedure and Execution:** Adherence to correct procedures, accurate execution of experiments, and following safety protocols.
   - **Skill Proficiency:** Proficiency in handling equipment, accuracy in observations, and troubleshooting skills during the experiments.
   - **Teamwork:** Collaboration and participation in group experiments.
3. **Lab Reports and Record Keeping (3 Marks)**
   - **Quality of Reports:** Clarity, completeness and accuracy of lab reports. Proper documentation of experiments, data analysis and conclusions.
   - **Timely Submission:** Adhering to deadlines for submitting lab reports/rough record and maintaining a well-organized fair record.
4. **Viva Voce (3 Marks)**

   Oral Examination: Ability to explain the experiment, results and underlying principles during a viva voce session.

Final Marks Averaging: *The final marks for preparation, conduct of experiments,viva, and record are the average of all the specified experiments in the syllabus.*

Evaluation Pattern for Lab Examination (5 Marks)

1. **Procedure/Preliminary Work/Conduct of Experiments (2 Marks)**
   - Procedure Understanding and Description: Clarity in explaining the procedure and understanding each step involved.
   - Preliminary Work and Planning: Thoroughness in planning and organizing materials/equipment.
   - Setup and Execution: Proper setup and accurate execution of the experiment or programming task
2. **Result (2 Marks)**

   Accuracy of Results: Precision and correctness of the obtained results.
3. **Viva Voce (1 Marks)**

   Proficiency in answering questions related to theoretical and practicalaspects of the subject.

Experiment List

Experiment No.	Experiments (Minimum 10 Experiments)	CO
1.	Optical fiber characteristics- Measurement of Numerical aperture.	1
2.	Determination of wavelength of Laser using diffraction grating.	2
3.	Measure wavelength of light source using diffraction grating.	2
4.	Determination of wavelength of a monochromatic light using Newton's Rings method.	2
5.	CRO basics-Measurement of frequency and amplitude of wave forms.	4
6.	CRO- Lissajous Patterns	4
7.	Determination of resolving power and dispersive power of grating.	2
8.	Wheatstone Bridge.	4
9.	Solar Cell- I V and Intensity Characteristics.	2
10.	Melde's experiment- Frequency calculation in Transverse and Longitudinal Mode.	4
11.	Determination of diameter of wire or thickness of thin sheet using Air wedge method.	2
12.	Determination of wavelength and velocity of ultrasonic waves using ultrasonic diffractometer.	4
13.	Determination of particle size of lycopodium powder.	4
14.	Determination of slit width (diffraction due to a single slit).	2
15.	Photo diode - V-I Characteristics	1

ENGINEERING GRAPHICS AND COMPUTER AIDED DRAWING

Course Code	24SJGCEST203	CIE Marks	40
Teaching Hours/Week (L:T:P:R)	2-0-2-0	ESE Marks	60
Credits	3	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	None	Course Type	Theory & Lab

Course Objectives:

1. Learn the principles and techniques of dimensioning and preparation of drawings.
2. Develop the ability to accurately interpret engineering drawings.
3. Learn the features of CAD software(s).

Course Outcomes (COs)

At the end of the course students should be able to:

	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Understand and plot the projection of points and lines located in different quadrants	K3
CO2	Prepare Multiview orthographic projections of objects by visualizing them in different positions	K3
CO3	Plot sectional views and develop surfaces of a given object	K3
CO4	Prepare pictorial drawings using the principles of isometric projection	K3
CO5	Sketch simple drawing using CAD tools.	K3

K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping:

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

SYLLABUS

Module	Syllabus Description	Contact Hours	CO
1	**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.	18	1
2	Projection of simple solids such as Triangular, Rectangle, Square, Pentagonal and Hexagonal Prisms, Pyramids, Cone, Cylinder and Tetrahedron. Projection of solids in simple position including profile view. Projection of solids with axis inclined to one of the references planes and with axis inclined to both reference planes.	16	2
3	**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. (Exclude problems with through holes)	16	3
4	**Isometric Projection:** Isometric scale- Isometric View and Projections of Prisms, Pyramids, Cone, Cylinder, Frustum of Pyramid, Frustum of Cone, Sphere, Hemisphere and their combinations. **Computer Aided Drawing (CAD):** Introduction, Role of CAD in design and development of new products, Advantages of CAD. Creating two-dimensional drawing with dimensions using suitable software. (CAD, only internal evaluation)	18	4 5

Course Assessment Method (CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Class work	CAD – Internal Evaluation	Internal Examination -1 (Written)	Internal Examination - 2 (Written)	Total
5	10	5	10	10	40

End Semester Examination Marks (ESE)

Student can choose any one full question out of two questions from each module

2 Questions from one module. Total 8 Questions, each question carries 15 marks **(15x4 = 60marks)**	**Total**
	60

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Engineering Graphics	Varghese, P. I.	V I P Publishers	34th Edition 2024
2	Engineering Graphics	Benjamin, J.	Pentex Publishers	5th Edition 2021
3	Engineering Graphics using AutoCAD	T Jeyapoovan	Vikas Publishing House Pvt. Ltd.	7th Edition, 2015
4	Engineering Graphics	Anilkumar, K. N.	Adhyuth Narayan Publishers	10th Edition 2016
5	Engineering Drawing	N. D. Bhatt	Charotar Publishing House Pvt. Ltd.	54th Edition 2023

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Engineering Graphics with AutoCAD	Kulkarni, D. M., Rastogi, A. P. and Sarkar, A. K.	Prentice Hall India Publishers	2009
2	Engineering Drawing & Graphics	Venugopal, K.	New Age International Publishers	4th edition 2007
3	Engineering Drawing	Parthasarathy, N. S., and Murali, V.	Oxford University Press	2015
4	Engineering Graphics for degree	John, K. C.	Prentice Hall India Publishers	Published in 2011

Video Links (NPTEL, SWAYAM…)	
Module	**Link ID**
All modules	https://archive.nptel.ac.in/courses/112/102/112102304/

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Course Code	24SJGCEST204	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	4:0:0:0	ESE Marks	60
Credits	4	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	None	Course Type	Theory

Course Objectives:

1. Apply fundamental concepts and circuit laws to solve simple DC/AC electric circuits.
2. Develop an awareness on the fundamentals of electric power generation, transmission and distribution
3. Compare different types of DC and AC motors
4. Describe the fundamental concepts of electronic components and devices
5. Develop an understanding of electronic instrumentation, sensors and their applications in contemporary world

Course Outcomes (COs)

At the end of the course students should be able to:

	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Apply fundamental concepts and circuit laws to solve simple DC/AC electric circuits	K2
CO2	Develop an awareness on the fundamentals of electric power generation, transmission and distribution	K2
CO3	Compare different types of DC and AC motors	K2
CO4	Describe the fundamental concepts of electronic components and devices.	K2
CO5	Develop an understanding of electronic instrumentation, sensors and their applications in contemporary world.	K2

K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2									2
CO2	3		2			2					2
CO3	3					1					2
CO4	3	1									2
CO5	3		1			2					2

SYLLABUS

Module	Syllabus Description	Contact Hours	CO
1	**DC Circuits:** Resistance in Series and Parallel, Ohms Law and Kirchhoff's laws, Voltage and current divider rule (Fundamental numerical problems) **Generation of alternating voltage:** Faradays laws of Electromagnetic induction, Elementary Generator, Representation of ac voltage and currents, sinusoidal waveforms: frequency, period average, RMS values and form factor of waveform; (Fundamental numerical problems) **AC circuits:** Purely resistive, inductive and capacitive circuits; Inductive and capacitive reactance, concept of impedance. (Fundamental numerical problems) **Three phase AC systems:** Representation of three phase voltages; star and delta connections (balanced only), relation between line and phase voltages, line and phase currents. **Power in AC circuits** Power factor; active, reactive and apparent power in single phase and three phase system. (Simple numerical problems)	**14**	**1**
2	**Generation of electrical energy:** **Conventional Sources:** Hydro, thermal, nuclear plants (Block diagram description) **Introduction to non-conventional energy sources:** solar, wind, small hydro plants, PV system for domestic application. **Transformers:** Principle of operation, step-up and step-down transformers **AC power supply scheme:** Single phase and three phase system, Three phase 3 wire and 4 wire systems, Transmission System, Distribution system: Feeder, distributor, service mains **DC Motors:** Principle of Operation: Block diagram showing power stages, losses and efficiency (electrical, mechanical and overall efficiency); types and application. Fundamental numerical problems. **AC motors:** Classification and different types and applications of ac motors. Principle of traction. **Earthing:** need for earthing, Types of earthing; pipe earthing, plate earthing. **Principle of operation of MCB, ELCB/RCCB**	**14**	**2** **3**
3	**Introduction to Semiconductor devices:** Electronic components- Passive and active components - Resistors, Capacitors and Inductors (constructional features not required): types, specifications. Standard values, colour coding. **PN Junction diode**: Principle of operation, V-I characteristics. Bipolar Junction **Transistors:** PNP and NPN structures, Principle of operation **Digital Electronics**: Binary number system, Boolean algebra and Logic Gates, Universal gates. **Basic electronic circuits:** Rectifiers and power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator. **Amplifiers:** Transistor as an amplifier, Block diagram of Public Address system	**11**	**4**
4	**Electronic Instrumentation:** Quality of measurements -accuracy, precision, sensitivity and resolution, Working principle and applications of Sensors – pressure – strain gauge, Bourden gauge, temperature – RTD, Thermocouple, proximity – capacitive sensor, Ultrasonic sensor and Accelerometer. **Internet of things (IoT):** Introduction, architecture of IoT, Implementation of smart city – street lighting, smart parking.	**11**	**5**

Course Assessment Method (CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any onefull question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, • each carrying 3 marks **(8x3 =24marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 subdivisions **(4x9 = 36 marks)**	**60**

Text Books

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Basic Electrical Engineering	D P Kothari and I J Nagrath	Tata McGraw Hill	4/e 2019
2	Schaum's Outline of Basic Electrical Engineering	J.J.Cathey and Syed A Nasar	Tata McGraw Hill	3/e, 2010
3	Basic Electronics: Principles and Applications	Chinmoy Saha, Arindham Halder and Debarati Ganguly	Cambridge University Press	1/e 2018
4	Basic Electrical and Electronics Engineering	D. P. Kothari and I. J. Nagrath	McGraw Hill	2/e 2020
5	The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World	Michael Miller	QUE	1/e 2015
6	Basic Electronics and Linear Circuits	N N Bhargava D C Kulshreshtha and S. C. Gupta	McGraw Hill	2/e 2017
7	Electronic Communication Systems	Kennedy and Davis	McGraw Hill	6/e 2017

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Basic Electrical Engineering	D C Kulshreshtha	Tata McGraw Hill	2/e 2019
2	Electrical Engineering Fundamentals	Del Toro V	Pearson Education	2/e 2019
3	Basic Electrical Engineering	T. K. Nagsarkar, M. S.Sukhija	Oxford Higher Education	3/e 2017
4	Electronics: A Systems Approach	Neil Storey	Pearson	6e 2017
5	Electronic Devices and Circuit Theory	Robert L. Boylestad Louis Nashelsky	Pearson	11e 2015
6	Principles of Electronic Communication Systems	Frenzel, L. E	McGraw Hill	4e 2016
7	Internet of Things: Architecture and Design Principles	Raj Kamal	McGraw Hill	1/e 2017
8	Electronic Communication	Dennis Roddy and John Coolen	McGraw Hill	4/e 2008

MATERIAL SCIENCE AND ENGINEERING

Course Code	24SJPCMET205	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:1:0:0	ESE Marks	60
Credits	4	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	None	Course Type	Theory

Course Objectives:

- To recognize the importance of the microstructures and physical properties of the materials to enable the material selection process.
- To develop an understanding of the basic principles of phase transformations and apply those principles to engineering applications.

Course Outcomes (COs):

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Understand the crystal structures (BCC, FCC, and HCP), and their relationship with the properties.	K2
CO2	Understand the crystallographic defects through metallography	K2
CO3	Compare the material properties among different materials for material selection.	K2
CO4	Define and differentiate the microstructure of metallic materials using phase diagrams.	K3

K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping:

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

SYLLABUS

Module No.	Syllabus Description	Contact Hours	CO
1	Introduction to material science: Classification of engineering materials, Structure of solids- Metallic, Ionic and covalent bonding. Properties based on atomic bonding. Crystallography: - SC, BCC, FCC, HCP structures, APF - theoretical density simple problems – Miller Indices: - crystal plane and direction - Modes of plastic deformation: - Slip and twinning	11	1
2	Crystal imperfections – - Point defects, Line defects, Surface defects, Volume defects. edge and screw dislocations – Burgers vector – interaction between dislocations. Polishing and etching, Metallographic characterisations of metallic materials. SEM, TEM- Grain size determination Wear, Roughness, Corrosion. Diffusion in solids, fick's laws, mechanisms, applications of diffusion in mechanical engineering, simple problems. Applications of Diffusion.	11	2
3	Mechanical properties: Tensile properties, Hardness and hardness measurement, Impact properties, Fatigue, Creep, DBBTT, Super plasticity. Types of steels- low, medium and high carbon steels, stainless steels, alloy steels and their applications. Properties and applications of composites, super-alloys, intermetallic- Stoichiometric and Non-stoichiometric compounds- Applications. maraging steel, Titanium- Ceramics: - structures, applications	11	3
4	Phase diagrams: - need of alloying - classification of alloys - Hume Rothery`s rule – equilibrium diagram of common types of binary systems: isomorphous (Cu- Ni) eutectic (Pb- Sn), lever rule and Gibb`s phase rule. Detailed discussion on Iron- Carbon equilibrium diagram with microstructure and properties -Heat treatment: - TTT, CCT diagram, applications - Tempering- Hardenability, Jominy end quench test, applications-Surface hardening methods.	11	4

Course Assessment Method (CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination - 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any onefull question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, • each carrying 3 marks **(8x3 =24marks)**	• Each question carries 9 marks. Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 subdivisions. **(4x9 = 36 marks)**	60

Text Books

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Material Science and Engineering - An Introduction	Callister William.D	John Wiley	9th Edition, 2014
2	Engineering Metallurgy part-I	Higgins R. A	Arnold	6th Edition, 1999

Reference Books

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	The Science and Engineering of Materials	Donald R Askeland	Thomson	6th Edition, 2010
2	Introduction to Physical Metallurgy	Avner H Sidney	Tata McGraw Hill	2009
3	Material Science and Engineering	Raghavan V	Prentiece hall	2004

Video Links (NPTEL, SWAYAM…)	
Module	**Link ID**
All modules	https://archive.nptel.ac.in/courses/113/105/113105103/ https://archive.nptel.ac.in/courses/113/102/113102080/

ENGINEERING ENTREPRENEURSHIP AND IPR

Course Code	24SJICEST206	CIE Marks	60
Teaching Hours/Week (L: T:P: R)	3:0:0:0	ESE Marks	40
Credits	3	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	None	Course Type	Theory

Course Objectives:

- Develop a framework for identifying, curating and validating engineering-based business ideas.
- Learn essential tools for understanding product-market fit and customer needs.
- Develop a comprehensive business plan for a new venture.
- Gain foundational knowledge of Intellectual Property Rights (IPR) and their importance for startups.
- Develop skills for prototyping, stakeholder engagement, and team collaboration.

Course Outcomes (COs)

At the end of the course students should be able to:

	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Gain foundational knowledge of Ideation, Innovation & Entrepreneurship and importance of Intellectual Property Rights (IPR)	K2
CO2	Develop a framework for identifying, curating and validating engineering-based business ideas grounded on customer analysis	K3
CO3	Develop a comprehensive business plan for a new venture by gaining knowledge of essential tools for understanding product-market fit and customer needs and competitor profiling	K3
CO4	Develop skills for prototyping, stakeholder engagement, and team collaboration.	K3

K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping:

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

SYLLABUS

Module	Syllabus Description	Contact Hours	CO
1	**Introduction to Ideation, Innovation & Entrepreneurship** • What is Ideation? • Understanding Innovation • Frameworks for Innovation • The Entrepreneurial Mindset • Starting a Business, types formation statutory compliances. • Resources for Aspiring Entrepreneurs **Introduction to Intellectual Property Rights (IPR)** • Types of IPR: Patents, Trademarks, Copyrights, Trade secrets • Strategies for protecting intellectual property based on the type of innovation • Role of IPR in securing funding and competitive advantage **Importance of building a strong team** • Identifying roles • Skill sets • Team dynamics **Identifying Pain Points and problem statement** • Idea Generation Techniques • Developing and Refining Ideas • Develop strategies for bringing your innovation to life	9	1
2	**Problem and solution canvas preparation** • Orientation and canvas introduction • Customer needs assessment • Market segmentation • Value proposition • Competitive analysis • Market entry strategy • Market validation • Regulatory and legal considerations **Customer profiling** • Review of market research • Customer segmentation • Customer profiling • Persona development • Validation and feedback • Prioritisation and selection • Communication and messaging	9	2

3	**Competitor analysis** • Identify competitors • Competitor profiling • SWOT analysis • Market positioning • Customer feedback and reviews • Pricing analysis • Differentiation strategy • Benchmarking and improvement **Business plan preparation** • Business plan framework • Market analysis • Product/Service description • Marketing and sales strategy • Operations plan • Financial projections • Risk management	**9**	**3**
4	**Prototype development plan preparation** • Prototype requirements analysis • Technical specifications • Development approach • Development timeline • Resource allocation • Testing and quality assurance • Iterative development and feedback loop • Documentation and version control **Prototype development Stakeholder engagement strategies** • Investors • Partners • Customers • Advisors & Mentors	**9**	**4**

Course Assessment Method (CIE: 60 marks, ESE: 40 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Micro Project	Internal Exam 1	Internal Exam 2	Total
5	35	10	10	60

Micro project / Comprehensive Business Plan:

The course will be evaluated based on a comprehensive Business Plan Report submitted and prototype development evaluation at the end of the course. The report should integrate learnings and activities from each module, demonstrating a deep understanding of the concepts and your ability to apply them to a chosen engineering venture.

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 2 marks **(8x2 =16 marks)**	• Each question carries 6 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. **(4x6 = 24 marks)**	40

Text Books

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Entrepreneurship: Creating and Leading an entrepreneurial Organization	Arya Kumar	Pearson	1st Edition, 2012
2	The Innovator's DNA	Clayton M. Christensen and Jeffrey H. Dyer	Harvard Business Review Press	Revised edition (June 4, 2019)
3	Start with Why	Simon Sinek	Portfolio	Reprint edition (December 27, 2011)
4	Business Model Generation	Alexander Osterwalder & Yves Pigneur	Wiley	2010
5	Entrepreneurship Development in India	Debasish Biswas and Chanchal Dey	Routledge Focus	1st Edition, 2021
6	Innovation and Entrepreneurship for Engineers	Bharat Bhushan and Seema Bhushan	CRS Press	2016
7	Entrepreneurship The Practice and Mindset	Heidi M. Neck, Christopher P. Neck, Emma L. Murray	SAGE Publishers	1st Edition, 2018
8	Entrepreneurship Development and Small Business Enterprises	Poornima M Charanatimath	Pearson Education	1st Edition, 2006

REFERENCE BOOKS				
1	The Engineering Handbook	Richard C. Dorf	CRC Press	2nd Edn, 2004
2	The Engineering Entrepreneur: A Practical Guide to Starting and Running a Successful Engineering Business in India	Saibal Gupta and Ashok Jhunjhunwala	Sage Publications	2011
3	Patent Law	P. Narayanan	Eastern Law House	4th Edition, 2023
4	The Law of Copyright and Designs	B. L. Wadehra	Universal Law	5th Edn/2010
5	Intellectual Property Rights (Including IPR in the Digital Age)	Prabuddha Ganguli	Tata McGraw-Hill Education	2001
6	The Startup India Manifesto: A Guide to the Indian Startup Ecosystem	Rashmi Bansal and Deepinder Goyal	Westland Publications	2020

HEALTH AND WELLNESS

Course Code	24SJICHWT127	CIE Marks	50
Teaching Hours/Week (L: T:P: R)	1:0:1:0	ESE Marks	0
Credits	1	Exam Hours	Nil
Prerequisites (if any)	None	Course Type	

Course Objectives:

- To provide essential knowledge on physical activity, health, and wellness.
- To ensure students understand body systems, exercise principles, nutrition, mental health, and disease management.
- To educate students on the benefits of yoga, the risks of substance abuse and basic first aid skills.
- To equip students with the ability to lead healthier lifestyles.
- To enable students to design effective and personalized exercise programs.

Course Outcomes (COs)

At the end of the course students should be able to:

	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Explain the different human body systems and describe various types of physical activities along with methods to measure and quantify these activities.	**K2**
CO2	Explain how to maintain or improve health and wellness through psychological practices, dietary habits, and sports activities.	**K2**
CO3	Discuss about common hypokinetic disorders and musculoskeletal disorders, and describe the importance of leadinga healthy lifestyle through the practice of yoga and abstaining from addictive substances.	**K2**
CO4	Explain the basics of first aid and describe common sports injuries	**K2**

K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping:

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

SYLLABUS

Module	Syllabus Description	Contact Hours	CO
1	**Human Body Systems related to Physical activity and its functions:** Respiratory System - Cardiovascular System. Musculoskeletal System and the Major Muscle groups of the Human Body. Quantifying Physical Activity Energy Expenditure and Metabolic equivalent of task (MET) **Exercise Continuum:** Light-intensity physical activity, Moderate - intensity physical activity, Vigorous -intensity physical activity. Defining Physical Activity, Aerobic Physical Activity, Anaerobic Physical Activity, Exercise and Health-Related Physical Fitness. FITT principle to design an Exercise programme Components of Health-related Physical Fitness: - Cardiorespiratory Fitness- Muscular strength- Muscular endurance- Flexibility- Body composition.	4	1
2	**Concept of Health and Wellness:** Health and wellness differentiation, Factors affecting health and wellness. Mental health and Factors affecting mental health. Sports and Socialization: Sports and character building - Leadership through Physical Activity and Sports **Diet and nutrition:** Exploring Micro and Macronutrients: Conceptof Balanced diet Carbohydrate & the Glycaemic Index Animal & Plant - based Proteins and their Effects on Human Health Dietary Fats & their Effects on Human Health Essential Vitamins and Minerals	2	2
3	Lifestyle management strategies to prevent / manage common hypokinetic diseases and disorders - Obesity - cardiovascular diseases (e.g., coronary artery disease, hypertension) - Diabetes - Osteoporosis - Musculoskeletal disorders (e.g., osteoarthritis, Low back pain, Kyphosis, lordosis, flat foot, Knock knee) Meaning, Aims and objectives of yoga - Classification and importance of Yogic Asanas (Sitting, Standing, lying) Pranayama and Its Types - Active Lifestyle and Stress Management Through Yoga Understanding on substance abuse and addiction - Psychoactive substances & its ill effects- Alcohol- Opioids- Cannabis - Sedative -Cocaine -Other stimulants, including caffeine - Hallucinogens -Tobacco -Volatile solvents.	4	3
4	**First aid and principles of First Aid:** Primary survey: ABC(Airway, Breathing, Circulation). Qualities of a Good First Aider First aid measures for: Cuts and scrapes - Bruises - Sprains - Strains -Fractures - Burns - Nosebleeds. First Aid Procedures: Cardiopulmonary Resuscitation (CPR) – Heimlich Maneuver - Applying a sling Sports injuries: Classification (Soft Tissue Injuries - Abrasion,Contusion, Laceration, Incision, Sprain & Strain)	2	4

Additional Topics

- Need and Importance of Physical Education and its relevance in interdisciplinary context. Understanding of the Endocrine System
- Developing a fitness profile
- Healthy foods habits for prevention and progression of Lifestyle Diseases. Processed foods and unhealthy eating habits.
- Depression - Anxiety - Stress
- Different ways of carrying an injured person. Usage of Automated external defibrillator

Text Books

Sl. No	Title of the Book	Name of the Author/s	Name of thePublisher	Edition and Year
1	Foundations of Nutrition	Bhavana Sabarwal	Commonwealth Publishers	1999
2	Anatomy and physiology in health and illness.	Ross and Wilson	Waugh, A., & Grant, A.	2022

Reference Books

Sl. No	Title of the Book	Name of theAuthor/s	Name of thePublisher	Edition and Year
1	Fit to be Well Essential Concept	Thygerson, A. L., Thygerson, S. M., & Thygerson, J. S.	Jones & Bartlett Learning.	2018
2	Introduction to physical education, fitness, andsport.	Siedentop, D., &Van der Mars, H.	Human kinetics.	2022
3	Substance Use Disorders. Manual for Physicians.	Lal, R., & Ambekar, A. (2005).	National Drug Dependence Treatment Centre, New Delhi	2005
4	The exercise health connection-how toreduce your risk ofdisease and other illnesses by making exercise your medicine.	Nieman, D. C., & White, J. A	Public Health	1998
5	ACSM's resourcemanual for guidelines for exercise testing and prescription.	Lippincott Williams & Wilkins.	American College of Sports Medicine.	2012
6	Exercise Physiology:energy, nutrition and human performance.	Katch, F. I., Katch, V. L., & McArdle, W. D.	Lippincott Williams &Wilkins	2010

Course Assessment Method (CIE: 50 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Case Study/ Micro project/ Presentation	Activity Evaluation	Total
10	20	20	50

Continuous Internal Evaluation Marks (CIE): for the Health and wellness course

Students will be evaluated as follows.

Title	Method of Evaluation
Attendance	Students must attend at least 75% of both theory and practical classes. Theywill receive 10 marks based on their class attendance. Students who do not meet the minimum attendance requirement for a course,as specified in the B. Tech regulations, will not be eligible to proceed to the next criteria.
Assignment / Presentation	Assignments will be given to students to assess their understanding of the subjects taught. Students will be required to make presentations on the subjects taught in class, and their understanding of the subjects will be assessed. Based on the Assignments and Presentations the students will be awarded marks out of 20
Activity Evaluation	The Assignment / Presentation faculty handling the class will use the tests from the Fitness Protocols and Guidelines for ages 18+ to 65 years, as set forth by FIT India. Measurements will be taken for all the tests of the FIT India Fitness Protocol and the evaluation will be based on the benchmark score received for the following tests: 1. V Sit Reach Test 2. Partial Curl Up - 30 seconds 3. Push Ups (Male) and Modified Push Up (Female) 4. Two (2) km Run/Walk Students who achieve a total benchmark score of 8 across the aforementioned 4 tests will be awarded pass marks for activity evaluation. Students who score better will be awarded a maximum mark of 20.
Activity Evaluation - Special Circumstances	Physically challenged and medically unfit students can opt for an objective test to demonstrate their knowledge of the subjects taught. Based on their performance in the objective test, they will be awarded marks out of 20.
Activity Evaluation - Special Considerations - NCC	Students who enrolled themselves in the NCC during the course period (between the start and end dates of the program) and attended 5 college level parades will be awarded pass marks for activity evaluation. Students who attend more parades will be eligible for a maximum mark of 20 based on their parade attendance.

Tests to evaluated and Benchmark Scores

1. V Sit Reach Test

How to Perform:

- The subject removes their shoes and sits on the floor with the measuring line between their legs and the soles of their feet placed immediately behind the baseline, heels 8-12" apart.
- The thumbs are clasped so that hands are together, palms facing down and placed on the measuring line.
- With the legs held flat by a partner, the subject slowly reaches forward as far as possible, keeping thefingers on baseline and feet flexed.
- After three tries, the student holds the fourth reach for three seconds while that distance is recorded.
- Make sure there are no jerky movements, and that the fingertips remain level and the legs flat.

Infrastructure/Equipment Required:

- A tape for marking the ground, marker pen, and ruler.
- With the tape mark a straight line two feet long on the floor as the baseline, and a measurement line perpendicular to the midpoint of the baseline extending two feet on each side.
- Use the marker pen to indicate every centimetre and millimetre along the measurement line. The point where the baseline and the measuring line intersect is the zero point.
- Scoring: The score is recorded in centimetres and millimetres as the distance reached by the hand, which is the difference between the zero point (where the baseline and measuring line intersect) and the final position

Scoring for V Sit Reach Test for Males

Level	Benchmark Score	Measurement (cm)
1	2	<11
2	4	12-13
3	6	14-17
4	7	18-19
5	8	20-21
6	9	22
7	10	>22

Scoring for V Sit Reach Test for Females

Level	Benchmark Score	Measurement (cm)
1	2	<14
2	4	15-16
3	6	17-19
4	7	20-21
5	8	22
6	9	23
7	10	>23

2. Partial Curl Up - 30 seconds

How to Perform:

- The subject lies on a cushioned, flat, clean surface with knees flexed, usually at 90 degrees, with hands straight on the sides (palms facing downwards) closer to the ground, parallel to the body.
- The subject raises the trunk in a smooth motion, keeping the arms in position, curling up the desired amount (at least 6 inches above/along the ground towards the parallel strip).
- The trunk is lowered back to the floor so that the shoulder blades or upper back touch the floor.

Infrastructure/Equipment Required:

Flat clean cushioned surface with two parallel strips (6 inches apart), Stopwatch
Scoring: Record the maximum number of Curl ups in a certain time period 30 seconds.

Scoring for Partial Curl Up - 30 seconds Test for Males

Level	Benchmark Score	Numbers
1	2	<25
2	4	25-30
3	6	31-34
4	7	35-38
5	8	39-43
6	9	44-49
7	10	>49

Scoring for Partial Curl Up - 30 seconds Test for Females

Level	Benchmark Score	Numbers
1	2	<18
2	4	18-24
3	6	25-28
4	7	29-32
5	8	33-36
6	9	37-43
7	10	>43

3. Push Ups for Male/Modified Push Ups for Female

How to Perform:

- A standard push up begins with the hands and toes touching the floor, the body and legs ina straight line, feet slightly apart, the arms at shoulder width apart, extended and at a right angle to the body.
- Keeping the back and knees straight, the subject lowers the body to a predetermined point, to touch some other object, or until there is a 90-degree angle at the elbows, then returns back to the starting position with the arms extended.
- This action is repeated, and the test continues until exhaustion, or until they can do no more in rhythm or have reached the target number of push-ups.
- For Female: push-up technique is with the knees resting on the ground.

Infrastructure/Equipment Required:

- Flat clean cushioned surface/Gym mat
- Scoring: Record number of correctly completed push-ups.

Scoring for Push Ups for Male

Level	Benchmark Score	Numbers
1	2	<4
2	4	04- 10
3	6	11 -18
4	7	19-34
5	8	35-46
6	9	47-56
7	10	>56

Scoring for Modified Push Ups for Female

Level	Benchmark Score	Numbers
1	2	0-1
2	4	2 - 5
3	6	6 -10
4	7	11 - 20
5	8	21-27
6	9	27-35
7	10	>35

4. 2 Km Run/Walk

How to Perform:

- Participants are instructed to run or walk 2 kms in the fastest possible pace.
- The participants begin on signal (Starting point)- "ready, start". As they cross the finishline, elapsed time should be announced to the participants.
- Walking is permitted but the objective is to cover the distance in the shortest possible time.

Infrastructure/Equipment Required:

- Stopwatch, whistle, marker cone, lime powder, measuring tape, 200 or 400 m with 1.22 m (minimum 1 m) width preferably on a flat and even playground with a marking of starting and finish line. You can also use any application on your mobile phone that tells you the distance.
- Scoring: Time taken for completion (Run or Walk) in min, sec.

Scoring for 2Km Run/walk for Male

Level	Benchmark Score	Minutes: Seconds
1	2	> 11:50
2	4	10:42
3	6	09:44
4	7	08:59
5	8	08:33
6	9	07:37
7	10	>07:37

Scoring for 2Km Run/walk for Female

Level	Benchmark Score	Minutes: Seconds
1	2	>13:47
2	4	12:51
3	6	12:00
4	7	11:34
5	8	10:42
6	9	09:45
7	10	>09:45

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING WORKSHOP

Course Code	24SJGCESL208	CIE Marks	70
Teaching Hours/Week (L: T:P: R)	0:0:2:0	ESE Marks	30
Credits	1	Exam Hours	2 Hrs.
Prerequisites (if any)	None	Course Type	Lab

Course Objectives:

- To create awareness and familiarity with electrical wiring and safety measures to be taken.
- To Identify various electronic components and to operate various measuring instruments
- Learn to setup simple electronic circuits on breadboard and PCB

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Demonstrate safety measures against electrical shocks	K2
CO2	Familiarize with batteries and Earthing schemes	K2
CO3	Illustrate the connection diagram and identify the suitable accessories necessary for wiring simple electric circuits	K3
CO4	Identify various electronic components	K2
CO5	Operate various measuring instruments	K3
CO6	Apply the design procedure of simple electronic circuits on breadboard and PCB	K3
CO7	Build the ability to work in a team with good interpersonal skills	K3

K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1						3					2
CO2	1					2					2
CO3	2					1					2
CO4	3					2					3
CO5	3				3	2		2			3
CO6	3		3	1	3	2		2			3
CO7								3	2		2

List of Experiments

ELECTRICAL WORKSHOP		
Expt. No.	**Experiments**	**CO**
1	a) Demonstrate the precautionary steps adopted in case of Electrical shocks. b) Identify different types of cables, wires, switches, fuses, fuse carriers, MCB, ELCB and MCCB, familiarize the ratings.	1
2	Wiring of simple light circuit for controlling light/ fan point (PVC conduit wiring)	3
3	Wiring of light/fan circuit using two-way switches. (Staircase wiring)	3
4	Wiring of a simple light circuit for light/ fan point (PVC conduit wiring) and a 6A plug socket with individual control.	3
5	Wiring of power distribution arrangement using single phase MCB distribution board with ELCB, main switch and Energy meter.	3
6	Identify battery specifications using different types of batteries. (Lead acid, Li Ion, NiCd etc.)	2
7	Familiarize different types of Earthing (Pipe, Plate Earthing, Mat Schemes) and Ground Enhancing Materials (GEM).	2
Advanced Experiments		
1	Wiring of a power plug (16 A) socket with a control switch.	3
2	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	3
3	Familiarization of rheostats, measurement of potential across resistance elements and introducing the concept of relative potential using a DC circuit.	3

ELECTRONICS WORKSHOP		
Expt. No.	**Experiments (Minimum of 7 Experiments to be done)**	**CO**
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.)	4
2	Drawing of electronic circuit diagrams using BIS/IEEE symbols and Interpret data sheets of discrete components and IC's	6
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	5
4	Testing of electronic components using multimeter - Resistor, Capacitor, Diode, Transistor and JFET.	4
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
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.	6
7	Assembling of electronic circuit/system on general purpose PCB, test and show the functioning (Any two)- Fixed voltage power supply with transformer • Rectifier diode • Capacitor filter • Zener/IC regulator • Square wave generation using IC 555 timer in IC base.	7
8	Introduction to EDA tools (such as KiCad or XCircuit)	4

Course Assessment Method (CIE: 70 marks, ESE: 30 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Preparation/Pre-Lab Work, experiments, Viva and Timely completion of Lab Reports / Record (Continuous Assessment)	Total
10	**60**	**70**

*End Semester Examination Marks (ESE):

Procedure/ Preparatory work/Design/ Algorithm	Conduct of experiment/ Execution of work/ troubleshooting/ Programming	Result with valid inference/ Quality of Output	Viva voce	Record	Total
5	10	5	5	5	30

- ***Submission of Record: Students shall be allowed for the end semester examination only upon submitting the duly certified record.***
- ***Minimum Pass Mark: The requirement for passing the lab course included in the first-year curriculum is that the student must score a minimum of 50% overall, combining marks from both Continuous Internal Evaluation (CIE) and End Semester Examination (ESE). There is no separate minimum requirement for each component.***
- ***There will not be any relaxation in the attendance requirement.***

Continuous Assessment with equal weightage for both specializations (60 Marks)

Preparation and Pre-Lab Work (25 Marks)

- **Pre-Lab Assignments:** Assessment of pre-lab assignments or quizzes that test understanding of the upcoming experiment.
- **Skill Proficiency:** Proficiency in handling equipment, accuracy in observations, and troubleshooting skills during the experiments.
- **Teamwork:** Collaboration and participation in group experiments.

Lab Reports and Record Keeping (25 Marks)

- **Quality of Reports**: Clarity, completeness and accuracy of lab reports. Proper documentation of experiments, data analysis and conclusions.
- **Timely Submission:** Adhering to deadlines for submitting and maintaining a well-organized lab record.

Viva Voce (10 Marks)

- **Oral Examination:** Ability to explain the experiment, results and underlying principles during a viva voce session.

Evaluation Pattern for End Semester Examination (30 Marks)

ESE to be conducted by the course offering department based on the following evaluation criteria

Procedure/Preliminary Work/Design/Algorithm (5 Marks)

- **Procedure Understanding and Description:** Clarity in explaining the procedure and understanding each step involved.
- **Preliminary Work and Planning**: Thoroughness in planning and organizing materials/equipment.
- **Algorithm Development:** Correctness and efficiency of the algorithm related to the experiment.

- Creativity and logic in algorithm or experimental design.

Conduct of Experiment/Execution of Work/Programming (10 Marks)

- Setup and Execution: Proper setup and accurate execution of the experiment or programming task.

Result with Valid Inference/Quality of Output (5 Marks)

- **Accuracy of Results:** Precision and correctness of the obtained results.
- **Analysis and Interpretation:** Validity of inferences drawn from the experiment or quality of program output.

Viva Voce (5 Marks)

A written examination or an MCQ to assess the knowledge level of the student in the experiments & proficiency in answering questions related to theoretical and practical aspects of the course.

Record (5 Marks)

Completeness, clarity, and accuracy of the lab record submitted

Text Books				
Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Electrical Design Estimating and Costing	K B Raina and S K Bhattacharya	New Age International Publishers	2/e 2024
2	Electrical Systems Design	M K Giridharan	I K International Publishing House Pvt. Ltd	3/e 2022
3	Basic Electrical Engineering	D P Kothari and I J Nagrath	Tata McGraw Hill	4/e 2019
4	Basic Electronics and Linear Circuits	NN Bhargava, D C Kulshreshtha and S C Gupta	Mc Graw Hill	2/e 2017

Programme Outcomes (POs)

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature and analyse complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

PO6: The Engineer and The World: Analyse and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

Knowledge and Attitude Profile (WK)

WK1: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

WK2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

WK7: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

WK8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

WK9: Ethics, inclusive behaviour and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

Department of

Mechanical Engineering

Vision

To develop into a center for imparting knowledge and technical skills of international standards, in Mechanical Engineering.

Mission

- To follow a teaching-learning process, with the support of qualified and committed faculty, in undergraduate and post graduate Mechanical Engineering programs.
- To establish an infrastructure and academic ambience for collaborating with Industry, Academia and Community to serve local and national enterprises.
- To make the students self-learners and socially committed engineers, for individual and collective accomplishments.

ST. JOSEPH'S
COLLEGE OF ENGINEERING AND TECHNOLOGY, - PALAI -
AUTONOMOUS

Vision

Developing into a world class, pace setting institute of Engineering and Technology with distinct identity and character, meeting the goals and aspirations of the society.

Mission

- To maintain a conducive infrastructure and learning environment for world class education.
- To nurture a team of dedicated, competent and research-oriented faculty.
- To develop students with moral and ethical values, for their successful careers, by offering variety of programs and services.