



SEMESTER 1

RAJADHAM
INSTITUTE OF ENGINEERING
AND TECHNOLOGY
AUTONOMOUS

SEMESTER S1

MATHEMATICS FOR ELECTRICAL SCIENCE - 1/MATHEMATICS FOR PHYSICAL SCIENCE - 1

Course Code	25MAT151	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)	Basic knowledge in single variable calculus and matrix operations.		
Course Type	Theory		

Course Objectives:

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

Course Outcomes (COs)

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

CO	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 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	PSO1	PSO2	PSO3
CO1	3	2	1	1	3	-	-	-	-	-	-	-	-	-
CO2	3	3	2	2	2	1	-	-	-	-	1	-	-	-
CO3	3	3	2	2	3	1	-	-	-	-	1	-	-	-
CO4	3	2	1	2	2	-	-	-	-	-	1	-	-	-

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

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)	9
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-homogeneous ODEs (with constant coefficients) - General solution, Particular solution by the method of undetermined coefficients (Particular solutions for the functions $ke^{\gamma x}$, kx^n , $k \cos \omega x$, $k \sin \omega x$, $ke^{\alpha x} \cos \omega x$, $ke^{\alpha x} \sin \omega x$), 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

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
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

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
<ul style="list-style-type: none">• 2 Questions from each module.• Total of 8 Questions, each carrying 3 marks• $(8 \times 3 = 24 \text{ marks})$	<ul style="list-style-type: none">• 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.• $(4 \times 9 = 36 \text{ marks})$	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	10 th edition, 2016
2	Calculus	H. Anton, I. Biven, S. Davis	Wiley	12 th 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	15 th edition, 2023
2	Essential Calculus	J. Stewart	Cengage	2 nd edition, 2017
3	Elementary Linear Algebra	Howard Anton, Chris Rorres	Wiley	11 th edition, 2019
4	Bird's Higher Engineering Mathematics	John Bird	Taylor & Francis	9 th edition, 2021

5	Higher Engineering Mathematics	B. V. Ramana	McGraw-Hill Education	39 th edition, 2023
6	Calculus	H. Anton, I. Biven, S. Davis	Wiley	12 th edition, 2024
7	Signals and Systems	Simon Haykin, Barry Van Veen	Wiley	2 nd 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/



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03GYMAT101122403

Rajadhani Institute of Engineering and Technology (Autonomous)

B.Tech Degree S1 (R) Examination Month and Year

Course Code: 25MAT151

**Course Name: MATHEMATICS FOR ELECTRICAL SCIENCE AND
PHYSICAL SCIENCE - I**

Max. Marks: 60

Duration: 2 hours 30 minutes

PART A

(Answer all questions, each question carries 3 marks)

Qn	Question	CO	Marks
1	Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 6 & 7 \\ 2 & 3 & -1 & 6 \\ 3 & 5 & 5 & 13 \end{bmatrix}$	CO 1	(3)
2	Find the eigen values of the matrix $A = \begin{bmatrix} 1 & 6 & -2 \\ 0 & 2 & 1 \\ 0 & 0 & 3 \end{bmatrix}$ What are the eigen values of A^2, A^{-1} ?	CO 1	(3)
3	Solve $y'' + y' - 6y = 0$	CO 2	(3)
4	Find the Wronskian corresponding to the solution of $y'' + 3y' + 2y = 0$.	CO 2	(3)
5	Find $\mathcal{L}[e^{2t} \cos 3t]$	CO 3	(3)
6	Find $L(e^{-2t} \cosh(4t))$.	CO 3	(3)
7	Find the Taylor series for $f(x) = \frac{1}{x}$ about $x = -1$.	CO 4	(3)
8	Find the Fourier coefficient b_n for $f(x) = x$ in $-\pi < x < \pi$.	CO 4	(3)

PART B

(Answer any one full question from each module, each question carries 9 marks)

Module - 1

Qn	Question	CO	Marks
9a	Solve the system of equations $2x - y + z = 7, \quad 3x + y - 5z = 13, \quad x + y + z = 5.$	CO 1	(4)
9b	Find the Eigen values and Eigen vectors of the following matrix $\begin{bmatrix} 3 & 10 & 5 \\ -2 & -4 & 3 \\ 5 & 7 & 1 \end{bmatrix}.$	CO 1	(5)
10a	Find the values of λ, μ for which the system of equations $2x + 3y + 5z = 9, \quad 7x + 3y - 2z = 8, \quad 2x + 3y + \lambda z = \mu$ has (i) no solution (ii) infinite number of solutions (iii) unique solution.	CO 1	(4)
10b	Diagonalise $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & 4 \\ 2 & 4 & 3 \end{bmatrix}$	CO 1	(5)

Module - 2

11a	Solve $y'' + y = \sec x$ by the method of variation of parameters.	CO 2	(5)
11b	Solve $(D^2 - 16I)y = 3.2e^{4x} + 15e^x$.	CO 2	(4)
12a	Solve $(D^2 - 16I)y = 15e^{2x} + x^2$.	CO 2	(6)
12b	Solve $y''' + y' = 0$.	CO 2	(3)

Module - 3

13a	Find $\mathcal{L}^{-1} \left[\frac{2s + 5}{s^2 - 4s + 13} \right]$	CO 3	(4)
13b	Use Laplace transform to solve: $y'' - 3y' + 2y = 4, \quad y(0) = 2, \quad y'(0) = 3$	CO 3	(5)
14a	Find $\mathcal{L}[3u(t - 2) \cos(t - 2)]$	CO 3	(4)
14b	Using Convolution theorem, find $\mathcal{L}^{-1} \left[\frac{1}{s^2(s^2 + a^2)} \right]$	CO 3	(5)

Module - 4

15a	Find a Fourier series representation of $f(x) = \begin{cases} -x, & -1 < x < 0 \\ x, & 0 < x < 1 \end{cases}$	CO 4	(5)
15b	Find the Half range cosine series of the function $e^{-x}, 0 < x < 1$.	CO 4	(4)
16a	Find a Fourier series representation of $f(x) = \begin{cases} -1, & -3 < x < 0 \\ 1, & 0 < x < 3 \end{cases}$	CO 4	(4)
16b	Find a Fourier series representation of $f(x) = x^2, -\pi \leq x \leq \pi$. Hence show that $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \dots = \frac{\pi^2}{6}$.	CO 4	(5)

***** End of question paper *****

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SEMESTER S1/S2

PHYSICS FOR PHYSICAL SCIENCE AND LIFE SCIENCE

Course Code	25PHT131	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:

1. To provide students with a solid background in the fundamentals of Physics and impart this knowledge in Physical Science and Life Science disciplines.
2. To develop scientific attitudes and enable students to correlate Physics concepts with their core programs.
3. 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 their understanding of Physics.

Course Outcomes (COs)

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

CO	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

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	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	2	1	-	1	-	2	-	-	-
CO2	3	3	2	2	3	1	1	-	1	-	2	-	-	-
CO3	3	3	2	2	2	1	1	-	1	-	3	-	-	-
CO4	2	3	3	2	3	3	2	1	2	1	2	-	-	-

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

Syllabus

Module No.	Syllabus Description	Contact Hours
1	<p>Laser & Fibre Optics</p> <p>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.</p> <p>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)</p>	16 hrs
2	<p>Interference and Diffraction</p> <p>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.</p> <p>Diffraction-types of diffraction, Diffraction due to a single slit, Diffraction grating – Construction - grating equation, Dispersive and Resolving Power (qualitative).</p>	16 hrs

3	<p>Quantum Mechanics</p> <p>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).</p>	13 hrs
4	<p>Waves & Acoustics</p> <p>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).</p>	15 hrs

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)	Lab Exam	Total
5	15	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
<ul style="list-style-type: none"> • 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks • ($8 \times 3 = 24$ marks) 	<ul style="list-style-type: none"> • 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. • ($4 \times 9 = 36$ 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
3	Optics	Ajoy Ghatak	McGraw Hill 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	Aruldas G	PHI Pvt. Ltd	2nd Edition, 2015
4	Fiber Optic Communications	Gerd Keiser	Springer	2021
5	Advanced Engineering Physics	Premlet B	Phasor Books	Edition, 2017

6	A Textbook of Engineering Physics	I. Dominic, A. Nahari	Owl Books Publishers	2nd Edition, 2016
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)

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.

Evaluation Pattern for Lab Examination (5 Marks)

1. Procedure/Preliminary Work/Conduct of Experiments (2 Marks)

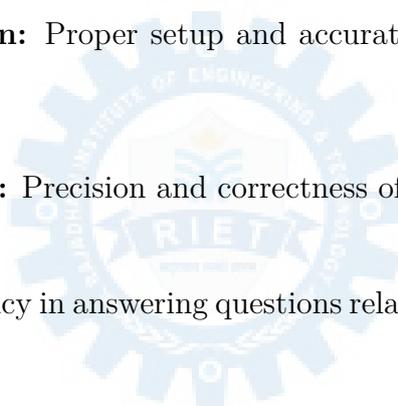
- **Procedure Understanding and Description:** Clarity in explaining the procedure and understanding each step involved.
- **Preliminary Work and Planning:** Thoroughness in planning and organizing materials/equipment.
- **Setup and Execution:** Proper setup and accurate execution of the experiment or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

2. Result (2 Marks)

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

3. Viva Voce (1 Mark)

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



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Experiment list
(Minimum 10 Experiments)

Sl 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.
16	Numerical aperture of optical fiber.

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Rajadhani Institute of Engineering and Technology (Autonomous)

B.Tech Degree S1/S2 (R) Examination Month and Year

Course Code: 25PHT131

Course Name: PHYSICS FOR PHYSICAL SCIENCE AND LIFE SCIENCE

Max. Marks: 60

Duration: 2 hours 30 minutes

PART A

(Answer all questions, each question carries 3 marks)

Qn	Question	CO	Marks
1	What is stimulated emission? Give equation for rate of stimulated emission.	1	(3)
2	Compare step index and graded index fibers.	1	(3)
3	What are the equations for constructive and destructive interference in thin films in reflected system.	2	(3)
4	Distinguish between Fresnel and Fraunhofer classes of diffraction.	2	(3)
5	Define wavefunction? Give its physical significance.	3	(3)
6	Define Heisenberg's uncertainty principle and write the three uncertainty relations.	3	(3)
7	State the laws of transverse vibrations in a stretched string.	4	(3)
8	What is Non-Destructive Testing (NDT)? Write any one of the advantages of NDT.	4	(3)

PART B

(Answer any one full question from each module, each question carries 9 marks)

Module - 1

Qn	Question	CO	Marks
9a	Explain construction and working of Ruby laser.	1	(6)
9b	What is meant by population inversion? Why is it necessary for lasing action?	1	(3)
10a	Define Numerical Aperture of an optical fibre. With a neat diagram derive an expression for Numerical Aperture of a step index fibre.	1	(6)
10b	Calculate acceptance angle of an optic fibre having core refractive index 1.45 and cladding refractive index 1.4.	1	(3)

Module - 2

11a	Explain with necessary theory, the formation of Newton's rings and derive the expression for radius of nth dark ring in the interference pattern.	2	(6)
11b	In a Newton's rings experiment the diameter of the 15th ring was found to be 0.59 cm and that of the 5th ring was 0.336 cm. If the radius of the Plano convex lens is 100 cm, calculate the wavelength of light used.	2	(3)
12a	Define transmission grating? With a neat diagram, represent the path difference occurred for diffracted light in grating and derive grating equation.	2	(6)
12b	What is the highest order spectrum which may be seen with monochromatic light of wavelength 600 nm by means of a diffraction grating with 5000 lines/cm?	2	(3)

Module - 3

13a	Starting from a plane wave equation, derive Schrodinger's time dependent wave equation.	3	(6)
13b	An electron is accelerated through a potential difference of 200 Volts. Find the de-Broglie wavelength of electron. Assume Charge of electron 1.6×10^{-19} C, mass of the electron 9.1×10^{-31} kg and $h = 6.625 \times 10^{-34}$ Js.	3	(3)
14	Derive energy eigenvalues and energy eigen function for a particle confined in an infinite square well potential.	3	(9)

Module - 4

15a	Discuss the propagation of a transverse wave along a stretched string and derive the expression for velocity of wave.	4	(6)
15b	A piece of wire 60 cm length is stretched by a load of 9.8 N. Its mass is 2.5 g. Calculate the fundamental frequency.	4	(3)
16a	Explain any three factors affecting acoustics of buildings and the remedial methods.	4	(6)
16b	What is piezoelectric effect? Write any two medical applications of ultrasonic waves.	4	(3)

***** End of question paper *****

SEMESTER S1/S2 CHEMISTRY FOR PHYSICAL SCIENCE

Course Code	25CYT132	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:

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

Course Outcomes (COs)

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

CO	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Outline various water treatment and waste management methods.	K2
CO2	Use appropriate analytical techniques for different engineering materials.	K3
CO3	Describe the use of various engineering materials in different industries.	K2
CO4	Explain the basic concepts of electrochemistry and corrosion to explore the possible applications in various engineering fields.	K2

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	PSO1	PSO2	PSO3
CO1	2	2	2	2	2	3	2	2	-	-	2	-	-	-
CO2	3	3	2	3	2	2	1	1	2	-	2	-	-	-
CO3	3	3	2	2	1	2	3	1	1	-	2	-	-	-
CO4	3	3	2	2	2	2	2	1	-	-	2	-	-	-

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

Syllabus

Module No.	Syllabus Description	Contact Hours
1	<p>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.</p>	17 hrs

2	<p>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 CO₂ and H₂O – Applications. Thermal analysis: –TGA- Principle, instrumentation (block diagram) and applications – TGA of CaC₂O₄.H₂O and polymers. DTA Principle, instrumentation (block diagram) and applications - DTA of CaC₂O₄.H₂O. Chromatography-Gas Chromatography-Principle Instrumentation- Application – Analysis of chemical composition of exhaust gases. Electron Microscopic Techniques: SEM - Principle, instrumentation and Applications.</p>	17 hrs
3	<p>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.</p>	13 hrs
4	<p>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 & H₂-O₂ 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.</p>	13 hrs

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)	Lab Exam	Total
5	15	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
<ul style="list-style-type: none">• 2 Questions from each module.• Total of 8 Questions, each carrying 3 marks• ($8 \times 3 = 24$ marks)	<ul style="list-style-type: none">• 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.• ($4 \times 9 = 36$ marks)	60

Text Books

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Engineering 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. Merrit	CBS Publishers	7th Edition, 2005
4	Engineering Chemistry	Jain & Jain	Dhanpat Rai Publishing Company	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 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. K. 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...)

Module No.	Link ID
3	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=BeSxFLvL1h0
4	https://archive.nptel.ac.in/courses/113/105/104105142/ https://archive.nptel.ac.in/courses/104/105/104105124/

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.

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

Experiment list
(Minimum 10 Experiments)

Sl 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 (KMnO_4 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

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Rajadhani Institute of Engineering and Technology (Autonomous)

B.Tech Degree S1 (R) Examination Month and Year

Course Code: 25CYT132

Course Name: CHEMISTRY FOR PHYSICAL SCIENCE

Max. Marks: 60

Duration: 2 hours 30 minutes

PART A

(Answer all questions, each question carries 3 marks)

Qn	Question	CO	Marks
1	Calculate the hardness of 0.05M CaCl ₂ solution.	1	(3)
2	Explain ozone layer depletion?	1	(3)
3	Sketch the TGA and DTA profile of CaC ₂ O ₄ ·H ₂ O.	2	(3)
4	State Beer Lambert's Law. Write its differential form.	2	(3)
5	Explain the following (i) Aniline point (ii) Flash point?	3	(3)
6	Give any three applications of carbon nanotubes.	3	(3)
7	Calculate the emf of the following cell, Zn(s)/Zn ²⁺ (0.3M)//Ag ⁺ (0.04M)/Ag(s) at 25° C. Write the cell reaction. The E ⁰ cell is 1.56 V at 25° C.	4	(3)
8	Represent the electrode reactions at different electrodes of a Li-ion cell during discharging.	4	(3)

PART B

(Answer any one full question from each module, each question carries 9 marks)

Module - 1

9(a)	Explain Trickling Filter process.	1	(5)
9(b)	Describe various disinfection methods.	1	(4)
10(a)	Describe the methods for Solid waste disposal?	1	(5)
10(b)	What are the various sources of air pollution and how can this be controlled?	1	(4)

Module - 2

11(a)	Explain the principle, instrumentation and application of GC.	2	(5)
11(b)	Explain the various modes of vibrations possible in H ₂ O molecule. Which of them are IR active? Give reasons.	2	(4)
12(a)	Briefly explain the principle and instrumentation of SEM.	2	(5)
13(b)	UV-Visible spectroscopy is also known as 'Electronic Spectroscopy'. Justify the comment.	2	(4)

Module - 3

Qn	Question	CO	Marks
12(a)	Describe the various steps involved in the manufacture of Portland cement.	3	(5)
12(b)	Explain the classification of conducting polymers?	3	(4)
13(a)	Explain the working of a Bomb calorimeter for determining the calorific value of a solid fuel with the help of a neat diagram.	3	(5)
13(b)	Briefly outline the following properties of lubricants: (a) viscosity index (b) flash and fire points.	3	(4)

Module - 4

14(a)	Explain the construction and working of H ₂ -O ₂ fuel cells. List any two applications?	4	(5)
14(b)	Explain the principle of electroless plating. Write the reactions involved in the electroless plating of copper?	4	(4)
15(a)	Explain the construction and working of a calomel electrode as a reference electrode? What is the variation in the potential of a calomel electrode with change in chloride ion concentration?	4	(5)
15(b)	Explain the mechanism of electrochemical corrosion of iron in oxygen rich acidic environment.	4	(4)

***** End of question paper *****

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SEMESTER S1 ENGINEERING MECHANICS

Course Code	25EST133	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:

CO	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Apply mechanics concepts to analyze forces, reactions, moments, and equilibrium in 2D and 3D systems.	K3
CO2	Apply friction principles and calculate centroid and moments of inertia of simple and composite bodies.	K3
CO3	Apply kinematics and kinetics principles to analyze rectilinear motion of bodies on different surfaces and connected systems.	K3
CO4	Apply principles of curvilinear and rotational motion to analyze projectile motion and rigid body rotation under constant moments.	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	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-	-	-

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

Syllabus

Module No.	Syllabus Description	Contact Hours
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
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
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
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

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
<ul style="list-style-type: none">• 2 Questions from each module.• Total of 8 Questions, each carrying 3 marks• (8 × 3 = 24 marks)	<ul style="list-style-type: none">• 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.• (4 × 9 = 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	4th Edition 2016

Reference Books

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

Video Links (NPTEL, SWAYAM...)

Module No.	Link ID
1	https://nptel.ac.in/courses/112106286
2	https://nptel.ac.in/courses/112106286
3	https://nptel.ac.in/courses/112106286
4	https://nptel.ac.in/courses/112106286



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Rajadhani Institute of Engineering and Technology (Autonomous)

B.Tech Degree S1 (R) Examination Month and Year

Course Code: 25EST133

Course Name: ENGINEERING MECHANICS

Max. Marks: 60

Duration: 2 hours 30 minutes

PART A

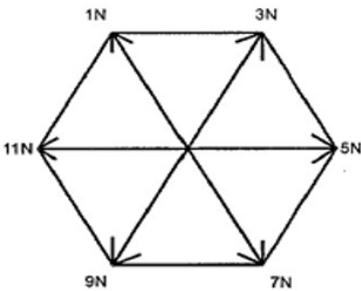
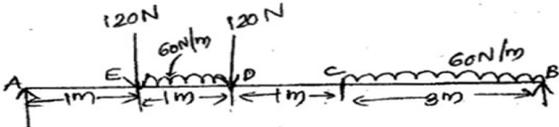
(Answer all questions, each question carries 3 marks)

Qn	Question	CO	Marks
1	A force of magnitude 60 N is applied at the origin of the x-y-z axes and through the point A (1,1.5,2.25). Determine the components of force along the x-y-z axes.	CO1	(3)
2	Explain free-body diagram with an example.	CO1	(3)
3	Distinguish between the angle of friction and the angle of repose.	CO2	(3)
4	Define the terms moment of inertia and polar moment of inertia.	CO2	(3)
5	A body is moving with a velocity of 20 m/s. After 10 seconds, the velocity of the body becomes 50 m/s. Find the acceleration of the body and the distance traveled while accelerating.	CO3	(3)
6	A lift has an acceleration of 1.5 m/s^2 downwards. What force will a man weighing 1050 N exert on the floor of the lift?	CO3	(3)
7	Differentiate between curvilinear motion and projectile motion.	CO4	(3)
8	A body is projected at an angle such that its horizontal displacement is 3 times that of its maximum height. Find the angle of projection.	CO4	(3)

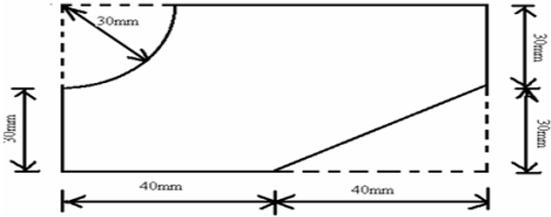
PART B

(Answer any one full question from each module, each question carries 9 marks)

Module - 1

Qn	Question	CO	Marks
9	<p>Concurrent forces 1, 3, 5, 7, 9, and 11 N are applied at the center of a regular hexagon, acting towards its vertices as shown in Figure 3. Determine the magnitude and direction of the resultant.</p> 	CO1	(9)
10	<p>Determine the reactions at the supports A and B of the beam loaded as shown in the figure.</p> 	CO1	(9)

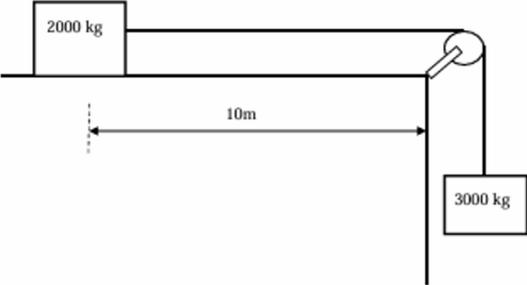
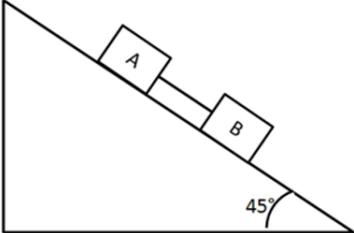
Module - 2

11	A uniform ladder 4m in length rests against a vertical wall with which it makes an angle of 45° . The coefficient of friction between the ladder and wall is 0.4, and between the ladder and floor is 0.5. If a man whose weight is one-half the weight of the ladder ascends it, how high will he be when the ladder slips?	CO2	(9)
12	Calculate the centroid of the composite area shown in the figure. 	CO2	(9)



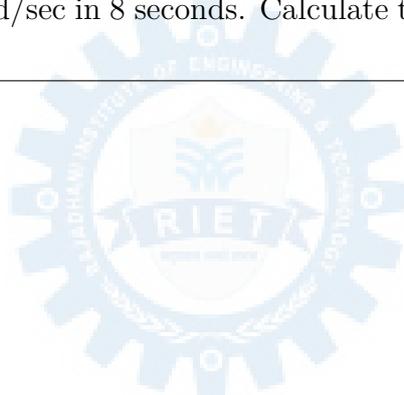
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Module - 3

<p>13</p>	<p>Two blocks are joined by an inextensible string as shown in the figure. The block resting on the horizontal surface is placed 10 m away from the edge. If the system is released from rest, determine the velocity of the block after it has moved 4 m, and find the time at which the horizontal block reaches the edge of the surface. Assume the coefficient of friction between the block and the plane is 0.2. The pulley is weightless and frictionless.</p> 	<p>CO3</p>	<p>(9)</p>
<p>14</p>	<p>Two masses, $M_A = 20\text{ kg}$ and $M_B = 10\text{ kg}$, are connected by a bar of negligible mass. Find the acceleration of the system when it slides down an inclined plane of inclination 45° as shown in the figure. Also, find the force in the bar. Assume $\mu_A = 0.2$ and $\mu_B = 0.4$.</p> 	<p>CO3</p>	<p>(9)</p>

Module - 4

15	A car starts from rest on a curved road of radius 250 m and attains a speed of 18 km/h at the end of 60 seconds while travelling with a uniform acceleration. Find the tangential and normal accelerations of the car 30 seconds after it started.	CO4	(9)
16a	A flywheel weighing 900 N and having a radius of gyration of 1.3 m loses its speed from 500 rpm to 200 rpm in 150 seconds. Calculate the retarding torque acting on it.	CO4	(5)
16b	A flywheel has an angular acceleration of 200 rad/sec, and it accelerates to 600 rad/sec in 8 seconds. Calculate the angular acceleration.	CO4	(4)



***** End of question paper *****

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SEMESTER S1
INTRODUCTION TO MECHANICAL ENGINEERING &
CIVIL ENGINEERING
(Part 1: Mechanical Engineering, Part 2: Civil Engineering)

Course Code	25EST134	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. Understand thermodynamic and refrigeration cycles, and working of IC engines.
2. Understand the basics of fluid machinery, power transmission, various manufacturing and machining processes.
3. Understand the relevance of civil engineering, its various disciplines, building codes (NBC), types of buildings, and its components as per NBC.
4. Understand different building materials and their applications.

Course Outcomes (COs)

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

CO	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Understand thermodynamic and refrigeration cycles, and working of IC engines.	K2
CO2	Understand the basics of fluid machinery.	K2
CO3	Understand the basics of manufacturing and machining processes.	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

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	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	1	2	-	-	-	-	-	-	-
CO2	3	2	2	2	2	1	1	-	-	-	-	-	-	-
CO3	3	2	3	-	-	3	2	-	-	-	-	-	-	-
CO4	3	-	3	-	3	3	-	-	-	-	-	-	-	-

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

Syllabus

Module No.	Syllabus Description	Contact Hours
1	<p>General introduction to Mechanical Engineering: Thermodynamic cycles -Carnot Cycle -Derivation of efficiency (problems on efficiency) Otto, Diesel cycles (no derivation of efficiency and problems).</p> <p>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.</p> <p>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.</p>	10 hrs

2	<p>Fluid Machinery: Classification of pumps, Description about working with sketches of: Reciprocating pump, Centrifugal pump. Classification of Hydraulic Turbines.</p> <p>Power Transmission: 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).</p> <p>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.</p> <p>Machining processes: Description and operations performed on Lathe, Drilling machine, Milling machine, CNC machine, 3D printing.</p>	9 hrs
3	<p>General Introduction to Civil Engineering: Relevance of Civil Engineering in the overall infrastructural development of the country.</p> <p>Brief introduction to major disciplines of Civil Engineering like Structural Engineering, Geo-technical Engineering, Transportation Engineering, Water Resources Engineering and Environmental Engineering.</p> <p>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.</p> <p>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).</p>	9 hrs

4	<p>Conventional construction materials: Brick, stone, sand, cement and timber- Classifications, Qualities, Tests and Uses of construction materials. Cement concrete: Constituent materials, properties and types.</p> <p>Tests on fresh and hardened concrete - slump test, cube compressive strength as per IS Codes.</p> <p>Steel: Structural steel sections and steel reinforcements–types and uses.</p> <p>Soil - Origin of soil-weathering of rocks, types of weathering</p>	9 hrs
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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
<ul style="list-style-type: none"> • 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks • (8 × 3 = 24 marks) 	<ul style="list-style-type: none"> • 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. • (4 × 9 = 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 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	Materials(Material Science)	Rangwala S C	Charotar Publishing House Pvt. Limited	43rd Edition, 2019
7	Building Materials	Duggal S. K.	New Age International	5th Edition 2019

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 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, K.B.	Charotar Publishing House	34th Edition, 2022
7	Construction Technology Vol. I to IV	Chudley, R	Longman Group, England	2nd Edition, 2014
8	Building Construction Volumes 1 to 4	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
11	Basic Civil Engineering	Shibu Nalpat	Nalpat Publishers	11th Edition, 2015

Video Links (NPTEL, SWAYAM...)

Module No.	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/

03GYEST133122403

Rajadhani Institute of Engineering and Technology (Autonomous)

B.Tech Degree S1 (R) Examination Month and Year

Course Code: 25EST134

**Course Name: INTRODUCTION TO MECHANICAL ENGINEERING &
CIVIL ENGINEERING**

Max. Marks: 60

Duration: 2 hours 30 minutes

PART 1 : MECHANICAL ENGINEERING

PART A

(Answer all questions, each question carries 3 marks)

Qn	Question	CO	Marks
1	Sketch the P-V and T-S diagram of a Diesel cycle. List the processes.	CO1	(3)
2	Define: Specific humidity, relative humidity, dry bulb temperature and dew point temperature.	CO1	(3)
3	What is the purpose of runner and riser in casting?	CO2	(3)
4	Differentiate soldering and brazing. Give applications of each.	CO2	(3)

PART B

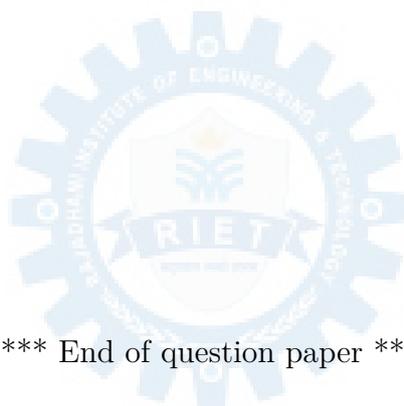
(Answer any one full question from each module, each question carries 9 marks)

Module - 1

Qn	Question	CO	Marks
5a	Explain the classification of IC Engines based on any three criteria.	CO1	(3)
5b	With neat sketch explain CRDI engine?	CO1	(6)
	OR		
6	Explain the working cycle of Petrol engine and derive the air standard efficiency.	CO1	(9)

Module - 2

7	With the help of a neat sketch, explain the working of a positive displacement pump?	CO2	(9)
	OR		
8a	Explain different types of rolling mills.	CO2	(5)
8b	Differentiate direct and indirect extrusion.	CO2	(6)



***** End of question paper *****

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INSTITUTE OF ENGINEERING
AND TECHNOLOGY

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03GYEST133122403

Rajadhani Institute of Engineering and Technology (Autonomous)

B.Tech Degree S1 (R) Examination Month and Year

Course Code: 25EST134

**Course Name: INTRODUCTION TO MECHANICAL ENGINEERING &
CIVIL ENGINEERING**

Max. Marks: 60

Duration: 2 hours 30 minutes

PART 2: CIVIL ENGINEERING

PART A

(Answer all questions, each question carries 3 marks)

Qn	Question	CO	Marks
1	Explain built up area and floor area ratio (FAR).	CO3	(3)
2	Differentiate between load bearing and non-load bearing structure.	CO3	(3)
3	Explain the advantages and disadvantages of timber as a construction material.	CO4	(3)
4	What is rapid hardening cement? What are its advantages and uses?	CO4	(3)

PART B

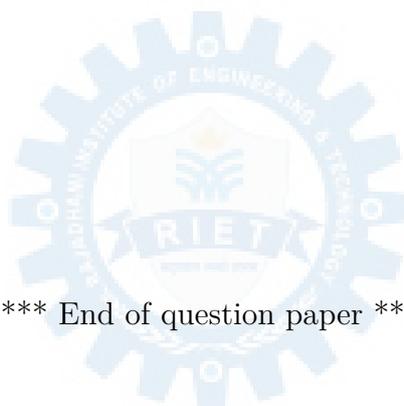
(Answer any one full question from each module, each question carries 9 marks)

Module - 3

Qn	Question	CO	Marks
5a	Discuss any three factors to be considered in the selection of site for a residential building.	CO3	(3)
5b	Explain the basic elements of a residential building and its function with the help of neat sketch.	CO3	(6)
6a	Explain the relevance of civil engineering in the infrastructural development of a country.	CO3	(3)
6b	Explain any four major disciplines of civil engineering.	CO3	(6)

Module - 4

7a	Explain any 3 types of cement with its composition and uses.	CO4	(3)
7b	Explain any four tests for proper quality control of bricks.	CO4	(6)
8a	List the qualities of a good building stone.	CO4	(3)
8b	Explain one test each on fresh and hardened concrete.	CO4	(6)



***** End of question paper *****

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SEMESTER S1

ALGORITHMIC THINKING WITH PYTHON

Course Code	25EST105	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:

1. To provide students with a thorough understanding of algorithmic thinking and its practical applications in solving real-world problems.
2. To explore various algorithmic paradigms, including brute force, divide-and-conquer, dynamic programming, and heuristics, in addressing and solving complex problems.

Course Outcomes (COs)

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

CO	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Use different problem-solving strategies and apply the process of analyzing, modelling and designing algorithms to solve problems.	K3
CO2	Articulate a problem before attempting to solve it and prepare a clear and accurate flowchart to represent the problem and use python variables, data types and operations to solve problems.	K3
CO3	Utilize effective algorithms to solve the formulated models and translate algorithms into executable programs.	K3
CO4	Interpret the problem-solving strategies, a systematic approach to solving computational problems, and essential Python programming skills.	K3

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

CO–PO Mapping Table:

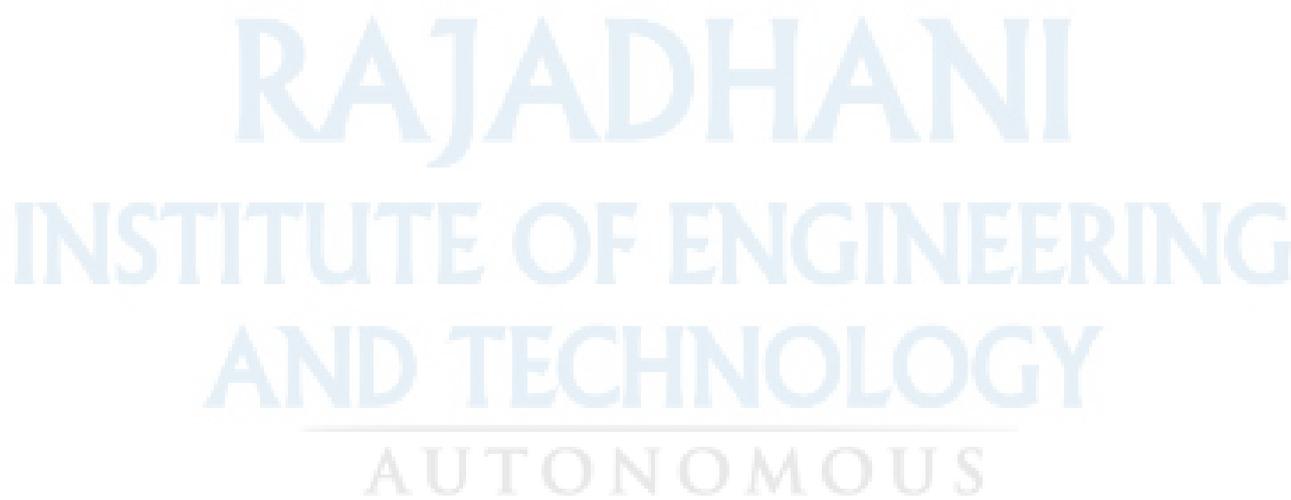
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	1	-	-	-	-	2	-	-	-
CO2	3	3	3	-	2	1	-	-	-	-	1	-	-	-
CO3	3	3	2	2	3	1	-	-	-	-	2	-	-	-
CO4	3	2	2	1	2	1	-	1	2	-	2	-	-	-

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

Syllabus

Module No.	Syllabus Description	Contact Hours
1	<p>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).</p> <p>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.</p> <p>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.</p>	10 hrs
2	<p>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.</p> <p>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.</p>	14 hrs

3	<p>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).</p> <p>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.</p> <p>RECURSION: Recursion Defined, Reasons for using Recursion, The Call Stack, Recursion and the Stack, Avoiding Circularity in Recursion, Sample problems - Finding the nth 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.</p>	18 hrs
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4	<p>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.</p>	18 hrs
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Course Assessment Method

(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Continous assesment (Accurate execution of programming tasks)	Internal Examination-1 (Written)	Internal Examination-2 (Written)	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
<ul style="list-style-type: none">• 2 Questions from each module.• Total of 8 Questions, each carrying 3 marks• $(8 \times 3 = 24 \text{ marks})$	<ul style="list-style-type: none">• 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.• $(4 \times 9 = 36 \text{ marks})$	60

Text Books

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Problem Solving & Programming Concepts	Maureen Sprankle, Jim Hubbard	Pearson	9/e, 2011
2	Introduction to Computation and Programming using Python	Gutttag John V	PHI	2/e, 2016

3	Computer Arithmetic Algorithms	Koren, Israel	AK Peters/CRC Press	2/e, 2001
4	Python for Everyone	Cay S. Horstmann, Rance D. Necaise	Wiley	3/e, 2024s

Reference Books

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	How to Solve It: A New Aspect of Mathematical Method	George Pólya	Princeton University Press	2/e, 2015
2	Creative Problem Solving: An Introduction	Donald Treffinger, Scott Isaksen, Brian Stead-Doval	Prufrock Press	4/e, 2005
3	Computational Thinking: A Primer for Programmers and Data Scientists	G Venkatesh, Madhavan Mukund	Mylspot Education Services Pvt Ltd	1/e, 2020
4	Psychology (Sec. Problem Solving.)	Spielman, R. M., Dumper, K., Jenkins, W., Lacombe, A., Lovett, M., & Perlmutter, M	H5P Edition	1/e, 2021

Video Links (NPTEL, SWAYAM...)

Module No.	Link ID
1	https://opentextbc.ca/h5pppsychology/chapter/problem-solving/
2	https://onlinecourses.nptel.ac.in/noc21_cs32/preview
3	onlinecourses.swayam2.ac.in/cec22_cs20/preview
4	onlinecourses.swayam2.ac.in/cec20_cs04/preview

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 (2 Marks)

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

2. Programming (3 Marks)

Execution: Accurate execution of the programming task

3. Result (3 Marks)

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

4. Viva Voice (2 Marks)

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

Sample Classroom Exercises

1. Identify three ill-defined problems and well-defined problems.
2. Identify five use cases for Trial and error, Heuristics, backtracking, and Means-ends analysis.
3. Use a diagram to solve the Tower of Hanoi for three pegs with the minimum number of moves.

4. Evaluate different algorithms discussed earlier based on their efficiency by counting the number of steps.
5. A recursive function that takes a number and returns the sum of all the numbers from zero to that number.
6. A recursive function that takes a number as an input and returns the factorial of that number.
7. A recursive function that takes a number 'n' and returns the nth Fibonacci number.
8. A recursive function that takes an array of numbers as input and returns the product of all the numbers in the array.
9. A program to reverse the contents of an ID array without using a second array.
10. To register for the end-semester examination, you need to log into the University portal with your credentials. Write a program to validate the credentials. Assume that the usernames are stored in an array of strings called USERNAME and the corresponding passwords are stored in another array of strings called PASSWORD such that password[i] is the password for the user username[i].
11. You are given a list and your task is to divide it to make two smaller lists. The sublists should be made from alternate elements in the original list. So if the original list is 5,1,4,12,6, then one sublist should be 5,4,6 and the other should be 1,12.
12. A program that takes three points in a 2D plane and determines whether they are collinear. Two pairs of points are collinear if they have the same slope.

LAB Experiments

1. Simple desktop calculator using Python. Only the five basic arithmetic operators.
2. Create, concatenate, and print a string and access a sub-string from a given string.
3. Familiarize time and date in various formats (Eg. "Thu Jul 11 10:26:23 IST 2024").
4. Write a program to create, append, and remove lists in Python using NumPy.
5. Program to find the largest of three numbers.
6. Convert temperature values back and forth between Celsius (c), and Fahrenheit (f).
[Formula: $c/5 = f - 32/9$]
7. Program to construct patterns of stars (*), using a nested for loop.
8. A program that prints prime numbers less than N.
9. Program to find the factorial of a number using Recursion.
10. Recursive function to add two positive numbers.
11. Recursive function to multiply two positive numbers.
12. Recursive function to find the greatest common divisor of two positive numbers.
13. A program that accepts the lengths of three sides of a triangle as inputs. The program should output 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.

14. Program to define a module to find Fibonacci Numbers and import the module to another program.
15. 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
16. Input two lists from the user. Merge these lists into a third list such that in the merged list, all even numbers occur first followed by odd numbers. Both the even numbers and odd numbers should be in sorted order.
 17. Write a program to play a sticks game in which there are 16 sticks. Two players take turns to play the game. Each player picks one set of sticks (needn't be adjacent) during his turn. A set contains 1, 2, or 3 sticks. The player who takes the last stick is the loser. The number of sticks in the set is to be input.
 18. Suppose you're on a game show, and you are given the choice of three doors: Behind one door is a car; behind the others, goats. You pick a door, say No. 1, and the host, who knows what is behind the doors, opens another door, Say No. 3, which has a goat. He then asks, "Do you want to pick door No 2?" Is it to your advantage to switch your choice?

(source:https://en.wikipedia.org/wiki/Monty_Hall_problem#i~:text=The%20Monty%20Hall%20problem%20is,the%20American%20Statistician%20in%201975.)

03GYEST105122403

Rajadhani Institute of Engineering and Technology (Autonomous)

B.Tech Degree S1 (R) Examination Month and Year

Course Code: 25EST105

Course Name: ALGORITHMIC THINKING WITH PYTHON

Max. Marks: 60

Duration: 2 hours 30 minutes

PART A

(Answer all questions, each question carries 3 marks)

Qn	Question	CO	Marks
1	You are asked to solve a jigsaw puzzle without a reference picture. How will you solve it using trial and error method?	CO-1	(3)
2	Given the input "12345", write a Python code snippet to check if it is numeric.	CO-1	(3)
3	Draw the flowchart to generate the first 'n' numbers in the Fibonacci sequence.	CO-2	(3)
4	Write an algorithm to check whether the input integer is Palindrome or not.	CO-2	(3)
5	Write the output produced by the following code. (i) for count in range(-10,-20,-2): print(count, end=" ") (ii) for i in range(10,-1,-2): print(i) (iii) 2*3**2**2	CO-3	(3)
6	Write a Python program to find the sum of even numbers from N given numbers.	CO-3	(3)
7	What is the motivation for using a randomized approach in problem-solving?	CO-4	(3)
8	You are a software engineer working on a security application for a company that handles sensitive user data. The application has a 4-digit numeric password system for authentication. However, due to a system error, a user has forgotten their password. Write an algorithm for recovering the 4-digit numeric password.	CO-4	(3)

PART B

(Answer any one full question from each module, each question carries 9 marks)

Module - 1

Qn	Question	CO	Marks
9a	Explain how backtracking strategy can be applied to solve Sudoku problem?	CO-1	(5)
9b	Your college is located in a metropolitan city and you are new to that city. You would like to go out for dinner with your friends. Explain how heuristics approach can be used to find the best restaurant for dinner.	CO-1	(4)
10a	You are asked to develop new campus management software for your college. How will you apply Means-Ends Analysis to develop the software?	CO-1	(6)
10b	Given the area of a circle. Write a Python program to calculate the radius of the circle using the <code>math</code> module.	CO-1	(3)

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Module - 2

11a	<p>Write a pseudocode to implement a grading system based on the following conditions:</p> <ul style="list-style-type: none"> • Marks ≥ 90: Grade A • Marks 80–89: Grade B • Marks 70–79: Grade C • Marks 60–70: Grade D • Marks 50–59: Grade E • Marks < 50: Grade F • If the difference between the marks and the next multiple of 10 is less than 3, then convert it to the next grade. • If the marks are below 50, no need to convert even if the difference is less than 3. 	CO-2	(6)
11b	<p>You are a software developer working on a data analysis tool for a logistics company. The company has a list of delivery times, where each entry represents the time taken (in minutes) for a particular delivery. The team needs to identify delivery times that are divisible by 6 (as they are considered optimal delivery durations) but not divisible by 4 (as they tend to involve more complexity in scheduling). Write an algorithm to print the delivery times that are divisible by 6 but not divisible by 4 from a given set of delivery times.</p>	CO-2	(3)
12a	<p>You are developing a feature for a business analytics tool that processes a list of sales figures for a company. As part of the analytics, the tool must identify the highest and lowest sales figures from the provided data. Write the pseudocode to determine the largest and smallest numbers in a given list of N numbers, ensuring the solution is efficient for real-world applications.</p>	CO-2	(6)
12b	<p>Write the pseudocode to calculate the factorial of a given number using a for loop.</p>	CO-2	(3)

Module - 3

13a	You are working as a software engineer for a financial analysis company. The company uses Fibonacci sequences to model certain financial growth patterns, such as project milestones or revenue projections. You are tasked with developing a tool that generates the first 'n' numbers in the Fibonacci sequence to assist in creating projections for clients. You should use recursion to solve it.	CO-3	(5)
13b	Write a program that accepts the length of three sides of a triangle as input and determine whether or not the triangle is a right triangle.	CO-3	(4)
14a	You are given two positive integers, a and b . Write a Python program using recursion to find the Least Common Multiple (LCM) of these integers. You are not allowed to directly calculate the LCM formula, but must instead use the relationship between GCD and LCM. Note: For any two positive integers, the product of their LCM and GCD is equal to the product of the two numbers. In other words, $lcm(a, b) \times gcd(a, b) = ab$	CO-3	(6)
14b	You are working on a text-processing application for a content moderation team. The team needs a feature to analyze user-generated sentences and reorganize their characters for better readability and analysis. Specifically, they want all capital letters to appear first, followed by small letters, then digits, and finally any special characters. Write a Python program to implement this feature, ensuring the reorganized output is displayed as a single word.	CO-3	(3)

Module - 4

15a	You are working as a financial analyst for a bank. The bank has received a list of loan interest rates from multiple branches, and you need to identify the two lowest rates to recommend the most cost-effective options to customers. The rates are provided as an array of positive integers, and your task is to develop an efficient algorithm using the Divide and Conquer approach to find the sum of the two smallest rates. Explain with a suitable example.	CO-4	(6)
15b	Compare and contrast greedy approach and dynamic programming approach.	CO-4	(3)
16a	Explain <i>memoization</i> and tabulation techniques in dynamic programming for calculating the n^{th} Fibonacci number.	CO-4	(6)
16b	Solve the following: You are given an array of positive integers where each integer represents the time taken to complete a task. Develop a greedy algorithm to determine the maximum number of tasks you can complete in a given total time limit. Explain your reasoning behind each step of the solution.	CO-4	(3)

***** End of question paper *****

SEMESTER S1 ENGINEERING WORKSHOP

Course Code	25ESL136	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:

1. To enable the student to familiarize various tools, measuring devices, practices and different methods employed in the industry.
2. 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:

CO	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.	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

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	PSO1	PSO2	PSO3
CO1	3	2	-	-	2	-	-	3	2	-	3	-	-	-
CO2	3	1	-	-	3	1	-	3	2	-	3	-	-	-
CO3	3	1	-	-	3	1	-	3	-	-	3	-	-	-
CO4	3	1	-	-	3	-	-	3	2	-	3	-	-	-
CO4	3	1	-	1	3	-	-	1	-	-	3	-	-	-

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

Syllabus

Expt No.	Experiments (Minimum 12 Exercises)
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. One exercise on smithy (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. Disassembling 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 (Fab lab/IDEA Lab – 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 Calipers, 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 ¼ 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 ¼ 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 × 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 at least three materials available in the market (such as bricks, cement, aggregates, steel, plumbing items, fixtures, welding rods, fasteners 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.]

Note: *Minimum of 12 experiments from among the 26 experiments listed, is to be completed*

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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 Lab record.

Pass Criteria:

- A student must score a minimum of 50% overall, combining marks from both Continuous Internal Evaluation (CIE) and End Semester Examination (ESE).
- In addition, the student must secure at least 40% in the **End Semester Examination (ESE)**.

The ESE shall be conducted internally, with evaluation carried out by a panel of faculty members. This panel must include at least one faculty member who was not involved in the Continuous Internal Evaluation (CIE) of the lab course.

Text Books

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. Ltd.	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 Distributors (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 the Author/s	Name of the Publisher	Edition and Year
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...)

Link ID
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/

SEMESTER S1/S2 HEALTH & WELLNESS

Course Code	25HWT107	CIE Marks	50
Teaching Hours/Week (L: T: P: R)	1:0:1:0	ESE Marks	0
Credits	1	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	None		
Course Type	Theory and Practical		

Course Objectives:

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

Course Outcomes (COs)

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

CO	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 leading a 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

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	PSO1	PSO2	PSO3
CO1	-	-	-	2	-	3	-	3	3	2	2	-	-	-
CO2	-	-	-	2	-	3	-	2	2	-	2	-	-	-
CO3	-	-	-	0	-	3	-	3	-	-	2	-	-	-
CO4	-	-	-	2	-	3	-	-	-	-	2	-	-	-

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

Syllabus

Module No.	Syllabus Description	Contact Hours
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.	9/11 hrs
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: Concept of Balanced diet Carbohydrate & the Glycemic Index Animal & Plant - based Proteins and their Effects on Human Health Dietary Fats & their Effects on Human Health Essential Vitamins and Minerals.	9/11 hrs

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 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.	9/11 hrs
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).	9/11 hrs

Additional Topics

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

Course Assessment Method (CIE: 50 marks)

Continuous Internal Evaluation Marks (CIE):

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

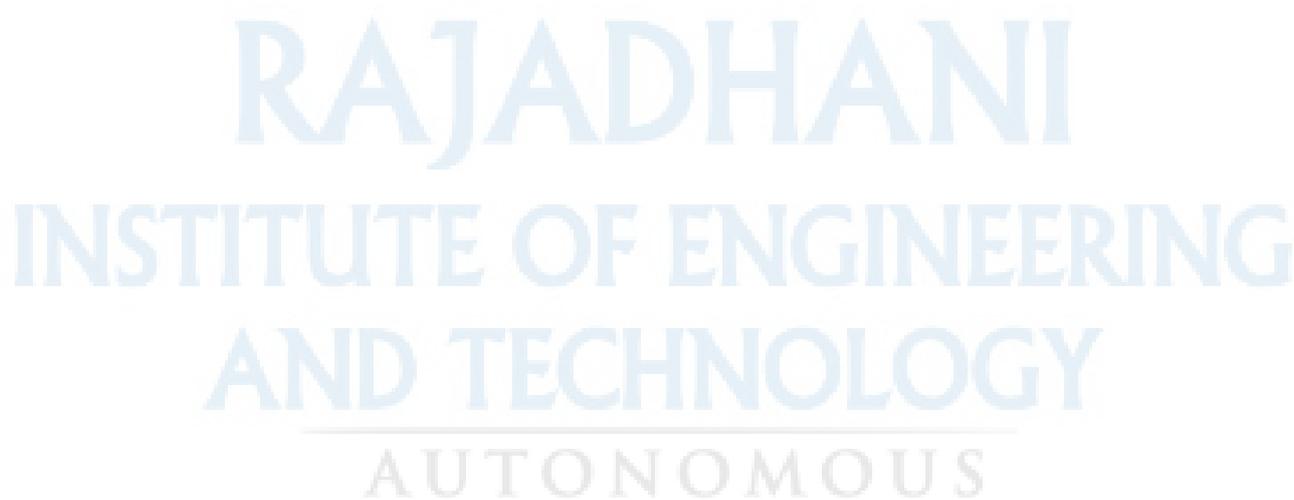
Text Books

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

Reference Books

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Fit to be Well Essential Concept	Thygeron, A. L., Thygeron, S. M., & Thygeron, J. S.	Jones & Bartlett Learning.	2018
2	Introduction to physical education, fitness, and sport.	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 to reduce your risk of disease and other illnesses by making exercise your medicine.	Nieman, D. C., & White, J. A	Public Health	1998
5	ACSM's resource manual 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



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

Students will be evaluated as follows.

Title	Method of Evaluation
Attendance	<p>Students must attend at least 75% of both theory and practical classes. They will receive 10 marks based on their class attendance.</p> <p>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.</p>
Assignment / Presentation	<p>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.</p> <p>Based on the Assignments and Presentations the students will be awarded marks out of 20.</p>
Activity Evaluation	<p>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.</p> <p>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:</p> <ol style="list-style-type: none">1. V Sit Reach Test2. Partial Curl Up - 30 seconds3. Push Ups (Male) and Modified Push Up (Female)4. Two (2) Km Run/Walk <p>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.</p>
Activity Evaluation – Special Circumstances	<p>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.</p>
Activity Evaluation – Special Considerations – NCC	<p>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.</p>

Tests to be evaluated as per Criterion - 2 and Benchmark Scores

V Sit Reach Test

How to Perform:

1. 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.
2. The thumbs are clasped so that hands are together, palms facing down and placed on the measuring line.
3. With the legs held flat by a partner, the subject slowly reaches forward as far as possible, keeping the fingers on baseline and feet flexed.
4. After three tries, the student holds the fourth reach for three seconds while that distance is recorded.
5. Make sure there are no jerky movements, and that the fingertips remain level and the legs flat.

Infrastructure/Equipment Required:

1. A tape for marking the ground, marker pen, and ruler.
2. 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.
3. Use the marker pen to indicate every centimeter and millimeter along the measurement line. The point where the baseline and the measuring line intersect is the zero point.
4. Scoring: The score is recorded in centimeters and millimeters 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

Partial Curl Up – 30 seconds

How to Perform:

1. 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.
2. 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).
3. The trunk is lowered back to the floor so that the shoulder blades or upper back touch the floor.

Infrastructure/Equipment Required:

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

Push Ups for Male / Modified Push Ups for Female

How to Perform:

1. A standard push up begins with the hands and toes touching the floor, the body and legs in a straight line, feet slightly apart, the arms at shoulder width apart, extended and at a right angle to the body.
2. 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.
3. 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.
4. For Female: push-up technique is with the knees resting on the ground.

Infrastructure/Equipment Required:

1. Flat clean cushioned surface/Gym mat Scoring.
2. Record number of correctly completed pushups.

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

2 Km Run/Walk

How to Perform:

1. Participants are instructed to run or walk 2 kms in the fastest possible pace.
2. The participants begin on signal (Starting point) – “ready, start”. As they cross the finish line, elapsed time should be announced to the participants.
3. 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: Time taken for completion (Run or Walk) in min, sec.

Scoring for 2 Km 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 2 Km 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

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SEMESTER S1

LIFE SKILLS AND PROFESSIONAL COMMUNICATION

Course Code	25HUT108	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:

1. To foster self-awareness and personal growth, enhance communication and inter-personal 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.
2. To equip students with the necessary skills to listen, read, write & speak, to comprehend and successfully convey any idea, technical or otherwise.
3. To equip students to build their profile in line with the professional requirements and standards.

Course Outcomes (COs)

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

CO	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	K5
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	K5
CO3	Develop thinking skills, problem-solving and decision-making skills	K5
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	K6
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	K6
CO6	Initiate profile-building exercises in line with the professional requirements, and start networking with professionals/academicians	K6

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	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	-	2	-	2	-	3	-	-	-
CO2	-	-	-	2	1	-	3	2	2	3	3	-	-	-
CO3	3	2	2	-	1	2	-	-	-	1	2	-	-	-
CO4	-	-	-	2	1	-	-	-	3	1	3	-	-	-
CO5	-	-	-	-	2	-	-	-	3	2	2	-	-	-
CO6	-	-	-	2	1	2	2	-	2	1	2	-	-	-

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

Syllabus

No.	Syllabus	Week of Completion
1.1	Group formation and self-introduction among the group members	1
1.2	Familiarizing the activities and preparation of the time plan for the activities	1
1.3	Preparation of Gantt chart based on the time plan	1
2.1	Take an online personality development test, self-reflect and report	1
2.2	Role-storming exercise 1: Students assume 2 different roles	1
2.3	Role-storming exercise 2: Students assume the role of their teacher	1
2.4	Discuss the skills identified through role-storming exercise by each one within their own group and improvise the list of skills	1

2.5	Prepare a mind map based on the role storming exercise and exhibit/present it in class	2
3	Prepare a presentation on instances of empathy they have observed in their own life or in others' life	2 to 4
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)	3
4.2	Interact with them to understand their workplace details including: workplace skills required, their work experience, activities they have done to enhance their employability during their B.Tech years, and suggestions on the different activities to be done during B.Tech years. Prepare a documentation of this	3
4.3	Discuss the different workplace details & work readiness activities assimilated by each through the interactions within their group and compile the inputs collected by the individuals. Prepare the Minutes of the discussions	3
4.4	Report preparation based on the discussions	4
4.5	Perform a role-play based on the work place dynamics assimilated through interactions and group discussions	5
4.6	Identify their own goal and prepare an action plan for their undergraduate journey to achieve the goal	5
5.1	Select a real-life problem that requires a technical solution and list the study materials needed	6
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)	6
5.3	Use any online tech forum to gather ideas for solving the problem chosen	6
5.4	Arrive at a possible solution using six thinking hat exercise	7

5.5	Prepare a report based on the problem-solving experience	7
6.1	LinkedIn profile creation	1
6.2	Resume preparation	8
6.3	Self-introduction video	8
7	Prepare a presentation on instances of demonstration of emotional intelligence	9
8	Prepare a short video presentation on diversity aspects observed in our society (3 to 5 minutes)	10
9	Take online Interview skills development sessions like robotic interviews; self-reflect and report	10
10	Take an online listening test, self-reflect and report	11
11.1	Activities to improve English vocabulary of students	8
11.2	Activities to help students identify errors in English language usage	9
11.3	Activity to help students identify commonly misspelled words, commonly mispronounced words and confusing words	10
11.4	Write a self-reflection report on the improvement in English language communication through this course	12
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	11 to 12
12.1	Each group prepares video content for podcasts on innovative technological interventions/research work tried out in Kerala context by academicians/professionals/Govt. agencies/research institutions/private agencies/NGOs/other agencies	12
12.2	Upload the video content to podcasting platforms or YouTube	12
12.3	Add the link of the podcast in their LinkedIn profile	12

LAB Activities

1. Drilling practice using electric hand drilling machines.
 2. Cutting of MS rod and flat using electric hand cutters.
 3. Filing, finishing and smoothening using electrically operated hand grinders.
 4. MS rod cutting using Hack saw by holding the work in bench 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 taps 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.
- Language Lab sessions

Course Assessment Method (CIE: 100 marks)

Continuous Internal Evaluation Marks (CIE):

Assignment/Activity	Lab Activities	Total
76	24	100

Text Books

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Life Skills & Personality Development	Maithri Shinde et.al.	Cambridge University Press	First Edition 2022
2	Emotional Intelligence: Why it can 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	September 2023
4	Deep Work: Rules for focused success in a distracted world	Cal Newport	PIATKUS	January 2016
5	Effective Technical Communication	Ashraf Rizvi	McGraw Hill	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 the Author/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 and Agna 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

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SEMESTER 2

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SEMESTER S2

MATHEMATICS FOR ELECTRICAL SCIENCE AND PHYSICAL SCIENCE - 2

Course Code	25MAT251	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)	Basic knowledge in single variable calculus		
Course Type	Theory		

Course Objectives:

1. 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:

CO	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	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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

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, 13.6)	9 hrs
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 hrs
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 hrs

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 hrs
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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
<ul style="list-style-type: none"> • 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks • $(8 \times 3 = 24 \text{ marks})$ 	<ul style="list-style-type: none"> • 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. • $(4 \times 9 = 36 \text{ marks})$ 	60

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 Hell, George B. Thomas	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...)

Module No.	Link ID
1	https://nptel.ac.in/courses/111107108
2	https://nptel.ac.in/courses/111107108
3	https://nptel.ac.in/courses/111107108
4	https://nptel.ac.in/courses/111107108

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Rajadhani Institute of Engineering and Technology (Autonomous)

B.Tech Degree S2 (R) Examination Month and Year

Course Code: 25MAT251

Course Name: MATHEMATICS FOR ELECTRICAL SCIENCE AND
PHYSICAL SCIENCE – 2

Max. Marks: 60

Duration: 2 hours 30 minutes

PART A

(Answer all questions, each question carries 3 marks)

Qn	Question	CO	Marks
1	Find the slope of the sphere $x^2 + y^2 + z^2 = 1$ in the y -direction at $(2/3, 1/3, -2/3)$.	CO1	(3)
2	Find all first order derivatives of $f(x, y) = x^3e^{-y} + y^4 \sec \sqrt{x}$.	CO1	(3)
3	Evaluate $\int_0^{\ln 3} \int_0^{\ln 2} e^{x+2y} dy dx$.	CO2	(3)
4	Evaluate $\int_C -y dx + x dy$ where $C : y^2 = 3x$ from $(3, 3)$ to $(0, 0)$.	CO2	(3)
5	Find the gradient of $f(x, y) = x^2 + xy$ at $(-2, -1)$.	CO3	(3)
6	If $\vec{F}(x, y, z) = x^2 \hat{i} - 3 \hat{j} + yz^2 \hat{k}$, find $\text{div } \vec{F}$.	CO3	(3)
7	Use Green's theorem to evaluate $\int_C 2xy dx + (x^2 + x) dy$ where C is the unit circle in the positive direction.	CO4	(3)
8	Let $\vec{F}(x, y, z) = a \hat{i} + b \hat{j} + c \hat{k}$ be a constant vector field and let σ be the surface of the solid G . Use divergence theorem to show that the flux of \vec{F} across σ is zero.	CO4	(3)

PART B

(Answer any one full question from each module, each question carries 9 marks)

Module - 1

9(a)	Let $u = f(y - z, z - x, x - y)$. Show that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$.	CO1	(4)
9(b)	Locate all relative maxima, relative minima and saddle points if any, in $f(x, y) = 2xy - x^2 - y^2$.	CO1	(5)
10(a)	Find all second order partial derivatives of $f(x, y) = x^3y^2 + xy$.	CO1	(4)
10(b)	If $z = e^{xy}$, $u = 2u + v$, $y = \frac{u}{v}$ then find $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$.	CO1	(5)

Module - 2

11(a)	Evaluate $\int_0^1 \int_x^1 e^{x/y} dy dx$ by reversing the order of integration.	CO2	(4)
11(b)	Use a double integral to find the area of the region R enclosed by the curves $y^2 = 4x$ and $x^2 = 4y$.	CO2	(5)
12(a)	Evaluate $\int_0^1 \int_0^{1-x} xy dx dy$ over the region in the first quadrant for which $x + y \leq 1$.	CO2	(4)
12(b)	Using triple integral find the volume of the tetrahedron bounded by the planes $x + 2y + z = 6$, $x = 0$, $y = 0$, $z = 0$.	CO2	(5)

Module - 3

13(a)	Find the work done by the force field $\vec{F} = xy^2\hat{i} + xy\hat{j} + z^2\hat{k}$ on a particle that moves along the curve $C : T(t) = t\hat{i} + t^2\hat{j} + t^3\hat{k}$ where $0 \leq t \leq 1$.	CO3	(5)
13(b)	Find $\nabla \times \vec{F}$ if $\vec{F} = yz\hat{i} + (zx + 2)\hat{j} - x^2y\hat{k}$.	CO3	(4)
14(a)	Find the scalar and vector curl of vector field $\vec{F} = y^2\hat{i} + (x^2 + z^2)\hat{j} + (y^2 - 2xz)\hat{k}$.	CO3	(4)
14(b)	Show that $\vec{F}(x, y) = (3x^2y + y^3)\hat{i} + (x^3 + 3xy^2)\hat{j}$ is independent of the path and evaluate the integral $\int_C (3x^2y + y^3)dx + (x^3 + 3xy^2)dy$.	CO3	(5)

Module - 4

15(a)	Apply Green's theorem to evaluate $\int_C (2x^2 - y^2) dx + (x^2 + y^2) dy$ where C is the boundary of the area enclosed by the x -axis and the upper half of the circle $x^2 + y^2 = 4$.	CO4	(4)
15(b)	Use Stokes theorem to evaluate $\int_C \vec{F} \cdot d\vec{r}$ where $\vec{F} = 2z\hat{i} + 3x\hat{j} + y^3\hat{k}$, C is the circle in the XY plane, $x^2 + y^2 = 1$ with counter clockwise orientation.	CO4	(5)
16(a)	Use divergence theorem to evaluate $\iint_{\sigma} \vec{F} \cdot \hat{n} ds$ where $\vec{F} = x\hat{i} + y\hat{j} + z\hat{k}$ and σ is the surface of the cube bounded by planes $x = 0, x = 1, y = 0, y = 1, z = 0, z = 1$.	CO4	(5)
16(b)	Evaluate the surface integral $\iint_{\sigma} xz ds$ where σ is the part of the plane $x + y + z = 1$ that lies in the first octant.	CO4	(4)

***** End of question paper *****

SEMESTER S2

ENGINEERING GRAPHICS AND COMPUTER AIDED DRAWING

Course Code	25EST233	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		

Course Objectives:

1. To learn the basic principles and techniques of dimensioning and projection of points and straight line in different Quadrants.
2. Create the projection of simple solids using orthographic projections.
3. To develop section of solid and development of surfaces of simple solids.
4. Create isometric projection of simple solids.

Course Outcomes (COs)

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

CO	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Understand and plot the projection of points and lines located in different quadrants.	K3
CO2	Prepare orthographic projections of simple objects by visualizing them in different positions.	K3
CO3	Plot sectional views and develop surfaces of a given object.	K3
CO4	Create multi view drawings using the principles of orthographic projections.	K6

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	PO11	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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

Syllabus

Module No.	Syllabus Description	Contact Hours
1	Introduction: Relevance of technical drawing in the 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 hrs
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 reference planes and with axis inclined to both reference planes.	9 hrs
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)	9 hrs
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)	9 hrs

Course Assessment Method

(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Continuous Assessment (Lab)	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
<ul style="list-style-type: none">• 2 Questions from each module.• Total of 8 Questions, each carrying 3 marks• ($8 \times 3 = 24$ marks)	<ul style="list-style-type: none">• 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.• ($4 \times 9 = 36$ marks)	60

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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	1st Edition 2012
2	Engineering Graphics	Benjamin, J.	Pentex Publishers	5th Edition
3	Engineering Graphics for degree	John, K. C.	Prentice Hall India	Published on 2011
4	Engineering Graphics	Anilkumar, K. N.	Adhyuth Narayan Publishers	Edition 2016

Reference Books

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Engineering Drawing & Graphics	Venugopal, K	New Age International	4th Edition 2007
2	Engineering Drawing	Parthasarathy, N. S., and Murali, V.	Oxford University Press	2015

Video Links (NPTEL, SWAYAM...)

Module No.	Link ID
1	https://archive.nptel.ac.in/courses/112/102/112102304/
2	https://archive.nptel.ac.in/courses/112/102/112102304/
3	https://archive.nptel.ac.in/courses/112/102/112102304/
4	https://archive.nptel.ac.in/courses/112/102/112102304/

03GYEST144122403

Rajadhani Institute of Engineering and Technology (Autonomous)

B.Tech Degree S2 (R) Examination Month and Year

Course Code: 25EST233

Course Name: ENGINEERING GRAPHICS AND COMPUTER AIDED DRAWING

Max. Marks: 60

Duration: 2 hours 30 minutes

(Retain Construction lines. Show necessary dimensions. Answer any ONE question from each module. Each question carries 15 marks)

Module - 1

1	One end of a line CD is 15 mm above HP and 20 mm in front of VP. At the same time the other end is 60 mm above HP and 50 mm in front of the VP. The distance between the end projections is 70 mm. Draw the projections of the line and locate the traces. Determine the true and apparent lengths. Also find the true and apparent inclinations.	CO1	15
2	A line CD of length 65 mm is inclined at 45 to HP and 30 to VP. The end D is 50 mm above HP and 45 mm in front of VP. Draw the projections of the line and locate its traces.	CO1	15

Module - 2

3	A cone of base 40 mm diameter and axis 70 mm long has one of its generators on the HP. A plane containing that generator and the axis is perpendicular to HP and inclined at 45 to the VP. Draw the projection when the base is nearer to the VP than the vertex.	CO2	15
4	Draw the projections of a triangular pyramid 35 mm side and height 65 mm long, if it is resting on one of the corners of the base in HP with the base edge containing that corner making an angle of 30 with HP and top view of the axis making an angle of 45 with XY line.	CO2	15

Module - 3

5	A hexagonal pyramid side of the base 30 mm and axis 70 mm rests with its base on the HP and an edge of the base inclined at 30 to VP. A section plane inclined at 45 to VP and perpendicular to HP passes through the pyramid at a distance of 10 mm from the axis and in front of it. Draw its top view, sectional front view and true shape of section.	CO3	15
6	A pentagonal prism side of base 25 mm and altitude 50 mm, rests on its base on the HP such that an edge of the base is parallel to VP and nearer to observer. It is cut by a plane inclined at 45 to HP, perpendicular to VP and passing through the centre of the axis. Draw the development of the surface of the truncated prism.	CO3	15

Module - 4

7	Draw the isometric view of a pentagonal pyramid, side of base 20 mm and height 50 mm which rests centrally with base on a cylinder of diameter 50 mm and height 40 mm.	CO4	15
8	A cone of diameter 50 mm base and height 60 mm is surmounted over a square slab of 60 mm side and 20 mm thickness on HP so that one of the edges of the square slab is parallel to VP. Draw the isometric projection of the combination.	CO4	15

***** End of question paper *****

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SEMESTER S2

BASIC ELECTRICAL & ELECTRONICS ENGINEERING

Course Code	25EST234	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. Outline the basic principles of an electronic instrumentation system.
6. Identify important applications of modern electronics in the contemporary world.

Course Outcomes (COs)

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

CO	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Apply fundamental concepts and circuit laws to solve simple DC/AC electric circuits.	K3
CO2	Develop an awareness on the fundamentals of electric power generation, transmission and distribution and compare different types of DC and AC motors.	K2
CO3	Distinguish and understand the fundamental components and devices of an electronic system.	K2
CO4	Understand and describe the basic principles of instrumentation and internet of things.	K2

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	PO11	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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

Syllabus

Module No.	Syllabus Description	Contact Hours
1	<p>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).</p> <p>DC Circuits: Resistance in Series and Parallel, Ohm's Law and Kirchhoff's laws, Voltage and current divider rule. (Simple numerical problems)</p> <p>AC circuits: Purely resistive, inductive and capacitive circuits; Inductive and capacitive reactance, concept of impedance. (Simple numerical problems)</p> <p>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.</p> <p>Power in AC circuits: Power factor; active, reactive and apparent power in single phase and three phase system. (Simple numerical problems)</p>	11 hrs

<p>2</p>	<p>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.</p> <p>Transformers: Principle of operation, step-up and step-down transformers.</p> <p>AC power supply scheme: Single phase and three phase system, Three phase 3 wire and 4 wire systems.</p> <p>Transmission System, Distribution system: Feeder, distributor, service mains Types of Motors – Principle of Operation: Block diagram showing power stages, losses and efficiency (electrical and mechanical and overall efficiency); Simple numerical efficiency.</p> <p>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.</p> <p>Earthing: need for earthing, Types of earthing; pipe earthing, plate earthing; Principle of operation of MCB, ELCB/RCCB.</p>	<p>11 hrs</p>
<p>3</p>	<p>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.</p> <p>Bipolar Junction Transistors: PNP and NPN structures, Principle of operation.</p> <p>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.</p> <p>Amplifiers: Transistor as an amplifier, Block diagram of Public Address system.</p>	<p>11 hrs</p>

4	<p>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.</p> <p>Internet of things (IoT): Introduction, architecture of IoT, Implementation of smart city – street lighting, smart parking.</p>	11 hrs
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Course Assessment Method

(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Continuous Assessment (Lab)	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
<ul style="list-style-type: none"> • 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks • (8 × 3 = 24 marks) 	<ul style="list-style-type: none"> • 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. • (4 × 9 = 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	Dr Kothari and I J Nagrath	Tata McGraw Hill	4/e 2019
2	Schaum's Outline of Basic Electrical Engineering	J. Cathey and Syed A Nasar	Tata McGraw Hill	3/e 2010
3	Basic Electronics and Linear Circuits	J N Bhargava, D C Kulshreshtha and S C Gupta	McGraw Hill	2/e 2017
4	Basic Electronics: Principles and Applications	Chinmoy Saha, Arindham Halder, Debarathy Ganguly	Cambridge University Press	1/e 2018
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	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	4/e 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

Video Links (NPTEL, SWAYAM...)

Module No.	Link ID
1	http://nptel.ac.in/courses/108/105/108105104/
2	http://www.youtube.com/watch?v=KUpbVNwf7Gk
3	http://www.vlabmmit.in/courses/video/108101142/L02.html
4	http://onlinecourses.nptel.ac.in/noc22_cs53/preview

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03GYEST144122403

Rajadhani Institute of Engineering and Technology (Autonomous)

B.Tech Degree S2 (R) Examination Month and Year

Course Code: 25EST234

Course Name: BASIC ELECTRICAL & ELECTRONICS ENGINEERING

Max. Marks: 60

Duration: 2 hours 30 minutes

PART A

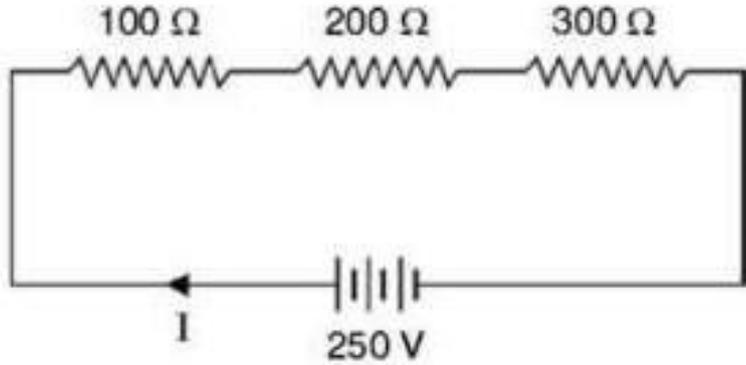
(Answer all questions, each question carries 3 marks)

Qn	Question	CO	Marks
1	Define active, reactive, and apparent powers in AC circuits.	C01	(3)
2	Draw the variation of voltage, current, and power in a purely inductive AC circuit and comment on the power consumed.	C01	(3)
3	Describe the principle of operation of a step-up transformer.	C02	(3)
4	List the different AC motors with a brief description. Also, mention some of the applications of each type.	C02	(3)
5	Distinguish between passive and active electronic components with two examples.	C03	(3)
6	Write the difference between PNP and NPN transistors with neat sketches.	C03	(3)
7	Define sensitivity and resolution in measurement with examples.	C04	(3)
8	Explain the role of IoT in smart parking systems.	C04	(3)

PART B

(Answer any one full question from each module, each question carries 9 marks)

Module - 1

9	a) Explain Faraday's laws of electromagnetic induction.	CO1	(4)
	b) In an AC circuit, the voltmeter and ammeter are connected and they show 220 volts and 12 Amps respectively. Calculate the maximum value and average value of voltage and current.	CO1	(5)
10	a) Three resistances 100 Ω , 200 Ω , and 300 Ω are connected in series to a 250 V supply. Determine the current in the circuit and the power dissipated in each resistor.	CO1	(5)
			
	b) Derive the relationship between line and phase values for voltages and currents in a 3-phase star-connected system.	CO1	(4)

Module - 2

11	a) With a neat block diagram explain a hydroelectric power plant.	CO2	(4)
	b) Explain a 3-phase 3-wire AC power supply scheme.	CO2	(5)
12	a) What is the need for earthing? Give an account of different types of earthing	CO2	(4)
	b) Illustrate the power stages in a motor and explain electrical, mechanical and overall efficiency.	CO2	(5)

Module - 3

13	a) Draw the block diagram of a regulated DC power supply and explain the function of each block.	CO3	(4)
	b) Explain the working principle of a PN junction diode with its V-I characteristics.	CO3	(5)
14	a) With a neat diagram, explain the working of a full-wave bridge rectifier with a capacitor filter.	CO3	(4)
	b) Describe the operation of a transistor as an amplifier.	CO3	(5)

Module - 4

15	a) Explain the working principle and applications of Strain gauge and Thermocouple.	CO4	(9)
16	a) Explain the architecture of the Internet of Things (IoT) with a neat diagram.	CO4	(4)
	b) Describe the implementation of IoT in smart street lighting.	CO4	(5)

***** End of question paper *****

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SEMESTER S2

MECHANICS OF SOLIDS

Course Code	25CET205	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:

1. To provide students with a fundamental understanding of the mechanics of deformable bodies and help them develop their analytical and problem-solving skills.
2. To introduce students to the various internal effects induced in structural members and their deformations due to different types of loading.
3. To enable students to determine the stress, strain, and deformation of loaded structural elements.

Course Outcomes (COs)

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

CO	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Recall the fundamental terms and theorems associated with the 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 formulas to find the elastic constants of materials, making use of the information available.	K3
CO5	Perform stress transformations, identify principal planes/ stresses, and the 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
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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	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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

Syllabus

Module No.	Syllabus Description	Contact Hours
1	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
2	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 types of loads. Point of contraflexure.	11

3	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.	11
4	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 column – direct and bending stress. Kern of a section. Slender column – 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.	11

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
<ul style="list-style-type: none">• 2 Questions from each module.• Total of 8 Questions, each carrying 3 marks• ($8 \times 3 = 24$ marks)	<ul style="list-style-type: none">• 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.• ($4 \times 9 = 36$ marks)	60

Text Books

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 Textbook 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

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
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...)

Module No.	Link ID
1	https://archive.nptel.ac.in/courses/105/104/105104160/
2	https://archive.nptel.ac.in/courses/105/104/105104160/
3	https://archive.nptel.ac.in/courses/105/104/105104160/
4	https://archive.nptel.ac.in/courses/105/104/105104160/

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Rajadhani Institute of Engineering and Technology (Autonomous)

B.Tech Degree S2 (R) Examination Month and Year

Course Code: 25CET205

Course Name: MECHANICS OF SOIDS

Max. Marks: 60

Duration: 2 hours 30 minutes

PART A

(Answer all questions, each question carries 3 marks)

Qn	Question	CO	Marks
1	Draw and explain the stress-strain diagram for mild steel.	CO1	(3)
2	Define Strain Energy. Derive the relation for the strain energy due to axial loading.	CO3	(3)
3	Define (a) bending moment, (b) shear force, (c) point of contraflexure.	CO1	(3)
4	Derive the relation between intensity of loading, shear force, and bending moment.	CO1	(3)
5	Define Section Modulus. Derive the Expression for a rectangular cross-section.	CO1	(3)
6	Sketch and explain the shear stress distribution in a symmetrical I-section.	CO1	(3)
7	Explain Mohr's circle of stress with a neat sketch.	CO5	(3)

8	Determine the maximum power transmitted at 270 r.p.m by a mild steel hollow shaft of 40 mm internal diameter and 5mm thick if the allowable stress is 75 MPa and the angle of twist is not to exceed 1 degree in a length of 1.8m. $G = 80$ GPa for the shaft.	CO3	(3)
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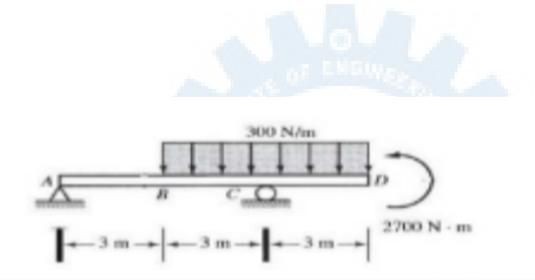
PART B

(Answer any one full question from each module, each question carries 9 marks)

Module - 1

9	a) A tensile load of 40 kN is acting on a rod of diameter 40 mm and of length 4 m. A bore of diameter 20 mm is made centrally on the rod. To what length should the rod be bored so that the total extension will increase 30% under the same tensile load? Take $E = 2 \times 10^5$ N/mm ² .	CO3	(9)
10	a) Derive the relation between modulus of elasticity and bulk modulus	CO1	(4)
	b) Calculate the modulus of rigidity and bulk modulus of a cylindrical bar of diameter 30 mm and of length 1.5 m if the longitudinal strain in a bar during a tensile stress is four times the lateral strain. Find the change in volume when the bar is subjected to a hydrostatic pressure of 100 N/mm ² . Take $E = 1 \times 10^5$ N/mm ²	CO1	(5)

Module - 2

11	a) Explain different types of beams.	CO1	(3)
	b) Draw the SFD and BMD for a cantilever beam of span 4 m carrying a UDL of 2 kN/m for the whole span and a concentrated load of 5 kN at 2 m from the left support.	CO3	(6)
12	a) Draw the SFD and BMD for the given beam. 	CO3	(6)
	b) Write notes on different types of loads acting on a beam.	CO1	(3)

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Module - 3

13	a) What do you understand by neutral axis and moment of resistance? How to locate the neutral axis?	CO3	(5)
	b) A cantilever beam 3 m long is subjected to a uniformly distributed load of 30 kN/m. The allowable working stress in either tension or compression is 150 MPa. If the cross-section is to be rectangular, determine the dimensions if the height is to be twice that of the width	CO3	(4)
14	a) Derive the expression for deflection at the span of a simply supported beam, carrying a point load at the centre.	CO3	(5)
	b) A cast iron beam of T-section with flange 100×20 mm and web 20×80 mm. The beam is simply supported on a span of 8 m. The beam carries a uniformly distributed load of 1.5 kN/m length on the entire span. Determine the maximum tensile and compressive stresses.	CO3	(4)

Module - 4

15	a) The stresses on two perpendicular planes through a point in a body are 30 MPa and 15 MPa, both tensile, along with a shear stress of 25 MPa. Find (i) the magnitude and direction of principal stresses, (ii) the planes of maximum shear stress, and (iii) the normal and shear stresses on the planes of maximum shear stress.	CO4	(5)
	b) Derive an expression for the strain energy produced in a circular shaft subjected to torsion.	CO4	(4)
16	a) Discuss the limitations of Euler's formula.	CO4	(5)

	b) A 3.2 m long fixed-end hollow cast iron column has its internal and external diameters as 60 mm and 80 mm, respectively. Determine Rankine's crippling load using the value of crushing stress, which is 500 MPa, and the value of Rankine's constant $1/1600$.	CO4	(4)
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***** End of question paper *****



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SEMESTER S2

ENGINEERING ENTREPRENEURSHIP AND IPR

Course Code	25EST206	CIE Marks	40
Teaching Hours/Week (L: T: P: R)	3:0:0:0	ESE Marks	60
Credits	4	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	None		
Course Type	Theory		

Course Objectives:

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

Course Outcomes (COs)

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

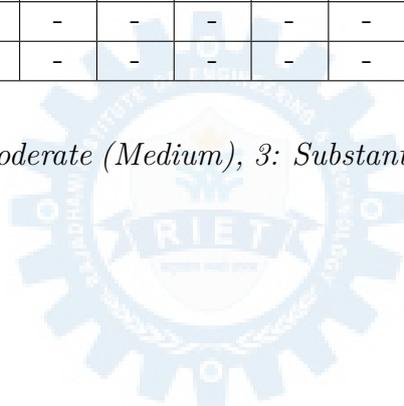
CO	Course Outcome	Bloom's Knowledge Level (KL)
C01	Gain foundational knowledge of Innovation and Entrepreneurship, Intellectual Property Rights (IPR) and their importance for startups.	K2
C02	Develop a framework for identifying, curating, and validating engineering-based business ideas using essential tools to understand product-market fit and customer needs.	K2
C03	Create a comprehensive business plan for a new venture.	K3
C04	Develop skills for prototyping, stakeholder engagement, and team collaboration.	K4

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	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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



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Syllabus

Module No.	Syllabus Description	Contact Hours
1	<p>Introduction to Ideation, Innovation & Entrepreneurship</p> <ul style="list-style-type: none">• What is Ideation?• Understanding Innovation.• Frameworks for Innovation.• The Entrepreneurial Mind set.• Starting a Business, types formation statutory compliances.• Resources for Aspiring Entrepreneurs. <p>Introduction to Intellectual Property Rights (IPR)</p> <ul style="list-style-type: none">• 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. <p>Importance of building a strong team</p> <ul style="list-style-type: none">• Identifying roles.• Skill sets.• Team dynamics. <p>Identifying Pain Points and problem statement</p> <ul style="list-style-type: none">• Idea Generation Techniques.• Developing and Refining Ideas.• Develop strategies for bringing your innovation to life.	9 hrs

2	<p>Problem and solution canvas preparation</p> <ul style="list-style-type: none"> • Orientation and canvas introduction. • Customer needs assessment . • Market segmentation. • Value proposition. • Competitive analysis. • Market entry strategy. • Market validation. • Regulatory and legal considerations. <p>Customer profiling</p> <ul style="list-style-type: none"> • Review of market research • Customer segmentation • Customer profiling • Persona development • Validation and feedback • Prioritization and selection • Communication and messaging <p>Competitor analysis</p> <ul style="list-style-type: none"> • Identify competitors • Competitor profiling • SWOT analysis • Market positioning • Customer feedback and reviews • Pricing analysis • Differentiation strategy • Benchmarking and improvement 	9 hrs
3	<p>Business plan preparation</p> <ul style="list-style-type: none"> • Business plan framework • Market analysis • Product/ service description • Marketing and sales strategy • Operations plan • Financial projections • Risk management <p>Prototype development plan preparation</p> <ul style="list-style-type: none"> • Prototype requirements analysis • Technical specifications • Development approach • Development timeline • Resource allocation • Testing and quality assurance • Iterative development and feedback loop • Documentation and version control 	9 hrs

4	Prototype development Stakeholder engagement strategies <ul style="list-style-type: none"> • Investors • Partners • Customers • Advisors & Mentors 	9 hrs
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Course Assessment Method

(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/Micro	Internal Examination-1 (Written)	Internal Examination-2 (Written)	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 learning 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
<ul style="list-style-type: none"> • 1 or 2 Questions from each module. • Total of 6 Questions, each carrying 2 marks • (6 × 2 = 12 marks) 	<ul style="list-style-type: none"> • Each question carries 7 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. • (4 × 7 = 28 marks) 	40

Text Books

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	The Engineering Handbook	Richard C. Dorf	CRC Press	2 nd edition 2004
2	The Innovator's DNA	Clayton M. Christensen and Jeffrey H. Dyer	Harvard Business Review Press	Revised edition (June 4, 2019)
3	Innovation and Entrepreneurship for Engineers	Bharat Bhushan and Seema Bhushan	CRS Press	2016
4	Business Model Generation	Alexander Osterwalder & Yves Pigneur	Wiley	2010

Reference Books

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	The Engineering Entrepreneur: A Practical Guide to Starting and Running a Successful Engineering Business in India	Saibal Gupta and Ashok Jhunjunwala	Sage Publications	2011
2	Indian Patent Law	P. Narayanan	Eastern Book Company	2 nd edn/2020
3	The Startup India Manifesto: A Guide to the Indian Startup Ecosystem	Rashmi Bansal and Deepinder Goyal	Westland Publications	2020
4	Intellectual Property Rights (Including IPR in the Digital Age)	Prabhuddha Ganguli	Tata McGraw-Hill Education	2001

Video Links (NPTEL, SWAYAM...)

Module No.	Link ID
1	https://youtu.be/C/0/05c-rnM5g
2	https://youtu.be/P8gTgcM330
3	https://youtu.be/bSjLh8kbkbg
4	https://youtu.be/03pD2LgOpHk



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Rajadhani Institute of Engineering and Technology (Autonomous)

B.Tech Degree S2 (R) Examination Month and Year

Course Code: 25EST206

Course Name: ENGINEERING ENTREPRENEURSHIP AND IPR

Max. Marks: 60

Duration: 2 hours 30 minutes

PART A

(Answer all questions. Each question carries 2 marks)

Qn	Question	CO	Marks
1	List and briefly explain the types of Intellectual Property Rights (IPR).	CO1	(2)
2	What is the value proposition, and why is it important for startups?	CO2	(2)
3	Describe the role of customer feedback in refining market strategies.	CO2	(2)
4	Write the steps involved in preparing a financial projection for a business plan.	CO3	(2)
5	Briefly describe two stakeholder engagement strategies used in prototype development.	CO4	(2)
6	Define the term entrepreneurial mindset and explain its importance.	CO1	(2)

PART B

(Answer any one full question from each module, each question carries 7 marks)

Module - 1

Qn	Question	CO	Marks
7	Discuss the frameworks for fostering innovation in startups. How does building a strong team influence the success of innovation?	CO1	(7)
8	A startup aims to launch a mobile-based health tracking application. Identify the statutory compliances they need to fulfill and outline strategies for protecting their intellectual property.	CO1	(7)

Module - 2

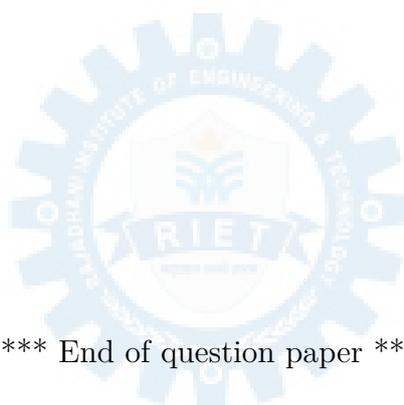
9	Explain the steps involved in conducting market segmentation and customer profiling. How does competitor analysis enhance a startup's value proposition?	CO2	(7)
10	A group of entrepreneurs is developing a solution canvas for a solar-powered water purifier targeting rural markets. Design their value proposition and draft a market validation strategy using customer feedback.	CO2	(7)

Module - 3

11	A startup is launching a food delivery app focusing on local cuisine. Develop a business plan framework including market analysis, marketing strategy, and risk mitigation approaches.	CO3	(7)
12	What are the key components of a business plan? Highlight the role of marketing and operations strategies in ensuring business sustainability.	CO3	(7)

Module - 4

13	An engineering team is prototyping a low-cost robotic arm for industrial use. Create a stakeholder engagement strategy to attract investors and secure partnerships while ensuring product quality and timely delivery.	C04	(7)
14	Describe the prototype development process, including resource allocation and quality assurance. Why is engaging with advisors and mentors important during this phase?	CO4	(7)



***** End of question paper *****

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