SEMESTER S 1/S 2

COURSE NAME: Mathematics for Electrical Science and Physical Science - 1

(Common to Groups B & C)

Course Code	**GYMAT101**	**CIE Marks**	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	**ESE Marks**	60
Credits	3	**Exam Hours**	2Hr. 30 Min.
Prerequisites (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 analyze linear systems and to provide advanced knowledge and practical skills in solving second-order ordinary differential equations, applying Laplace transforms, and understanding Fourier series, enabling them to analyze and model dynamic systems come across in engineering disciplines effectively.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
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 vector, Diagonalization of matrices. **(Text 1: Relevant topics from sections 7.3, 7.4, 7.5, 8.1, 8.4)**	**9hrs**
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)**	**9hrs**
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	**9hrs**

	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)**	
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, 15.4)**	**9hrs**

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 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 1 question should be answered. ● Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

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 equation with constant coefficients.	**K3**
CO3	Compute Laplace transform and apply it to solve ODEs arising in engineering.	**K3**
CO4	Determine the Taylor series and evaluate Fourier series expansion for different periodic functions.	**K3**

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

CO-PO Mapping Table:

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

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

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
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	Calculus	H. Anton, I. Biven, S.Davis	Wiley	12th edition, 2024

Video Links (NPTEL, SWAYAM…)		
Sl. No	**Module No.**	**Link ID**
1	Module 1	https://archive.nptel.ac.in/courses/111/107/111107164/
2	Module 2	NPTEL :: Mathematics - Ordinary Differential Equations
3	Module 3	NPTEL :: Mathematics - NOC:Laplace Transform
4	Module 4	https://archive.nptel.ac.in/courses/111/101/111101164/

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

(A State Government University)

SYLLABUS FORMAT (Theory + Lab courses)

For

B. Tech, 2024

Ambady Nagar

Thiruvananthapuram- 695016

SEMESTER – 1/2

COURSE NAME Physics for Physical Science & Life Science
(Common to Group C and Group D)

Course Code	**GYPHT121**	**CIE Marks**	40
Teaching Hours/Week (L: T:P: R)	3:0:2:0	**ESE Marks**	60
Credits	4	**Exam Hours**	2Hr. 30Mns.
Prerequisites (if any)	None	**Course Type**	Theory + Lab

Course objectives:

- To provide students a solid background in the fundamentals of Physics and to impart that knowledge in engineering disciplines. The course is designed to develop scientific attitudes and enable the students to correlate the concepts of Physics with the core programmes.
- To make the students gain practical knowledge to correlate the theoretical studies and to develop practical applications of engineering.

Syllabus		Contact Hours
Module-I	**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**
Module-II	**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**
Module- III	**Quantum Mechanics** Introduction, Concept of uncertainty and conjugate observables (qualitative), Uncertainty principle (statement	**9**

	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)	
Module- IV	**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**

Course Assessment Method (CIE: -40 Marks, ESE: 60 Marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	*Continuous Assessment*	*Internal Examination-1 (Written Examination)*	*Internal Examination-2 (Written Examination)*	*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 =24marks)**	• 2 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. Each question carries 9 marks. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course the student will be able to:

	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Describe the basic principles and properties of laser and optic fibers.	K2
CO2	Describe the phenomena of interference and diffraction of light.	K2
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 acoustic design of buildings.	K3
CO5	Apply basic knowledge of principles and theories in physics to conduct experiments.	K3

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

Course Articulation Matrix (Mapping of course outcomes with program outcomes)**:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	2	1									1
CO 2	3	2	1									1
CO 3	3	2	1									1
CO 4	3	2	1									1
CO 5	3	2	1		1			1	2			1

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

Textbooks

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	S Chand & Co.	2nd Edition, 2019

		Murthy		
2	Engineering Physics	H K Malik , A.K. Singh,	McGraw Hill Education	2nd Edition, 2017

Reference Books				
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	Optics	Ajoy Ghatak	Mc Graw Hill Education	6th Edition, 2017
5	Fiber Optic Communications	Gerd Keiser	Springer	2021
6	A Text Book of Engineering physics	I. Dominic, A. Nahari	OWL Publications	2nd Edition, 2016
7	Advanced Engineering Physics	Premlet B	Phasor Books	2017
8	Engineering Physics	Rakesh Dogra	Katson Books	1st Edition, 2019

Video Links (NPTEL, SWAYAM etc):	
Module - I	https://nptel.ac.in/courses/115102124 https://nptel.ac.in/courses/104104085
Module - II	https://nptel.ac.in/courses/115105537
Module - III	https://nptel.ac.in/courses/115102023 https://nptel.ac.in/courses/115101107
Module - IV	https://nptel.ac.in/courses/112104212 https://nptel.ac.in/courses/124105004

1. Continuous Assessment (10 Marks)

i. 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.

ii. 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.

iii. 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.

iv. 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.*

2. 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 practical aspects of the subject.

Experiment List

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

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

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SYLLABUS FORMAT (Theory + Lab courses)

For

B. Tech, 2024

Ambady Nagar

Thiruvananthapuram- 695016

SEMESTER -1/2

COURSE NAME: Chemistry for Physical Science
(Common to C Group)

Course Code	**GCCYT122**	**CIE Marks**	40
Teaching Hours/Week (L: T:P: R)	3:0:2:0	**ESE Marks**	60
Credits	4	**Exam Hours**	2Hr. 30Mns.
Prerequisites (if any)	None	**Course Type**	Theory

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 such as climate change, pollution, and waste management, which impact quality of life.

Syllabus		**Contact Hours**
Module-I	**Engineering Materials** **Fuels:** Calorific value – HCV and LCV – Experimental determination of 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**
Module-II	**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. Li-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**

Module-III	**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**
Module-IV	**Environmental Chemistry** **Water characteristics** - Hardness - Types of hardness- Temporary and Permanent - Disadvantages of hard water -Degree of hardness (Numericals) Water softening methods-Ion exchange process-Principle, procedure and advantages. Reverse osmosis – principle, process and advantages. – Water disinfection methods – chlorination-Break point chlorination, ozone and UV irradiation. Dissolved oxygen (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**

Course Assessment Method (CIE: -40 Marks, ESE: 60 Marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	*Continuous Assessment*	*Internal Examination-1 (Written Examination)*	*Internal Examination-2 (Written Examination)*	*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 =24marks)**	2 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. Each question carries 9 marks. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course the student will 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

Course Articulation Matrix (Mapping of course outcomes with program outcomes)**:**

	PO1	PO2	PO3	PO4	PO 5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										2
CO2	3	3										2
CO3	3	3										2
CO4	3	3				2	3					2

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

Textbooks

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 Publishing Company	17th Edition 2015

1. Continuous Assessment (10 Marks)

Reference Books				
1	Fundamentals of Molecular Spectroscopy	C. N. Banwell	McGraw-Hill	4thedn., 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 Learning India 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 and Applications	Prof. Dr. C. N. R. Rao, Prof. Dr. h.c. mult. Achim Müller, Prof. Dr. A. K. Cheetham	Wiley-VCH Verlag GmbH & Co. KGaA	2014
6	Organic Electronics Materials and Devices	Shuichiro Ogawa	Springer Tokyo	2024

Video Links (NPTEL, SWAYAM etc):	
Module - I	1. https://archive.nptel.ac.in/courses/104/106/104106137/ 2. https://archive.nptel.ac.in/courses/113/105/113105102/ 3. https://archive.nptel.ac.in/courses/113/104/113104082/ 4. https://www.youtube.com/watch?v=BeSxFLvk1h0
Module - II	1. https://archive.nptel.ac.in/courses/113/104/113104102/ 2. https://archive.nptel.ac.in/courses/104/105/104105124/ 3. https://archive.nptel.ac.in/courses/105/104/105104157/

i. 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.

ii. 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.

iii. 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.

iv. 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.*

2. 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 practical aspects of the subject.

List of Experiments

***Any 8 Experiments Mandatory**

Experiment No.	Experiment
1	Estimation of iron in iron ore
2	Estimation of copper in brass
3	Determination of cell constant and conductance of solutions
4	Calibration of pH meter and determination of pH of a solution
5	Synthesis of polymers (a) Urea-formaldehyde resin (b) Phenol-formaldehyde resin
6	Determination of wavelength of absorption maximum and colorimetric estimation of Fe^{3+} in solution
7	Determination of molar absorptivity of a compound (KMnO4 or any water-soluble food colorant)
8	Analysis of IR spectra
9	Identification of drugs using TLC
10	Estimation of total hardness of water-EDTA method
11	Estimation of dissolved oxygen by Winkler's method
12	Determination of calorific value using Bomb calorimeter
13	Determination of saponification value of a given vegetable oil
14	Determination of acid value of a given vegetable oil
15	Verification of Nernst equation for electrochemical cell.

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

(A State Government University)

SYLLABUS FORMAT (PC, PE and OE/ILE)

For

B. Tech, 2024

MBA Block, College of Engineering, Thiruvananthapuram

Campus Thiruvananthapuram- 695016

SEMESTER - 1			
COURSE NAME: ENGINEERING MECHANICS (Group C)			
Course Code:	**GCEST103**	**CIE Marks**	40
Teaching Hours/Week (L: T:P: R)	**3-0-0-0**	**ESE Marks**	60
Credits	3	**Exam Hours**	2 hrs 30 mins
Prerequisites (if any)	None	**Course Type**	Theory

Course objectives:

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

Syllabus		Contact Hours
Module - I	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 hrs**
Module - II	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 hrs**
Module - III	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 hrs**
Module - IV	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 hrs**

Course Assessment Method (CIE: -40 Marks, ESE: 60 Marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	*Assignment/ Microproject*	*Internal Ex-1*	*Internal Ex-2*	*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

Course Outcomes (COs)

At the end of the course the student will be able to:

	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Understand the vector representation of forces and moments	1,2
CO2	Identify and describe the components of system of forces acting on the rigid body	2,3
CO3	Apply the conditions of equilibrium to different force system.	3
CO4	Identify appropriate principles to solve problems of mechanics.	2, 3
CO5	Develop the understanding of fundamental principles of rigid body dynamics	3

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

Course Articulation Matrix (Mapping of course outcomes with program outcomes)**:**

	PO1	PO2	PO3	PO4	PO 5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2										
CO2	3	3										
CO3	3	3										
CO4	3	3										
CO5	3	2										

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

Textbooks				
Sl No	**Sl No**	**Sl No**	**Sl No**	**Sl No**
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.	4th Edition 2016
Reference Books				
1	Engineering Mechanics Statics	J. L. Meriam, L. G. Kraige	Wiley	*9th Edition 2020*
2	Engineering Mechanics	Chandramouli	PHI Learning	*2011*
Video Links (NPTEL, SWAYAM etc):				
https://nptel.ac.in/courses/112106286				

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

(A State Government University)

SYLLABUS

For

B. Tech, 2024

Ambady Nagar

Thiruvananthapuram- 695016

SEMESTER – I

Introduction to Mechanical Engineering & Civil Engineering
(Common to Group C)

Course Code	GCEST104	**CIE Marks**	40
Teaching Hours/Week (L: T:P: R)	(2+2)-0-0-0	**ESE Marks**	60
Credits	4	**Exam Hours**	2hrs 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.

Syllabus		Contact Hours
Module-I	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.	**11 hrs**
Module-II	Classification of pumps, Description about working with sketches of: Reciprocating pump, Centrifugal pump. Classification of Hydraulic Turbines. 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.	**11 hrs**

Module- III	**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).	**11 hrs**
Module- IV	**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, cube compressive strength as per IS Codes. **Steel:** Structural steel sections and steel reinforcements – types and uses. **Soil**-Origin of soil-weathering of rocks, types of weathering	**11 hrs**

Course A
ssessment Method (CIE: -40 Marks, ESE: 60 Marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	*Assignment*	*Internal Ex-1*	*Internal Ex-2*	*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)**	2 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. Each question carries 9 marks. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course the student will be able to:

	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Understand the relevance of mechanical engineering and its various disciplines.	**K2**
CO2	Learn the applications of thermodynamics through IC engines and refrigeration systems.	**K2**
CO3	Understand the various manufacturing processes adapted by mechanical engineers.	**K2**
CO4	Understand the relevance of civil engineering and its various disciplines.	**K2**
CO5	Describe the relevance of various building codes and types of buildings as per NBC	**K2**
CO6	Understand different building components and building materials.	**K2**

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

Course Articulation Matrix (Mapping of course outcomes with program outcomes**):**

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

Textbooks

SL No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
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(Material Science)	Rangwala S C	Charotar Publishing House Pvt Limited	43rd Edition 2019

7	Building Materials	Duggal S K	New Age International	5th Edition2019

Reference Books				
1	Hybrid Electric Vehicles: Principles and Applications 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.ItoIV	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
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 etc):	
Module - I	https://nptel.ac.in/courses/112/105/112105123/ https://nptel.ac.in/courses/112/106/112106133/ https://nptel.ac.in/courses/112/105/112105129/
Module - II	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
Module - III	https://archive.nptel.ac.in/courses/105/106/105106201/
Module - IV	https://archive.nptel.ac.in/courses/105/106/105106206/

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

(A State Government University)

SYLLABUS FORMAT (Theory + Lab courses)

For

B. Tech, 2024

Ambady Nagar

Thiruvananthapuram- 695016

SEMESTER - 1

Algorithmic Thinking with Python
(Common to All Branches)

Course Code	**UCEST105**	**CIE Marks**	40
Teaching Hours/Week (L: T:P: R)	3:0:2:0	**ESE Marks**	60
Credits	4	**Exam Hours**	2.30
Prerequisites (if any)	None	**Course Type**	Theory

Course objectives:

- Provide a comprehensive understanding of algorithmic thinking and its practical applications.
- Explore algorithmic paradigms including brute force, divide-and-conquer, dynamic programming and heuristics in solving complex problems

	Syllabus	**Contact Hours**
Module-I	PROBLEM-SOLVING STRATEGIES - Problem-solving strategies defined - Importance of Understanding Multiple Problem-solving Strategies - Trial and Error - Algorithm and Heuristic - Means-Ends Analysis 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 - Evaluating the Solution ESSENTIALS OF PYTHON PROGRAMMING - Creating and using Variables in Python, Numeric types in Python, Using strings in Python, Using the math module, Using the Python Standard Library for handling file I/O, basic mathematics, etc Using the NumPy library	**8**
Module-II	ALGORITHMS - The Notion of Algorithm : Reasons for Algorithm, Steps Involved in Algorithm Development, Characteristics of Algorithm, Representation of Algorithms, Representative Algorithms for Simple Problems, Measuring Efficiency of Algorithms, Advantages and Disadvantages of Algorithms. FLOWCHARTS - Concept of Flowcharts; Symbols used in Creating a Flowchart : Basic Symbols, Intermediate and Advanced Symbols, Common Types of Flowchart Types, Areas for using Flowcharts, Considerations in Flowcharting, Sample Flowcharts, Differences between Algorithm and Flowchart, Advantages of Flowcharts PSEUDOCODE - Meaning and Definition of Pseudocode, Reasons for using Pseudocode, The main constructs of pseudocode, Rules for writing pseudocode, Advantages of pseudocode, Worked Examples	**10**
Module- III	IMPLEMENTATION STRATEGIES (CONTROL STRUCTURES) SELECTION AND ITERATION USING PYTHON - Using If - Else, Elif, For Loops, range(), While Loops function in Python Creating and using Arrays in Python DECOMPOSITION AND MODULARISATION - Decomposition : Approach to	**11**

	Problem Decomposition, Modularisation, Motivations for Modularisation, Basic concept of Modularisation : Program Control Function, Specific Task Function, Basic Properties of Modularity, Advantages of modularisation in Programming, Creating 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, Overhead of Recursion	
Module- IV	COMPUTATIONAL APPROACHES TO PROBLEM SOLVING - (Introductory diagramatic/algorithmic explanations are enough. Analysis not required) Brute-force Approach - - Example : Pad lock, Password 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 - Characteristics of the Greedy Algorithm - Motivations for Greedy Approach - Greedy Algorithms vs Dynamic Programming Randomized Approach	**8**

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 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)**	2 questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 3 subdivisions. Each question carries 9 marks. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course the student will be able to:

	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Understand the role of a computer as a model of computation in solving problems.	**K2**
CO2	Develop skills to understand a problem before attempting to solve it and formulate a clear and accurate model to represent the problem.	**K3**
CO3	Create effective algorithms to solve formulated models and translate algorithms into executable programs.	**K3**
CO4	Infer 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

Course Articulation Matrix (Mapping of course outcomes with program outcomes**):**

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

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

Textbooks

SL No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year

1				

Reference Books				
1	Creative Problem Solving: An Introduction	Donald Treffinger., Scott Isaksen, Brian Stead-Doval	Prufrock Press	2005
2	Psychology (Ch. Problem Solving.)	Spielman, R. M., Dumper, K., Jenkins, W., Lacombe, A., Lovett, M., & Perlmutter, M	H5P Edition	2021
3	Computer Arithmetic Algorithms	Koren, Israel	AK Peters/CRC Press	2018
4	Introduction to Computation and Programming using Python	Guttag John V	PHI	2/e., 2016
5	Python for Everyone	Cay S. Horstmann, Rance D. Necaise	Wiley	3/e, 2024
5	Computational Thinking : A Primer for Programmers and Data Scientists	G Venkatesh Madhavan Mukund	Mylspot Education Services Pvt Ltd	2020

Video Links (NPTEL, SWAYAM etc):	
Module - I	https://opentextbc.ca/h5ppsychology/chapter/problem-solving/
Module - II	https://onlinecourses.nptel.ac.in/noc21_cs32/preview
Module - III	
Module - IV	

1. 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

2. Evaluation Pattern for Lab Examination (10 Marks)

1. **Algorithm (4 Marks)**

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

2. **Programming (2 Marks)**

   Execution: Accurate execution of the programming task.

3. **Result (2 Marks)**

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

4. **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 an action 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. Evaluate different algorithms based on their efficiency by counting the number of steps.
7. Recursive function that takes a number and returns the sum of all the numbers from zero to that number.
8. Recursive function that takes a number as an input and returns the factorial of that number.
9. Recursive function that takes a number 'n' and returns the nth number of the Fibonacci number.
10. Recursive function that takes an array of numbers as an input and returns the product of all the numbers in the list.

SAMPLE LAB Experiments:

1. Demonstrate about Basics of Python Programming
2. Demonstrate about fundamental Data types in Python Programming. (i.e., int, float, complex, bool and string types)
3. Demonstrate different Arithmetic Operations on numbers in Python.
4. Create, concatenate, and print a string and access a sub-string from a given string.
5. Familiarize time and date in various formats (Eg. "Sun May 29 02:26:23 IST 2017")
6. Write a program to create, append, and remove lists in Python using numPy.
7. Programs to find the largest of three numbers.
8. Convert temperatures to and from Celsius, and Fahrenheit. [Formula: c/5 = f-32/9]
9. Program to construct the stars(*) pattern, using a nested for loop
10. Program that prints prime numbers less than 20.
11. Program to find the factorial of a number using Recursion.
12. Recursive function to add two positive numbers.
13. Recursive function to multiply two positive numbers
14. Recursive function to the greatest common divisor of two positive numbers.
15. 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.
16. Program to define a module to find Fibonacci Numbers and import the module to another program.
17. Program to define a module and import a specific function in that module to another program.
18. Program to check whether the given number is a valid mobile number or not using functions?
    Rules:
    1. Every number should contain exactly 10 digits.
    2. The first digit should be 7 or 8 or 9

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

(A State Government University)

SYLLABUS FORMAT (LAB)

For

B. Tech, 2024

Ambady Nagar

Thiruvananthapuram- 695016

SEMESTER - I			
Engineering Workshop (Common to Group C)			
Course Code:	**GCESL106**	**CIE Marks**	50
Teaching Hours/Week (L: T:P: R)	0-0-2-0	**ESE Marks**	-
Credits	1	**Exam Hours**	2 hours
Prerequisites (if any)	None	**Course Type**	Lab

Course objectives:

- **Understand and learn various mechanical workshop specializations and operations by practice.**
- **Learn and practice safe and sustainable measures in a workplace according to the nature of operations.**
- **Learn and Practice various techniques of taking measurement of plane and sloping ground levels**
- **Understand and learn to handle conventional construction materials and building practices.**

Minimum 12 experiments is to be completed by a student

Experiment No.	Experiment
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, Micrometers, Bevel Protractor etc.
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
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
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
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
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
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. Minimum any one exercise on smithy 1. Square prism
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
9	Rolling: - Objective of rolling, rolling process, practical on two high rolling mill
10	Electroplating: -Electroplating a given job
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.
12	Assembly: Demonstration only Dissembling and assembling of 1. Cylinder and piston assembly 2. Tail stock assembly 3. Bicycle 4. Pump or any other machine
13	Machines: Demonstration of the following machines: Shaping and slotting machine; Milling machine; Grinding Machine; Lathe; Drilling Machine.
14	Modern manufacturing methods (Fablab/IDEALab - Demonstration only): Power tools, CNC machine tools, 3D printing, Soft Materials cutting using special machines
15	Use of proper Personal Protective Equipments. Measurements using Tape, Ruler, Vernier calliper, screw gauge
16	Measuring the area of a plot with an irregular boundary using a chain and cross staff
17	Measuring the area of a building using Distomat
18	Finding the level difference between two points using dumpy level
19	Onsite quality assessment of brick, and cement
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
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
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.
23	Setting out of a two roomed building using thread, tape and water tube levelling.
24	Conduct a market study to understand the types, prices, and general specifications of any two construction materials available in the market (such as bricks, cement, aggregates, steel, plumbing items, etc.).
25	Studying the tools and testing instruments for electrical works. Wiring a light or a fan circuit using one way and two-way switch.
26	Familiarization/Application of testing instruments and commonly used tools in electronic works. [Multimeter, Soldering iron, De-soldering pump, Pliers, Cutters, Wire strippers, Screw drivers, Tweezers, Crimping tool, Hot air soldering and desoldering station etc.]

Course Assessment Method (CIE: -50 Marks, ESE: 00 Marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	*Preparation/Pre-Lab Work, experiments, Viva and Timely completion of Lab Reports / Record (Continuous Assessment)*	*Internal Exam*	***Total***
10	**20**	**20**	**50**

Submission of Record: *Students shall be submitting the duly certified record along with internal evaluation process.*

Course Outcomes (COs)

At the end of the course the student will be able to:

	Course Outcome	**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	K3
CO3	Understand the industrial and practical relevance of various mechanical operations like industrial coating, metal rolling, Digital subtractive and additive operations etc.	K3
CO4	Understand the common practices of measurements of a plot	K3
C05	Understand common quality assessment techniques of bricks and simple construction practices using bricks.	K3
C06	Understand the market rates of conventional building materials	K3

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

Course Articulation Matrix (Mapping of course outcomes with program outcomes**):**

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2											
CO2	2								2			
CO3					2							
CO4	2											2
CO5	2											2
CO6	2											2

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

Textbooks

SL No	**Title of the Book**	**Name of the Author/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				
1	Elements of Workshop Technology Vol-1-Manufacturing Processes	S K Hajra Choudhury A K Hajra Choudhury Nirjhar Roy	MPP Media Promoters and Publishers	2008
Video Links (NPTEL, SWAYAM etc):				
1	https://archive.nptel.ac.in/courses/105/106/105106206/			
2	https://archive.nptel.ac.in/courses/105/106/105106201/			
3	https://archive.nptel.ac.in/courses/105/104/105104101/			
4	https://archive.nptel.ac.in/courses/117/106/117106108/			

Continuous Assessment (20 Marks)

1. **Preparation and Pre-Lab Work (5 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 (5 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 (5 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 (5 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 Internal Examination (20 Marks)

1. **Procedure/Preliminary Work/Design/Algorithm (10 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.

2. **Conduct of Experiment/Execution of Work/Programming (5 Marks)**
    - Setup and Execution: Proper setup and accurate execution of the experiment or programming task.
3. **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.

SEMESTER S1/S2

COURSE NAME: Mathematics for Electrical Science and Physical Science – 2 (Common to B & C Groups)

Course Code	**GYMAT201**	**CIE Marks**	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	**ESE Marks**	60
Credits	3	**Exam Hours**	2Hr. 30 Min.
Prerequisites (if any)	Basic knowledge in single variable calculus.	**Course Type**	Theory

Course Objectives:

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

SYLLABUS

Module No.	Syllabus Description	Contact Hours
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)**	**9hrs**
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)**	**9hrs**
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)**	**9hrs**

4	Green's theorem (for simply connected domains, without proof) and applications to evaluating line integrals, finding areas using Greens theorem, Surface integrals over surfaces of the form $z=g(x, y)$, Flux integrals over surfaces of the form $z = g(x, y)$, Divergence theorem (without proof), Using Divergence theorem to find flux, Stokes theorem (without proof) **(Text 1: Relevant topics from section 15.4, 15.5, 15.6, 15.7,15.8)**	**9hrs**

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 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 1 question should be answered. ● Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

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**

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

CO-PO Mapping Table:

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

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/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 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	Advanced Engineering Mathematics	Erwin Kreyszig	John Wiley & Sons	10th edition, 2016
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

Video Links (NPTEL, SWAYAM…)		
Sl. No	**Module No.**	**Link ID**
1	Module I	https://nptel.ac.in/courses/111107108
2	Module II	https://nptel.ac.in/courses/111107108
3	Module III	https://nptel.ac.in/courses/111107108
	Module IV	https://nptel.ac.in/courses/111107108

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

(A State Government University)

SYLLABUS FORMAT (PC,PE and OE/ILE)

For

B. Tech, 2024

MBA Block, College of Engineering, Thiruvananthapuram Campus

Thiruvananthapuram- 695016

SEMESTER -2

Engineering Graphics and Computer Aided Drawing
(Common to All Groups)

Course Code	GCEST203	**CIE Marks**	40
Teaching Hours/Week(L: T:P: R)	2-0-2-0	**ESE Marks**	60
Credits	3	**Exam Hours**	2hrs 30 minutes
Prerequisites (if any)	None	**Course Type**	Theory & Lab

Course objectives:

- Learn dimensioning and preparation of drawings
- Learn to interpret engineering drawings
- Learn the features of CAD software

Syllabus		Contact Hours
Module-I	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.	**9/11hrs**
Module-II	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 reference planes and with axis inclined to both reference planes.	**9/11hrs**
Module- III	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)	**9/11hrs**
Module- IV	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)	**9/11hrs**

* Manual drafting can be done on A4, A3 or A2 sheets.

* Mini drafter is recommended but not mandatory

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

Continuous Internal Evaluation Marks (CIE):

Attendance	*Assignment+ Lab Exam*	*Internal Exam-1*	*Internal Exam-2*	*Total*
5	**10+5**	**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 one module. • Total 8 Questions, each question carries 3 marks **(3x8 =24marks)**	2 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. Each question carries 9 marks. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course the student will be able to:

	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Understand and plot the projection of points and lines located in different quadrants	**K2/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- Analyze, K5- Evaluate, K6- Create

Course Articulation Matrix (Mapping of course outcomes with program outcomes)**:**

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

1:Slight(Low),2:Moderate(Medium),3:Substantial(High),-:NoCorrelation

Textbooks

SlNo	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	Ist Edition 2012
2	Engineering Graphics,	Benjamin, J.	Pentex Publishers	5th Edition 2017
3	Engineering Graphics for degree	John, K. C.	Prentice Hall India Publishers	Published in 2011
4	Engineering Drawing,	Bhatt, N., D.	Charotar Publishing House Pvt Ltd.	Published in 2017
5	Engineering Graphics,	Anilkumar, K. N.	Adhyuth Narayan Publishers	10th Edition 2016

Reference Books				
1	Engineering Graphics with AutoCAD,	Kulkarni, D. M., Rastogi, A. P. and Sarkar, A. K.,	Prentice Hall India Publishers	Published in 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	Published in 2015
Video Links (NPTEL, SWAYAM etc):				
https://archive.nptel.ac.in/courses/112/102/112102304/				

SEMESTER -II			
Basic Electrical & Electronics Engineering (Common to C Group)			
Course Code	**GCEST204**	**CIE Marks**	40
Teaching Hours/Week (L: T:P: R)	**4:0:0:0**	**ESE Marks**	60
Credits	4	**Exam Hours**	2 hrs.30 mins
Prerequisites (if any)	None	**Course Type**	Theory

Course Objectives:

- Apply fundamental concepts and circuit laws to solve simple DC/AC electric circuits
- Develop an awareness on the fundamentals of electric power generation, transmission and distribution
- Compare different types of DC and AC motors
- Describe the fundamental concepts of electronic components and devices
- Outline the basic principles of an electronic instrumentation system
- Identify important applications of modern electronics in the contemporary world

Syllabus		Contact Hours
Module-I	**Generation of alternating voltages:** - Faradays laws of Electromagnetic induction, Generation of Alternating Voltage, Elementary Generator, Representation of ac voltage and currents, sinusoidal waveforms: frequency, period average, RMS values and form factor of waveform; (Simple numerical problems) **DC Circuits:** Resistance in Series and Parallel, Ohms Law and Kirchhoff's laws, Voltage and current divider rule (Simple numerical problems) **AC circuits:** Purely resistive, inductive and capacitive circuits; Inductive and capacitive reactance, concept of impedance. (Simple 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)	**11 hrs**
Module-II	**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 **Types of Motors –** Principle of Operation: Block diagram showing power stages, losses and efficiency (electrical and	**11 hrs**

	mechanical and overall efficiency); Simple numerical efficiency **Introduction to different types of DC and AC motors.** Classification and different type of dc and ac motors, common applications: Principle of traction and applications **Earthing:** need for earthing, Types of earthing; pipe earthing, plate earthing; **Principle of operation of MCB, ELCB/RCCB**	
Module- III	**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	**13hrs**
Module- IV	**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.	**9hrs**

Course Assessment Method (CIE: -40 Marks, ESE: 60 Marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	*Assignment*	*Internal Ex-1*	*Internal Ex-2*	*Total*
10	**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 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)**	2 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. Each question carries 9 marks. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course the student will 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	**K3**
CO3	Compare different types of DC and AC motors	**K2**
CO4	Describe the fundamental concepts of electronic components and devices	**K2**
CO5	Outline the basic principles of an electronic instrumentation system	**K2**
CO6	Identify important applications of modern electronics in the contemporary world	**K2**

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

Course Articulation Matrix (Mapping of course outcomes with program outcomes**):**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										2
CO2	3		2			2	1					2
CO3	3					1						2
CO4	3	1										2
CO5	3		1									2
CO6	3					2	1					2

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

Textbooks

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	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

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 and 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

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

(A State Government University)

SYLLABUS FORMAT (PC, PE and OE/ILE)

For

B. Tech, 2024

Ambady Nagar

Thiruvananthapuram- 695016

SEMESTER - 2

MECHANICS OF SOLIDS

(Common to Civil Engineering Branches)

Course Code	**PCCET205**	**CIE Marks**	40
Teaching Hours/Week (L: T:P: R)	**3-1-0-0**	**ESE Marks**	60
Credits	4	**Exam Hours**	2Hr. 30 Mnts.
Prerequisites (if any)	GCEST103/ Equivalent	**Course Type**	Theory

Course objectives:

The course provides the fundamental concepts of mechanics of deformable bodies and helps students to develop their analytical and problem solving skills. The course introduces students to the various internal effects induced in structural members and their deformations due to different types of loading. After this course students will be able to determine the stress, strain and deformation of loaded structural elements.

	Syllabus	**Contact Hours**
Module-I	Concept of stress and strain – types, stress – strain relation - Hooke's law, Young's modulus of elasticity. Stress-strain diagram of mild steel. Factor of safety, working stress. Axially loaded bars with uniform and uniformly varying cross section–stress, strain and deformation. Temperature effects, temperature stress in composite bars. Shear stress and shear strain, Modulus of rigidity, simple shear, punching shear. Lateral strain, Poisson's ratio, volumetric strain. Bulk modulus of elasticity, relationships between elastic constants. Strain energy – concept. Strain energy due to normal stress. Strain energy in bars carrying axial loads. Strain energy due to shear stress.	**11 hrs**
Module-II	Beams – different types. Types of loading on beams. Concept of bending moment and shear force. Relationship between intensity of load, shear force and bending moment. Shear force and bending moment diagrams of cantilever beams, simply supported beams and overhanging beams for different type of loads. Point of contraflexure.	**11 hrs**
Module- III	Theory of simple bending, assumptions and limitations. Calculation of normal stress in beams, moment of resistance. Shear stress in beams. Beams of uniform strength. Strain energy due to bending – calculation of strain energy in beams. Derivation of differential equation for calculating the deflection of beams – Macaulay's method.	**10 hrs**
Module- IV	Stresses on inclined planes for uniaxial and biaxial stress fields. Principal stresses and principal planes, maximum shear stress in 2D problems. Mohr's circle of stress for 2D problems. Short columns – direct and bending stress. Kern of a section. Slender columns – Euler's buckling load, slenderness ratio, limitation of Euler's formula. Rankine's formula. Torsion of circular and hollow circular shafts, Power transmitted by circular shafts and hollow circular shafts. Strain energy due to torsion.	**12 hrs**

Course Assessment Method (CIE: -40 Marks, ESE: 60 Marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	*Assignment/ Micro project*	*Internal Ex-1*	*Internal Ex-2*	*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)**	2 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. Each question carries 9 marks. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course the student will be able to:

	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Recall the fundamental terms and theorems associated with mechanics of linear elastic deformable bodies.	K1
CO2	Explain the behavior and response of various structural elements under various loading conditions.	K2
CO3	Apply the principles of solid mechanics to calculate internal stresses/strains, stress resultants and strain energies in structural elements subjected to axial/transverse loads and bending/twisting moments.	K3
CO4	Choose appropriate principles or formula to find the elastic constants of materials making use of the information available.	K3
CO5	Perform stress transformations, identify principal planes/ stresses and maximum shear stress at a point in a structural member.	K3
CO6	Analyse the given structural member to calculate the safe load or proportion the cross section to carry the load safely.	K4

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

Course Articulation Matrix (Mapping of course outcomes with program outcomes)**:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	-	-	-	-	-	-	-	-
CO2	2	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO6	3	3	2	-	-	-	-	-	-	-	-	-

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

Textbooks

SL No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Mechanics of Structures	H. J. Shah and S. B. Junnarkar	Charotar Publishing House	32nd Edition 2016
2	A Text book of Strength of Materials	R. K. Bansal	Laxmi Publications	6th Edition 2018
3	Mechanics of Materials	B. C. Punmia, Ashok K. Jain, Arun Kumar Jain	Laxmi Publications	Revised Edition 2017

Reference Books

1	Engineering Mechanics of Solids	Egor P. Popov	Prentice Hall International Series	2nd Edition 2015
2	Mechanics of Materials	James M Gere, S.P. Timoshenko	CBS Publishers and Distributors	2nd Edition 2004
3	Mechanics of Materials	R.C. Hibbeler	Pearson	10th Edition 2018
4	Strength of Materials	S. Ramamrutham and R. Narayanan	Dhanpat Rai Publishing Co	18th Edition 2014
5	Strength of Materials	Rattan	McGraw Hill Education India	3rd Edition 2016

Video Links (NPTEL, SWAYAM etc):

https://archive.nptel.ac.in/courses/105/104/105104160/

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

(A State Government University)

SYLLABUS FORMAT (LAB)

For

B. Tech, 2024

Ambady Nagar

Thiruvananthapuram- 695016

SEMESTER – II

CIVIL ENGINEERING DRAFTING LAB

(Common to Civil Engineering branches)

Course Code	PCCEL208	**CIE Marks**	50
Teaching Hours/Week (L: T:P: R)	0:0:2:0	**ESE Marks**	00
Credits	1	**Exam Hours**	00
Prerequisites (if any)	GCEST104/ Equivalent	**Course Type**	Practical

Course objectives:

- The course is designed to introduce the fundamentals of Civil Engineering Drawing and understand the principles of planning.
- The students will be able to learn the drafting of buildings manually and using drafting software.

Experiment No.	Experiment
1	Introduction to Civil Engineering Drawing, Concept of Scale, Plan, Section and Elevation. Drawing tools and accessories, Manual and Computer Aided Drafting Draw the view of simple objects (books, shelves, benches, etc.) adopting appropriate scales
2	Draw sectional details and elevation of panelled doors.
3	Draw sectional details and elevation of wooden glazed window.
4	Draw elevation, section and detailing of connection between members for steel roof truss
5	Draw plan, section and elevation of dog legged staircase
6	Prepare a model of a single storied building with card board from given drawings (Not expected to complete in the lab hours)
7	Draw plan, section and elevation of single storied residential building from the given line sketch.
8	Draw plan, section and elevation of two-storied framed building from the given line sketch.
9	Draw plan, section and elevation of an industrial building.
10	Introduction to Auto CAD : Preparation of CAD drawing of any of the building components (Expt 2-5)
11	Preparation of CAD drawing of plan, section and elevation of single storied residential building (Expt 7).

* Manual drafting can be done on A4, A3 or A2 sheets.

* Mini drafter is recommended but not mandatory

Course Assessment Method (CIE: -50 Marks, ESE: 00 Marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	*Drawing Sheet Submission (Continuous Assessment)*	*Internal Exam*	***Total***
10	**20**	**20**	**50**

Course Outcomes (COs)

At the end of the course the student will be able to:

	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Illustrate ability to organise civil engineering drawings systematically and professionally	**K2**
CO2	Illustrate the detailing of building components like doors, windows, roof trusses etc	**K2**
CO3	Develop the sketch of plan, front elevation and sectional elevation from line diagram.	**K3**
CO4	Draft the plan elevation and sectional views of the residential buildings, industrial buildings, and framed structures using software.	**K3**

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

Course Articulation Matrix (Mapping of course outcomes with program outcomes)**:**

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

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

Textbooks

SL No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Building Drawing and Detailing	Dr. Balagopal T.S. Prabhu	Spades Publishers, Calicut	Revised Edition 2022
2	Building Drawing With An Integrated Approach to Built Environment	Shah, M.G., Kale, C. M. and Patki, S.Y.	Tata McGraw Hill Publishing Company Limited, New Delhi	5th edition 2017
3	Building Planning and Drawing	M.V. Chitawadagi S.S. Bhavikatti	Dreamtech Press	2019

References

1	National Building Code of India (refer the latest updates)
2	Kerala panchayat building rules (refer the latest updates)
3	Kerala Municipality building rules (refer the latest updates)
4	IS962: 1989 (Reaffirmed 2022) lndian Standard Code of practice for architectural And building drawings