SEMESTER 2

PERIOD: MAY 2021-AUGUST 2021

RAJAGIRI SCHOOL OF ENGINEERING & TECHNOLOGY
Department of Information Technology, Programme: Artificial Intelligence & Data Science

Vision

To evolve into a centre of excellence in information technology by creation and exchange of knowledge through leading edge research, innovation and services, which will in turn contribute towards solving complex societal problems and thus building a peaceful and prosperous mankind.

Mission

To impart high quality technical education, research training, professionalism and strong ethical values in the young minds for ensuring their productive careers in industry and academia so as to work with a commitment to the betterment of mankind.

Programme Educational Objectives (PEO)

Graduates of Artificial Intelligence & Data Science program shall

PEO 1: Have strong technical foundation for successful professional careers and to evolve as key-players/ entrepreneurs in the field of information technology.

PEO 2: Excel in analyzing, formulating and solving engineering problems to promote life-long learning, to develop applications, resulting in the betterment of the society.

PEO 3: Have leadership skills and awareness on professional ethics and codes.

Programme Outcomes (PO)

Artificial Intelligence & Data Science Program Students will be able to:

PO1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems. **PO2**. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6.The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7.Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8.Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9.Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10.Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11.Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSO)

Artificial Intelligence & Data Science Program Students will be able to:

PSO1: Apply the fundamentals of science, engineering and mathematics to understand, analyze and develop solutions in the areas related to artificial intelligence and data science for optimal design of intelligent systems.

PSO2: Design and Implement appropriate techniques and analytic tools for the integration of intelligent systems, with a view to engaging in lifelong learning for the betterment of society.

PSO3: Practice professional ethics in applying scientific method to model and support multi-disciplinary facets of engineering and its societal implications.

INDEX

Assignment Schedule

SI No	Subject Code & Name	Faculty in-charge	Week
1	VECTOR CALCULUS, DIFFERENTIAL EQUATIONS AND TRANSFORMS	MS. VINMOL K. JESUDAS	WEEK 1
2	ENGINEERING PHYSICS A	DR RINKU JACOB	WEEK 2
3	ENGINEERING MECHANICS	MS. INDU GEEVAR	WEEK 3
4	BASICS OF ELECTRICAL &ELECTRONICS ENGINEERING	ELECTRICAL: FR. MEJO PAUL ELECTRONICS: MS. POORNIMA S	WEEK 4
5	PROFESSIONAL COMMUNICATION	MS PARVATHY N	WEEK 5
6	PROGRAMMING IN C	MS. NIKHILA T BHUVAN	WEEK 6
7	VECTOR CALCULUS, DIFFERENTIAL EQUATIONS AND TRANSFORMS	MS. VINMOL K. JESUDAS	WEEK 7
8	ENGINEERING PHYSICS A	DR RINKU JACOB	WEEK 8
9	ENGINEERING MECHANICS	MS. INDU GEEVAR	WEEK 9
10	BASICS OF ELECTRICAL &ELECTRONICS ENGINEERING	ELECTRICAL: FR. MEJO PAUL ELECTRONICS: MS. POORNIMA S	WEEK 10
11	PROFESSIONAL COMMUNICATION	MS PARVATHY N	WEEK 11
12	PROGRAMMING IN C	MS. NIKHILA T BHUVAN	WEEK 12

VECTOR CALCULUS, DIFFERENTIAL EQUATIONS AND TRANSFORMS

COURSE INFORMATION SHEET

MAT102 VECTOR CALCULUS DIFFERENTIAL EQUATIONS AND TRANSFORMS

PROGRAMME: COMMON	**DEGREE: BTECH**
PROGRAMME: AD	UNIVERSITY**: A P J ABDUL KALAM TECHNOLOGICAL UNIVERSITY**
COURSE: VECTOR CALCULUS DIFFERENTIAL EQUATIONS AND TRANSFORMS	SEMESTER**: II** CREDITS: **4**
COURSE CODE: 100908/MA200A REGULATION: UG	COURSE TYPE: **CORE**
COURSE AREA/DOMAIN: ENGINEERING MATHEMATICS	CONTACT HOURS: **3+1 (Tutorial) hours/Week.**

SYLLABUS:

UNIT	DETAILS	HOURS
I	Module 1 (Calculus of vector functions) (Text 1: Relevant topics from sections 12.1, 12.2, 12.6, 13.6, 15.1, 15.2, 15.3) Vector valued function of single variable, derivative of vector function and geometrical interpretation, motion along a curve-velocity, speed and acceleration. Concept of scalar and vector fields , Gradient and its properties, directional derivative , divergence and curl, Line integrals of vector fields, work as line integral, Conservative vector fields , independence of path and potential function(results without proof).	9
II	Module 2 (Vector integral theorems) (Text 1: Relevant topics from sections 15.4, 15.5, 15.6, 15.7, 15.8) Green's theorem (for simply connected domains, without proof) and applications to evaluating line integrals and finding areas. Surface integrals over surfaces of the form $z = g(x, y)$, $y = g(x, z)$ or $x = g(y, z)$, Flux integrals over surfaces of the form $z = g(x, y)$, $y = g(x, z)$ or $x = g(y, z)$, divergence theorem (without proof) and its applications to finding flux integrals, Stokes' theorem (without proof) and its applications to finding line integrals of vector fields and work done	9

	(For practice and submission as assignment only: Plots of partial sums of Fourier series and demonstrations of convergence using plotting software)	
III	Module- 3 (Ordinary differential equations) (Text 2: Relevant topics from sections 2.1, 2.2, 2.5, 2.6, 2.7, 2.10, 3.1, 3.2, 3.3) Homogenous linear differential equation of second order, superposition principle, general solution,homogenous linear ODEs with constant coefficients-general solution. Solution of Euler-Cauchyequations (second order only).Existence and uniqueness (without proof). Non homogenous linear-general solution, solution by the method of undetermined coefficients (for the right hand sideof the form $x^n, e^{kx}, \sin ax, \cos ax, e^{kx}\sin ax, e^{kx}\cos ax$and their linear combinations), methods ofvariation of parameters. Solution of higher order equations-homogeneous and non-homogeneouswith constant coefficient using method of undetermined coefficient.	9
IV	Module- 4 (Laplace transforms) (Text 2: Relevant topics from sections 6.1,6.2,6.3,6.4,6.5) Laplace Transform and its inverse ,Existence theorem (without proof) , linearity,Laplacetransformof basic functions, first shifting theorem, Laplace transform of derivatives and integrals, solution ofdifferential equations using Laplace transform, Unit step function, Second shifting theorems. Diracdelta function and its Laplace transform, Solution of ordinary differential equation involving unitstep function and Dirac delta functions. Convolution theorem(without proof)and its application tofinding inverse Laplace transform of products of functions.	10
V	Module-5 (Fourier Tranforms) (Text 2: Relevant topics from sections 11.7,11.8, 11.9) Fourier integral representation, Fourier sine and cosine integrals. Fourier sine and cosine transforms,inverse sine and cosine transform. Fourier transform and inverse Fourier transform, basic properties.The Fourier transform of derivatives. Convolution theorem (without proof)	8
TOTAL HOURS		**45**

TEXT/REFERENCE BOOKS:

T/R	**BOOK TITLE/AUTHORS/PUBLICATION**
T1	H. Anton, I. Biven S.Davis, “Calculus”, Wiley, 10th edition, 2015
T2	Erwin Kreyszig, “Advanced Engineering Mathematics”, Wiley, 10th edition, 2015.
R1	J. Stewart, Essential Calculus, Cengage, 2nd edition, 2017

R2	G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9 th Edition, Pearson,Reprint,2002
R3	Peter O Neil, Advanced Engineering Mathematics, 7th Edition, Thomson, 2007.
R4	Louis C Barret, C Ray Wylie, "Advanced Engineering Mathematics", Tata McGraw Hill, 6th edition, 2003
R5	VeerarajanT."Engineering Mathematics for first year", Tata McGraw - Hill, 2008
R6	B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th edition , 2010
R7	Srimanta Pal, Subodh C. Bhunia, "Engineering Mathematics", Oxford University Press,2015
R8	Ronald N. Bracewell, "The Fourier Transform and its Applications", McGraw – Hill International Editions, 2000.

COURSE PREREQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
	A basic course in vector calculus, Differential equations and integration	To develop basic ideas on vector differentiation, vector integration ,applications and differential equations.	

COURSE OBJECTIVES:

1	To familiarize the concepts and applications of differentiation and integration of vector valued functions.
2	To understand the concept of ordinary differential equations which have many applications in engineering.
3	To apply the basic transforms such as Laplace and Fourier transform which are invaluable for any engineer's mathematical toolbox.

COURSE OUTCOMES:

SNO	DESCRIPTION	Bloom's Taxonomy Level
CO 1	**Apply** theconcept of differentiation and integration of vector valued functions in various fields of Engineering.	Apply (Level 3)
CO 2	**Evaluate** the surface and volume integrals and learn their inter-relations and applications.	Evaluate (Level 5)
CO 3	**Remember** and solve homogeneous and non-homogeneous linear differential equations with constant coefficients.	Remember (Level 1)
CO 4	**Analyze the** Laplace transform and apply them to solve ODEs arising in engineering.	Analyse (Level 4)
CO 5	**Understand** the Fourier transforms of functions and apply them to solve problems arising engineering	Understand (Level 2)

CO-PO AND CO-PSO MAPPING

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO 1	3	3	3	3	2	1				2		2	2		
CO 2	3	3	3	3	2	1				2		2	2		
CO 3	3	3	3	3	2	1				2		2	2		
CO 4	3	3	3	3	2	1				2		2	2		
CO 5	3	3	3	3	2	1				2		2	2		

JUSTIFICATIONS FOR CO-PO MAPPING

MAPPING	LOW/MEDIUM/ HIGH	JUSTIFICATION
CO 1-PO 1	3	Applying the concept of differentiation and integration of vector valued functions we can solve various types of engineering problems.
CO 1-PO 2	3	Vector calculus can be used to reduce complex engineering problems into a simpler one.
CO 1-PO 3	3	We can design solutions to engineering problems which involves vector valued functions
CO 1-PO 4	3	Using the concept of differentiation and integration of vector valued functions we can analyse and interpret functions of multiple variables in engineering.
CO 1-PO 5	2	Apply appropriate techniques in modelling ,various complex engineering problems using the techniques in vector calculus
CO 1-PO 6	1	Fundamental knowledge in vector calculus helps to assess various safety issues relevant to the professional engineering practice
CO 1-PO 10	2	The common knowledge of vector calculus makes it easier to communicate ideas effectively
CO 1-PO 12	2	Able to engage in independent and lifelong learning in the broadest context of technological change
CO 2-PO 1	3	Basic knowledge in vector integral calculus helps in solving engineering problems
CO 2-PO 2	3	Vector integration can be applied to analyze deterministic systems that have multiple degrees of freedom
CO 2-PO 3	3	Vector integration is used in many fields of natural and social science and engineering to model and study high-dimensional systems
CO 2-PO 4	3	Most of the natural phenomenon is non-linear and that can

		be best described by using vector calculus and partial differential equation
CO 2-PO 5	2	Vector calculus can be used to optimise functions of two or more variables
CO 2-PO 6	1	Theconcept of vector calculus helps to assess societal, health, safety, legal and cultural issues.
CO 2-PO 10	2	Effective communication helps the engineering community to give and receive clear instructions.
CO 2-PO 12	2	Study, experience, and practice of the fundamentals of vector integration will allow for further learning in the context of technological change
CO 3-PO 1	3	Basic knowledge of differential equations is used to create mathematical models in order to arrive at an optimal solution
CO 3-PO 2	3	Differential equations help to analyse complex engineering problems to reach substantiated conclusions
CO 3-PO 3	3	Application of differential equations help in designing solutions for engineering problems
CO 3-PO 4	3	Modelling using differential equations can help in better design of research and experiments
CO 3-PO 5	2	Differential equations gives the engineer new techniques and methods for prediction and modelling
CO 3-PO 6	1	Differential equations can be used to find the optimal solution, or the extrema for various problems
CO 3-PO 10	2	Effective presentations and clear instructions can be done using differential equations
CO 3-PO 12	2	In the new era of technology, application of differential equations is used in the creation of new knowledge and learning of new techniques
CO 4-PO 1	3	Laplace transforms make solving complex differential equations easier
CO 4-PO 2	3	Knowledge of Laplace transforms broaden the research literature and information available to the engineer

CO 4-PO 3	3	To meet the specified needs for the public health and safety, solutions of differential equations using Laplace transforms can be applied widely
CO 4-PO 4	3	Laplace transforms are used for interpreting and analysing the data in engineering field
CO 4-PO 5	2	Laplace transforms can be used to create new programs for solving various models and making predictions from them
CO 4-PO 6	1	Modelling, using differential equations and Laplace transforms can be applied to assess societal, legal and cultural issues.
CO 4-PO 10	2	Laplace transforms allow the engineer to communicate effectively on various complex engineering problems
CO 4-PO 12	2	Learning the fundamentals of Laplace transforms will increase learning skills, which will in turn foster lifelong independent learning
CO 5-PO 1	3	Knowledge ofFourier integrals and transforms provides different techniques in solving engineering problems
CO 5-PO 2	3	Identify and analyse the signals in electronics and communication using Fourier integrals and transforms
CO 5-PO 3	3	Fourier integrals can be used to design and develop solutions for problems with societal, cultural and environmental implications
CO 5-PO 4	3	Fourier transforms can be used to analyse new research literature and help in solving new complex problems
CO 5-PO 5	2	Modern IT and engineering tools can be created to apply Fourier integrals and transforms for solution of engineering problems
CO 5-PO 6	1	Application of Fourier transforms and integrals in context to assess societal issues
CO 5-PO 10	2	The ability to determine Fourier transforms and use them to solve problems will allow for effective communication
CO 5-PO 12	2	Good learning skills will improve independent and life-long learning with help of fourier transforms

JUSTIFICATIONS FOR CO-PSO MAPPING

MAPPING	LOW/MEDIUM/ HIGH	JUSTIFICATION
CO1-PSO1	3	Vector calculus is the basis for algorithms on machine learning and optimization
CO2- PSO1	3	Vector calculus is the basis for algorithms on machine learning and optimization
CO5-PSO1	3	Fourier transforms are fundamental tools for computer graphics

GAPS IN THE SYLLABUS - TO MEET INDUSTRY/PROFESSIONAL REQUIREMENTS:

Sl.NO	DESCRIPTION	RELEVANCE TO PO	PROPOSED ACTIONS	RELEVANCE
1	Basic notation and arithmetic of vectors		Reading	1
2	Applications of vector calculus		Reading / Assignment	1
3	Application of Fourier and Laplace transforms		Reading / Assignment	1

PROPOSED ACTIONS: TOPICS BEYOND SYLLABUS/ASSIGNMENT/INDUSTRY VISIT/GUEST LECTURER/NPTEL ETC

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:

SI.NO:	TOPIC	RELEVANCE TO PO
1	Conservative fields in 3- space	1
2	Properties of curl and gradient	1

WEB SOURCE REFERENCES / ICT ENABLED TEACHING LEARNING RESOURCES:

1	http://www.math.com/
2	https://www.youtube.com/watch?v=Fh8m6ZdFaqU

3	https://www.youtube.com/watch?v=GmIcbqdvIgc
4	https://www.youtube.com/watch?v=2ZBcbFhrfOg
5	https://www.youtube.com/watch?v=o77UV7YrWvw
6	https://www.youtube.com/watch?v=Jd_t8jUJJfA
7	https://www.youtube.com/watch?v=2I4jKIGy238
8	https://www.youtube.com/watch?v=uliv9TzeD6o

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☑ **CHALK & TALK**	☑ STUD. ASSIGNMENT	☑ WEB RESOURCES	☑LCD/SMART BOARDS
☐ **STUD. SEMINARS**	☐ ADD-ON COURSES		

ASSESSMENT METHODOLOGIES-DIRECT

☑ **ASSIGNMENTS**	☐ STUD. SEMINARS	☑ TESTS/MODEL EXAMS	☑ UNIV. EXAMINATION
☐ **STUD. LAB PRACTICES**	☐ STUD. VIVA	☐ MINI/MAJOR PROJECTS	☐ CERTIFICATIONS
☐ **ADD-ON COURSES**	☐ OTHERS		

ASSESSMENT METHODOLOGIES-INDIRECT

☑**ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)**	☑ STUDENT FEEDBACK ON FACULTY (TWICE)
☐ **ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS**	☐ OTHERS

Prepared by **Approved by**

Ms. Vinmol K. Jesudas **Dr. Ramkumar P.B. (HOD)**

COURSE PLAN

No	Topic	No. of Lectures
1	**Module 1 : Calculus of vector functions (9 hours)**	
1.1	Vector valued function of a scalar variable - derivative of vector valued function of scalar variable t-geometrical meaning	2
1.2	Motion along a curve-speed , velocity, acceleration	1
1.3	Gradient and its properties, directional derivative divergent and curl.	3
1.4	Line integrals with respect to arc length, line integrals of vector fields. Work done as line integral	2
1.5	Conservative vector field, independence of path potential function	1
2	**Module 2 : Vector integral theorems(9 hours)**	
2.1	Green's theorem and it's applications	2
2.2	Surface integrals , flux integral and their evaluation	3
2.3	Divergence theorem and applications	2
2.4	Stokes theorem and applications	2
3	**Module 3 : Ordinary Differential Equations (9 hours)**	
3.1	Homogenous linear equation of second order, Superposition principle, general solution	1
3.2	Homogenous linear ODEs of second order with constant coefficients	2
3.3	Second order Euler-Cauchy equation	1

ASSIGNMENT QUESTIONS

1.A particle moves along a circular path in such a way that its x- and y-coordinates at time t are x = 2 cos t, y = 2 sin t

(a) Find the instantaneous velocity and speed of the particle at time t.

(b) Sketch the path of the particle, and show the position and velocity vectors at time t = π/4 with the velocity vector drawn so that its initial point is at the tip of the positionvector.

(c) Show that at each instant the acceleration vector is perpendicular to the velocityvector.

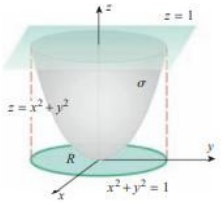
2.A particle moves through 3-space in such a way that its velocity is $\mathbf{v}(t) = \mathbf{i} + t\,\mathbf{j} + t^2\mathbf{k}$ Find the coordinates of the particle at time t = 1 given that the particle is at the point (−1, 2, 4) at time t =0.

3.

Use a line integral to find the area enclosed by the ellipse

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

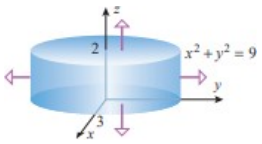
4.Suppose that a curved lamina σ with constant density δ(x, y, z) = δ0 is the portion of the paraboloid $z = x^2 + y^2$ below the plane z = 1.Find the mass of the lamina.



5. Find the flux of the vector field **F**(x, y, z) = z**k**across the outward oriented sphere $x^2 + y^2 + z^2 = a^2$

6. Use the Divergence Theorem to find the outward flux of the vector field **F**(x, y, z) = 2x**i** + 3y **j** + z^2**k** across the unit cube.

7.Use the Divergence Theorem to find the outward flux of the vector field **F**(x, y, z) = x^3i + y^3j + z^2 k across the surface of the region that is enclosed by the circular cylinder $x^2 + y^2 = 9$ and the planes z = 0 and z =2



8. FindtheLaplaceTransformof$(t)=e^{at}$,where$a$isaconstant.

9. Findthe Laplacetransform$\{cos3t\}$for$f(t)=cos3t$.

1. 10.Find the fourierintegral representation definedas

$$(x)=\begin{cases} a & if\ |x|<1 \\ 0 & if\ |x|>1 \end{cases}$$

MODULE III HOMOGENEOUS DIFFERENTIAL EQUATIONS

TUTORIAL

Solve the following differential equations.

1. $y" - 8y' + 16y = 0$
2. $4y" - 4y' - 3y = 0$
3. $y" + 2y' + 5y = 0$
4. $y" + 8y' - 30y = 0$
5. $y''' - 6y" + 11y' - 6y = 0$
6. $y^{IV} - y = 0$
7. $y^{IV} + 6y''' + 9y'' = 0$

Solve the following initial value problems.

8. $y" + y = 0; \quad y(0) = 2,\ y\left(\frac{\pi}{2}\right).$
9. $y" - 3y' + 2y = 0; \quad y(0) = y'(0) = 1.$
10. $y" + 0.2y' + 4.01y = 0; \quad y(0) = 0,\ y'(0) = 2.$
11. $y" - k^2y = 0\ (k \neq 0); \quad y(0) = 1, y'(0) = 1.$
12. $y" - 2y' - 3y = 0; \quad y(-1) = e,\ y'(-1) = \frac{-e}{4}.$

Verify the solutions of the given differential equations are linearly independent or not also find the basis

13. $4y" + 25y = 0$
14. $y" + 2y' + 2y = 0$

Find the second solution of the given differential equation given y_1. Also find the general solution.

15. $x^2y" + xy' - y = 0\ ;\ y_1 = x + \frac{1}{x}$
16. $xy" - (2x - 1)y' + (x - 1)y = 0;\ y_1 = e^x$
17. Show that the functions x and $xlog(x)$ are linearly independent (use Wronskian). Hence form an ODE for the given basis $x, xlog(x)$.

Reduce to first order and hence solve the ODE.

18. $y" + (y')^3 cosy = 0.$
19. $2xy" = 3y'$
20. $y" - y' = 0$
21. $xy" + 2y' + xy = 0,\ y_1 = \frac{cosx}{x}$
22. $y" + \left(1 + \frac{1}{y}\right)(y')^2 = 0.$

ENGINEERING PHYSICS A

COURSE INFORMATION SHEET- ENGINEERING PHYSICS

PROGRAMME: ENGINEERING	**DEGREE: BTECH**
COURSE: ENGINEERING PHYSICS	**SEMESTER: 1 AND 2 CREDITS: 4**
COURSE CODE: 100906/PH900B REGULATION: 2020	**COURSE TYPE: CORE**
COURSE AREA/DOMAIN: Engineering Physics	**CONTACT HOURS: 4(L) hours/Week**
CORRESPONDING LAB COURSE CODE:100908/PH922S	**LAB COURSE NAME: Engineering Physics Lab**

Preamble:

The aim of the Engineering Physics Program is to offer students a solid background in the fundamentals of Physics and to impart that knowledge in engineering disciplines. The program is designed to develop scientific attitudes and enable the students to correlate the concepts of Physics with the core programmes.

Prerequisite:

Higher secondary level Physics, Mathematical course on vector calculus, differential equations and linear algebra

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Oscillations and Waves (9 hours)**	
1.1	Harmonic oscillations, Damped harmonic motion-Derivation of differential equation and its solution, Over damped, Critically damped and Under damped Cases, Quality factor-Expression	2 hrs
1.2	Forced oscillations-Differential Equation-Derivation of expressions for amplitude and phase of forced oscillations, Amplitude Resonance-Expression for Resonant frequency, Quality factor and Sharpness ofResonance, Electrical analogy of mechanical oscillators	3hrs
1.3	Wave motion- Derivation of one-dimensional wave equation and itssolution, Three dimensional wave equation and its solution (no derivation)	2 hrs
1.4	Distinction between transverse and longitudinal waves. Transversevibration in a stretched string, Statement of laws of vibration	2 hrs
2	**Wave Optics (9 hours)**	

2.1	Interference of light-Principle of superposition of waves, Theory of thinfilms - Cosine law (Reflected system), Derivation of the conditions of constructive and destructive Interference	2 hrs
2.2	Interference due to wedge shaped films -Determination of thicknessand test for optical planeness, Newton's rings - Measurement of wavelength and refractive index, Antireflection coatings	4 hr
2.3	Diffraction of light, Fresnel and Fraunhofer classes of diffraction,Diffraction grating-Grating equation	2 hrs
2.4	Rayleigh criterion for limit of resolution, Resolving and Dispersivepower of a grating with expression (no derivation)	1 hr
3	**Quantum Mechanics &Nanotechnology (9hours)**	
3.1	Introduction for the need of Quantum mechanics, Wave nature of Particles, Uncertainty principle, Applications-Absence of electronsinside a nucleus and Natural line broadening mechanism	2 hrs
3.2	Formulation of time dependent and independent Schrodinger wave equations-Physical Meaning of wave function, Particle in a one dimensional box- Derivation for normalised wave function and energyeigen values, Quantum Mechanical Tunnelling (Qualitative)	4 hrs
3.3	Introduction to nanoscience and technology, Increase in surface to volume ratio for nanomaterials, Quantum confinement in one dimension, two dimension and three dimension-Nano sheets, Nanowires and Quantum dots	2 hrs
3.4	Properties of nanomaterials-mechanical, electrical and opticalApplications of nanotechnology (qualitative ideas)	1 hr
4	**Magnetism & Electro Magnetic Theory (9 hours)**	
4.1	Magnetic field and Magnetic flux density, Gauss's law for Magnetic flux density, Ampere's Circuital law, Faraday's law in terms of EMFproduced by changing magnetic flux	2 hrs
4.2	Explanation for Magnetic permeability and susceptibility Classificationof magnetic materials- para, dia and ferromagnetic materials	1 hr
4.3	Fundamentals of vector calculus, concept of divergence, gradient andcurl along with physical significance, Line, Surface and Volume integrals, Gauss divergence theorem & Stokes' theorem	2 hrs
4.4	Equation of continuity, Derivation of Maxwell's equations in vacuum, Comparison of displacement current with conduction current. Electromagnetic waves, Velocity of Electromagnetic waves in freespace, Flow of energy and Poynting's vector (no derivation)	4 hrs
5	**Superconductivity &Photonics (9hours)**	
5.1	Super conducting Phenomena, Meissner effect and perfectdiamagnetism, Types of superconductors-Type I and Type II	2 hrs

5.2	BCS Theory (Qualitative), High temperature superconductors,Applications of super conductivity	2 hrs
5.3	Introduction to photonics-Photonic devices-Light Emitting Diode, Photodetectors -Junction and PIN photodiodes, Solar cells-I-V Characteristics	2 hrs
5.4	-Principle of propagation of light, Types of fibres-Step index and ex fibres, Numerical aperture –Derivation, Fibre optic communication ock diagram), Industrial, Medical and Technological applications of e, Fibre optic sensors-IntensityModulated and Phase modulated sensors	3 hrs
		TOTAL **45 hrs**

Text Books

1. M.N.Avadhanulu, P.G.Kshirsagar,TVS Arun Murthy "A Text book of Engineering Physics", S.Chand&Co., Revised Edition 2019

2. H.K.Malik , A.K. Singh, "Engineering Physics" McGraw Hill Education, Second Edition 2017
3. 3. Neil Ashcroft and N. David Mermin, "Solid State Physics", 1st Edition, Cengage, 2003.
4. Hofmann, Philip, "Solid state physics: an introduction", Wiley, 2008.

5. Kittel, C., "Introduction to solid state physics", 7th Edition, John Wiley & Sons, 2004

Reference Books

1. Arthur Beiser, "Concepts of Modern Physics ", Tata McGraw Hill Publications, 6th Edition 2003

2. D.K. Bhattacharya, Poonam Tandon, "Engineering Physics", Oxford University Press, 2015

3. Md.N.Khan&S.Panigrahi "Principles of Engineering Physics 1&2", Cambridge University Press, 2016

4. Aruldhas G., "Engineering Physics", PHI Pvt. Ltd., 2015

5. AjoyGhatak, "Optics", Mc Graw Hill Education, Sixth Edition, 2017

6. T. Pradeep, "Nano:The Essentials'', McGraw Hill India Ltd, 2007

7. Halliday, Resnick, Walker, "Fundamentals of Physics'', John Wiley &Sons.Inc, 2001

8. David J Griffiths, "Introduction to Electrodynamics'', Addison-Wesley publishing, 3rd Edition, 1999

9. Premlet B., "Advanced Engineering Physics", Phasor Books,10th edition,2017

10. I. Dominic and. A. Nahari, "A Text Book of Engineering physics", Owl Books Publishers, Revised edition, 2016

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

CO 1	Compute the quantitative aspects of waves and oscillations in engineering systems.
CO 2	Apply the interaction of light with matter through interference, diffraction and identify these phenomena in different natural optical processes and optical instruments.
CO 3	Analyze the behaviour of matter in the atomic and subatomic level through the principles of quantum mechanics to perceive the microscopic processes in electronic devices.
CO 4	Classify the properties of magnetic materials and apply vector calculus to static magnetic fields and use Maxwell's equations to diverse engineering problems
CO 5	Analyze the principles behind various superconducting applications, explain the working of solid state lighting devices and fibre optic communication system

Mapping of course outcomes with program outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO 1	**3**	2						1	2			1
CO 2	3	2						1	2			1
CO 3	3	2						1	2			1
CO 4	3	1						1	2			1
CO 5	3	1						1	2			1

Justification

CO1.PO1	**Compute the quantitative aspects of waves and oscillations in engineering systems** like natural frequency, damped frequency, forced frequency, resonant frequency, band-width, Q-factor, wavelength, wave-velocity, frequency etc.
CO1.PO2	Review research literature to identify physics behind current and relevant innovations in the respective branch by assignment
CO1.PO8	Professional punctuality and understanding professional ethics by self-reading
CO1.PO9	Effectively function individually and as a team in various class presentations
CO1.PO12	Capture the current and relevant innovations in the respective branch

CO2.PO1	Apply the interaction of light with matter through interference, diffraction and identify these phenomena in different natural optical processes and optical instruments. E.g.: measurement of fringe width, refractive index, path difference, phase difference, annihilation of reflection by interference, angle of diffraction, grating element: its dispersive power and resolving power.
CO2.PO2	Review research literature to identify physics behind current and relevant innovations in the respective branch by assignment
CO2.PO8	Professional punctuality and understanding professional ethics by self-reading
CO2.PO9	Effectively function individually and as a team in various class presentations
CO2.PO12	Capture the current and relevant innovations in the respective branch

CO3.PO1	Analyze the behaviour of matter in the atomic and subatomic level through the principles of quantum mechanics to perceive the microscopic processes in electronic devices. E.g.: Wave-function and it's physical significance, Excitons, Schrodinger equations and application to particle in a one dimensional box, Energy Eigen values, tunneling, Quantum confinement, properties of nanomaterials
CO3.PO2	Review research literature to identify physics behind current and relevant innovations in the respective branch by assignment
CO3.PO8	Professional punctuality and understanding professional ethics by self-reading
CO3.PO9	Effectively function individually and as a team in various class presentations
CO3.PO12	Capture the current and relevant innovations in the respective branch

CO4.PO1	Classify the properties of magnetic materials and apply vector calculus to static magnetic fields and use Maxwell's equations to diverse engineering problems**.** E.g.: Faraday's Laws, Para, dia, ferromagnetism, Physical significance of gradient divergence and curl and its' applications, displacement current and propagation of electromagnetic waves.
CO4.PO2	Review research literature to identify physics behind current and relevant innovations in the respective branch by assignment
CO4.PO8	Professional punctuality and understanding professional ethics by self-reading
CO4.PO9	Effectively function individually and as a team in various class presentations
CO4.PO12	Capture the current and relevant innovations in the respective branch

CO5.PO1	Analyze the principles behind various superconducting applications, explain the working of solid state lighting devices and fibre optic communication system**.** E.g.: Meissner effect, classification of superconducting materials, Qualitative idea of BCS theory. Working of various photonic devices like LED, various Photo detectors, Solar cell, Classification of Optical fibre cable based on refractive index, significance of Numerical aperture, fiber optic communication system and fiber optic sensors.
CO5.PO2	Review research literature to identify physics behind current and relevant innovations in the respective branch by assignment
CO5.PO8	Professional punctuality and understanding professional ethics by self-reading
CO5.PO9	Effectively function individually and as a team in various class presentations
CO5.PO12	Capture the current and relevant innovations in the respective branch

WEB SOURCE REFERENCES:

1	http://www.animations.physics.unsw.edu.au/jw/oscillations.htm
2	http://www.itp.uni-hannover.de/~zawischa/ITP/diffraction.html
3	http://science.howstuffworks.com/environmental/energy/superconductivity.htm
4	http://plato.stanford.edu/entries/qm/
5	http://www.damtp.cam.ac.uk/user/tong/statphys.html
6	http://www.coherent.com/products/?834/Lasers

Mark distribution for the course

Total Marks	**CIEmarks**	**ESEmarks**	**ESE Duration**
150	50	100	3 hours

Continuous Internal Evaluation Pattern:

Attendance : 10
Continuous Assessment Test (2 numbers) : 25
Assignment/Quiz/Course project : 15

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination (Marks)
	Test 1 (Marks)	Test 2 (Marks)	
Remember	15	15	30
Understand	25	25	50
Apply	10	10	20

Assignment:

1. Entrepreneurial Learning & Teaching
2. Module based assignments.

ASSESSMENT METHODOLOGIES-DIRECT

☐ ASSIGNMENTS	☐ STUD. SEMINARS	☐ TESTS/MODEL EXAMS	☐ UNIV. EXAMINATION
☐ STUD. LAB PRACTICES	☐ STUD. VIVA	☐ MINI/MAJOR PROJECTS	☐ CERTIFICATIONS
☐ ADD-ON COURSES	☐ OTHERS	☐ POSTER PRESENTATIONS	

ASSESSMENT METHODOLOGIES-INDIRECT

☐ ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	☐ STUDENT FEEDBACK ON FACULTY (TWICE)
☐ ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS	☐ OTHERS

Prepared by

Approved by

JOSE ANTONY V J
RINKU JACOB
DEEPTHI JAYAN K
SUJITH S

(HOD)

COURSE PLAN

Class :**2021S2AID**
Subject :**100906/PH900B:Engineering Physics A**
Code

Sl.No	Module	Planned Date	Planned	Actual	Status	Extra Taken	Remarks	Done By	Date of Entry
1	1	3-May-2021	Harmonic Oscillations, Simple harmonic motion, damped harmonic oscillator, the differential equation for a damped harmonic oscillator	Harmonic Oscillations, Simple harmonic motion, damped harmonic oscillator, the differential equation for a damped harmonic oscillator	Completed			RINKU J	7/7/2021 8:02:38 PM
2	1	4-May-2021	General Solution of the differential equation of damped harmonic oscillator, overdamped and critcally damped case	General Solution of the differential equation of damped harmonic oscillator, overdamped and critcally dampedcase	Completed			RINKU J	7/7/2021 8:02:51 PM
3	1	5-May-2021	underdamped case, Expression for Time period of oscillation	underdamped case, Expression for Time period of oscillation	Completed			RINKU J	7/7/2021 8:03:02 PM

4	1	6-May-2021	Series LCR, comparison of an electrical and mechanical oscillator, Forced harmonic differential equation	Series LCR, comparison of an electrical and mechanical oscillator, Forced harmonic differential equation	Completed			RINKU J	7/7/2021 8:03:11 PM
5	1	10-May-2021	Solution to the differential equation for forced harmonic oscillator, Amplitude resonance, Derivation of resonance equation	Solution to the differential equation for forced harmonic oscillator, Amplitude resonance, Derivation of resonance equation	Completed			RINKU J	7/7/2021 8:03:20 PM
6	1	11-May-2021	Expression for resonant frequency, and maximum amplitude at resonance, Frequency response graph	Expression for resonant frequency, and maximum amplitude at resonance, Frequency response graph	Completed			RINKU J	7/9/2021 12:14:34 PM
7	1	12-May-2021	Frequency response graph, sharpness of resonance, Quality factor, Numerical Problems	Frequency response graph, sharpness of resonance, Quality factor, Numerical Problems	Completed			RINKU J	7/9/2021 12:14:42 PM

8	1	17-May-2021	Waves, Longitudinal and transverse waves, Differential equation for a one dimensional wave, general solution for the differential equation	Waves, Longitudinal and transverse waves, Differential equation for a one dimensional wave, general solution for the differential equation	Completed			RINKUJ	7/9/2021 12:14:52 PM
9	1	18-May-2021	General solution for the differential equation in 1D and 3D, Transverse vibrations on a stretched string	General solution for the differential equation in 1D and 3D, Transverse vibrations on a stretched string	Completed			RINKUJ	7/9/2021 12:15:01 PM
10	1	19-May-2021	Transverse vibrations on a stretched string, Laws of transverse vibrations	Transverse vibrations on a stretched string, Laws of transverse vibrations	Completed			RINKUJ	7/9/2021 12:15:11 PM
11	2	20-May-2021	Problems of module 1, (module 2, part 1 started), interference, coherence, thin films, Film viewed under reflected light (derivation of cosine law)	Problems of module 1, (module 2, part 1 started), interference, coherence, thin films, Film viewed under reflected light (derivation of cosine law)	Completed			RINKUJ	7/9/2021 12:15:21 PM
12	2	25-May-2021	Film viewed under reflected light (derivation of cosine law), condition for brightness and darkness in thin films	Film viewed under reflected light (derivation of cosine law), condition for brightness and darkness in	Completed			RINKUJ	7/9/2021 12:15:31 PM

				thinfilms					
13	2	26-May-2021	Air wedge, Derivation of expression for fringe width in air-wedge	Air wedge, Derivation of expression for fringe width in air-wedge	Completed			RINKUJ	7/9/2021 12:15:40 PM
14	2	31-May-2021	Expression for fringe width in air wedge, test for plainesss, Newton's rings setup, Expression for radius of nth ring and expression for wavelength, Determination of refractive index using newtons rings setup	Expression for fringe width in air wedge, test for plainesss, Newton's rings setup, Expression for radius of nth ring and expression for wavelength, Determinatio nof refractive index using newtons rings setup	Completed			RINKUJ	7/9/2021 12:15:49 PM
15	2	1-Jun-2021	Antireflection coating	Antireflection coating	Completed			RINKUJ	7/9/2021 12:15:58 PM
16	2	3-Jun-2021	Part 2 of module 2 : Diffraction, Difference between interference and diffraction, types of diffraction, comparison between fraunhoffer and fresnel diffraction, diffraction grating	Part 2 of module 2 : Diffraction, Difference between interference and diffraction, types of diffraction, comparison between fraunhoffer and fresnel diffraction, diffraction	Completed			RINKUJ	7/9/2021 12:16:08 PM

				grating					
17	2	7-Jun-2021	Grating Equation, Rayleigh's Criterion	Grating Equation, Rayleigh's Criterion	Completed			RINKUJ	7/9/2021 12:16:16 PM
18	2	7-Jun-2021	Dispersive power of grating, numerical problems	Dispersive power of grating, numerical problems	Completed			RINKUJ	7/9/2021 12:16:24 PM
19	2	8-Jun-2021	Numerical problems of Interference and Diffraction	Numerical problems of Interference andDiffraction	Completed			RINKUJ	7/9/2021 12:16:35 PM
20	3	14-Jun-2021	Introduction to the need of quantum mechanics, wave nature of particles, Physical meaning of wavefunction	Introduction to the need of quantum mechanics, wave nature of particles, Physical meaning of wavefunction	Completed			RINKUJ	7/9/2021 12:16:45 PM
21	3	15-Jun-2021	Normalization condition, Wavefunction of a particle in terms of Energy and momentum, Uncertainity principle	Normalization condition, Wavefunction of a particle in terms of Energy and momentum, Uncertainity principle	Completed			RINKUJ	7/9/2021 12:16:55 PM

22	3	17-Jun-2021	Applications of Uncertainity principle - Absence of electrons inside the nucleus - Natural line broadening mechanism, Derivation of time dependent Schrodinger equation	Applications of Uncertainity principle - Absence of electrons inside the nucleus - Natural line broadening mechanism, Derivation of time dependent Schrodinger equation	Completed			RINKU J	7/9/2021 12:17:06 PM
23	3	28-Jun-2021	Derivation of onedimensional time-dependent Schrodinger equation, and one-dimensional time independent Schrodinger equation.	Derivation of one dimensional time-dependent Schrodinger equation, and one-dimensional time independent Schrodinger equation.	Completed			RINKU J	7/9/2021 12:17:16 PM
24	3	29-Jun-2021	Particle trapped in a one dimensional infinite square well potential	Particle trapped in a one dimensional infinite square well potential	Completed			RINKU J	7/9/2021 12:17:27 PM
25	3	1-Jul-2021	Particle trapped in a one dimensional infinite square well potential, Quantum mechanical tunnelling	Particle trapped in a one dimensional infinite square well potential, Quantum mechanical tunnelling	Completed			RINKU J	7/9/2021 12:17:37 PM
26	3	6-Jul-2021	Class Test 2 (Quantum mechanics)	Class Test 2 (Quantum mechanics)	Completed			RINKU J	7/9/2021 12:17:46 PM

27	3	7-Jul-2021	Quantum Mechanical Tunnelling, Part2 - Nanotechnology, Nanoscience and Nanotechnology, Surface to Volume	Quantum Mechanical Tunnelling, Part2 - Nanotechnology, Nanoscience and Nanotechnology, Surface to Volume	Completed			RINKU J	7/9/2021 12:17:56 PM
28	3	8-Jul-2021	Increase in surface to volume ratio for nanomaterials , Quantum confinement in one dimension, two dimension and three dimension- Nano sheets, Nano wires and Quantum dots	Increase in surface to volume ratio for nanomaterials , Quantum confinement in one dimension, two dimension and three dimension- Nano sheets, Nano wires and Quantum dots	Completed			RINKU J	7/9/2021 12:18:06 PM
29	3	12-Jul-2021	Properties of nanomaterials - mechanical, electrical and optical applications of nanotechnology (qualitative ideas)		Completed			RINKU J	9/28/2021 6:47:35 PM
30	3	13-Jul-2021	Numerical Problems related to nanotechnology		Completed			RINKU J	9/28/2021 6:47:44 PM

31	4	14-Jul-2021	Magnetic field and Magnetic flux density, Gauss's law for Magnetic flux density, Ampere's Circuital law,		Completed			RINKUJ	9/28/2021 6:47:56 PM
32	4	15-Jul-2021	Faraday's law in terms of EMF produced by changing magnetic flux		Completed			RINKUJ	9/28/2021 6:48:04 PM
33	4	19-Jul-2021	Explanation for Magnetic permeability and susceptibility		Completed			RINKUJ	9/28/2021 6:48:12 PM
34	4	21-Jul-2021	Classification of magnetic materials- para, dia and ferromagnetic materials		Completed			RINKUJ	9/28/2021 6:48:19 PM
35	4	22-Jul-2021	Numerical Problems related to magnetism		Completed			RINKUJ	9/28/2021 6:48:26 PM
36	4	26-Jul-2021	Fundamentals of vector calculus, the concept of divergence, gradient, and curl along with physical significance,		Completed			RINKUJ	9/28/2021 6:48:36 PM
37	4	27-Jul-2021	Line, Surface and Volume integrals, Gauss divergence theorem & Stokes' theorem		Completed			RINKUJ	9/28/2021 6:48:44 PM

38	4	28-Jul-2021	Equation of continuity, Derivation of Maxwell's equations in vacuum,		Completed			RINKUJ	9/28/2021 6:48:51 PM
39	4	29-Jul-2021	Comparison of displacement current with conduction current. Electromagnetic waves, Velocity of Electromagnetic waves in free space,		Completed			RINKUJ	9/28/2021 6:48:59 PM
40	4	2-Aug-2021	Flow of energy and Poynting's vector (no derivation), numerical problems related to electromagnetic theory		Completed			RINKUJ	9/28/2021 6:49:07 PM
41	5	3-Aug-2021	Super conducting Phenomena, Meissner effect and perfect diamagnetism, Types of superconductors - Type I and TypeII		Completed			RINKUJ	9/28/2021 6:49:15 PM
42	5	4-Aug-2021	BCS Theory (Qualitative), High temperature superconductors, Applications of super		Completed			RINKUJ	9/28/2021 6:49:22 PM

			conductivity						
43	5	5-Aug-2021	Numerical Problems related to superconductivity		Completed			RINKUJ	9/28/2021 6:49:30 PM
44	5	9-Aug-2021	Introduction to photonics- Photonic devices- Light Emitting Diode		Completed			RINKUJ	9/28/2021 6:49:39 PM
45	5	10-Aug-2021	Photo detectors -Junction and PIN photodiodes, Solar cells-I-V Characteristics		Completed			RINKUJ	9/28/2021 6:49:47 PM
46	5	11-Aug-2021	Principle of propagation of light, Types of fibres-Step index and Graded index fibres		Completed			RINKUJ	9/28/2021 6:49:55 PM
47	5	12-Aug-2021	Numerical aperture –Derivation, Fibre optic communication system (block diagram),		Completed			RINKUJ	9/28/2021 6:50:02 PM
48	5	31-Aug-2021	Industrial, Medical and Technological applications of optical fibre, Fibre optic sensors- Intensity Modulated and Phase modulated sensors		Completed			RINKUJ	9/28/2021 6:50:10 PM

49	5	1-Sep-2021	Numerical Problems related to photonics		Completed			RINKUJ	9/28/2021 6:50:18 PM
50	1	2-Sep-2021	Revision of module 1		Completed			RINKUJ	9/28/2021 6:50:29 PM
51	2	6-Sep-2021	Revision of module 2		Completed			RINKUJ	9/28/2021 6:50:37 PM
52	3	7-Sep-2021	Revision of module 3		Completed			RINKUJ	9/28/2021 6:50:51 PM
53	4	8-Sep-2021	Revision of module 4		Completed			RINKUJ	9/28/2021 6:50:58 PM
54	5	9-Sep-2021	Revision of module 5		Completed			RINKUJ	9/28/2021 6:51:07 PM

ASSIGNMENT QUESTIONS

A Step-by-Step Procedure for Entrepreneurial Education

(Development of educational contents as per Entrepreneurial Pedagogy)

Assignment 1

Part 1: Outline of the Entrepreneurial Education Event

1. *Choose a Theme: To Initiate Learners into an Entrepreneurial Event*
   - Refer to NCERT Syllabus and identify a suitable theme
   - Choose an attractive title for the Learning Event
   - Make sure the title is appropriate, short and impactful
   - Capture the essence of entrepreneurial learning undertaken in the learning event.
2. *Define Learning Outcomes: To Fine-tune the Learning Event with Global Learning Outcomes*
   - Specify the small piece of knowledge generated during Entrepreneurial Learning Event(ELE)
   - Identify match with 21st century skills, abilities, talents, values, attitudes, etc.
   - Combine both parts into one sentence to define Learning Outcomes.
   - Ensure that the learner is rendered future-ready with those learning outcomes.
3. *Envision a Learning Relic: To Simulate Entrepreneurial Learning by Developing Products and Services*
   - Visualize a product or service of relevance to the family and nation based on the theme.
   - Make sure that it is affordable and achievable to the poorest learner of the nation.
   - Suggest an attractive brand name for the product/ service and identify a suitable career.
   - Ensure that the contextual/regional efforts of the learner also contribute to the nation building.

Part 2: Entrepreneurial Learning Event (ELE)

[A Learner-centered and Learner-driven Entrepreneurial Event as an Appetizer for Learning]

1. *Creation stage: Learner initiates learning and creates and entrepreneurial seed idea*
   [Motto: A seed idea is enough to make my life]
   - Handhold learner to explore to identify a piece of exciting knowledge, unknown to them so far. Direct the learner to explore a seed idea for entrepreneurial venture.
   - Make sure that learner make excellent use of their five sense organs and intuition (6th Sense) in the exploration
   - Confirm that the seed idea is unique, such that the learner can claim its ownership.
   - Facilitate learner to formulate his/her discovery in concrete and specific terms.
2. *Celebration stage: Learner celebrates the seed idea and creatively communicates it*
   [Motto: A seed idea is enough to address the world squarely]
   - Facilitate the celebration of the "Eureka Moment" of the learner
   - Help them communicate their discovery to the world (family, school, community,

nation, and world).

- Make sure that the focus of celebration is the seed idea the learner has developed.
- Suggest ways for creative communication in tune with their unique multiple intelligences.

3. *Challenge stage: Learner challenges oneself with the seed idea and perfects oneself.*
   [Motto: A seed idea is enough to improve my life]
   - Identify the matching 21st century skills, values and attitudes to the generated seed idea
   - Define a benchmark for their development during the course of the day.
   - Create an appropriate and a concrete exercise to develop the identified skill, value or attitude.
   - State the achievement level of the particular skill, value and attitude.
4. *Collaboration Stage: Learner gamifies the seed idea and playfully achieves synergy.*
   [Motto: A seed idea is enough to make a game]
   - Facilitate the learner to develop a game based on the seed idea they have discovered.
   - Assist them to play the game they have developed based on the seed idea.
   - Motivate them to collaborate/compete with others to improve the seed idea they have discovered.
   - Record the achievement levels and insights received during the game played with family or friends, etc.
5. *Campaign Stage: Learner develops entrepreneurship and masters the art of service.*
   [Motto: A seed idea is enough to change the world]
   - Encourage the learner to develop a product or service based on the seed idea discovered.
   - Make sure that the developed products and services are useful toothers.
   - Plan to develop products and services based on locally available resources.
   - Develop a concept to map the products and services local flavors on to the political map of the nation or the globe.

Part 3: Entrepreneurial Teaching Event (ETE)

[A Learner-centered, but Teacher- & Media-driven Entrepreneurial Teaching as the Feast of Learning]

Teachers are experts, who shall complement the foundational learning event with foundational teaching event. Here, teachers are expected to integrate the knowledge already developed related to the small piece of knowledge the child has already mastered in the part1 in two ways. Media shall complement the role of teachers, detailing currency and prognosis for the knowledge developed by the learner.

1. *Vertical Integration*
   - Purpose: To teach the history of development of the seed idea
   - Keep the seed idea developed by the learner as the fulcrum of integration.
   - Elaborate how the seed idea was initiated and developed through the history of ideas.
   - Project the possible future development of the seed idea and its outlook.
   - At the end of the day the learners shall get feeling, he has learnt something great.

2. *Horizontal Integration*
    - Purpose: To teach the diverse application of the seed idea in various fields
    - Elaborate on the application of the seed idea in different areas of human activity.
    - Elaborate on well-known current applications as reported in the news.
    - Project the possible future development of the seed idea as a whole.

Entrepreneurial Teaching Video

- Purpose: To develop a video describing the historical and interdisciplinary significance of seed idea
- Develop the script, based on which the video shall be developed
- Duration of video shall be 5-8minutes
- Develop the video using a software available to you.
- A 5-8 minute video describing the historical and interdisciplinary significance of seed idea

Part 4: Review of the Entrepreneurial Education Event

1. *Review1:*
    - Go back to the part 1 and recheck the appropriateness of definitions made there.
    - Make sure that the entrepreneurial seed idea and entrepreneurial products are appropriately defined.
    - Calibrate and fine-tune them if necessary.
    - Go through the video developed in the Foundational Teaching Event and make appropriate editorial work.
2. *Review2:*
    - Identify a learner of the age for whom the entrepreneurial home learning event is addressed.
    - Take how the learner appreciates the learning-teaching event developed by you.
    - Check the appropriateness of the language used for the narration of different steps of the learning-teaching event.
    - Make appropriate modifications and finalize the entrepreneurial home learning event.

Part 5: Finalization of the Entrepreneurial Education Event

1. *Finalization of the Entrepreneurial Learning Event*
    - Remove the structural format used to develop the content for entrepreneurial learning event.
    - Redraft it in a highly readable format and present it as a rich text with supportive diagrams and figures facilitating easy understanding of the text.
    - Try to present it in a one-page document for quick and easy reading
2. Finalization of Entrepreneurial Teaching Event
    - Review the video with an aesthetic perspective and make it appealing to the target audience of respective age groups.

- Make cosmetic corrections to the video and develop it as a unique video in terms of content and format.
- Make sure that the duration of the video is at least 5 minutes and that do not exceed 10 minutes in view of optimum performance in social media.

Assignment 2

Part - A

Oscillations and waves

1. Compare electrical and mechanical oscillating systems? (2 marks)
2. A capacitor of capacity*1*□□, an inductor of self-inductance 0.2 H and a resistor ofresistance*800*Ω are in series. Analyze if the circuit is oscillatory or not? If yes, find the frequency of current oscillation produced by it? (4 marks)
3. Obtain the expression for the frequency and velocity of a wave travelling through a stretched string. (4 marks)

Interference and Diffraction

4. With the help of a diagram, explain interference of light in thin film and derive expression for the path difference, condition for brightness and darkness. (6 marks)
5. A newton's ring arrangement is used with the source emitting two wavelengths λ_1 =6000 Å and λ_2 =4500 Å and it is found that the n^{th} dark ring due to λ_1 coincides with $(n+1)^{th}$ ring due to λ_2. If the radius of curvature of the lens is 90 cm, find the diameter of the nth ring due to λ_1. (4 marks)

Quantum mechanics and Nanotechnology

6. List the properties of an acceptable wave function. State Heisenberg's uncertainty principle. How does the uncertainty principle account for the absence of electrons in the nucleus. (6 marks)
7. A microscope, using photons, is employed to locate an electron in an atom within a distance of 0.2 *Å*. What is the uncertainty in the momentum of the electron located in this way? (4 marks)

Magnetism and Electromagnetic Theory

8. Starting from Maxwell's equation, derive electromagnetic wave equations in free space (6 marks)
9. If the magnitude of H in a plane wave is 1 A/m, find the magnitude of E in free space (4 marks)

Superconductivity and Photonics

10. Show that superconductors are perfect diamagnets. Distinguish between Type I and Type II superconductors with suitable examples. (6 marks)
11. For a superconducting specimen, the values of critical fields are 1.4 x 10^5 A/m and 4.2 x 10^5 A/m for 14 K and 13 K respectively. Calculate the transition temperature and critical fields at 0 K and 4.2 K (4 marks)

Part – B

Make as seed idea related to any topic from any module as done in the first part of assignment 1

ENGINEERING MECHANICS

COURSE INFORMATION SHEET

PROGRAMME:AD	**DEGREE**: BTECH
COURSE:ENGINEERING MECHANICS	**SEMESTER:** S2 **L-T-P-CREDITS**: 2-1-0-3
COURSE CODE: 100908/CE900C **REGULATION**: 2020	**COURSE TYPE**: BASIC
COURSE AREA/DOMAIN: ENGINEERING SCIENCE	**CONTACT HOURS**: 3+1(tutorial) hours/Week
CORRESPONDING LAB COURSE CODE (IF ANY): NIL	**LAB COURSE NAME**: NIL

SYLLABUS:

MODULE	DETAILS	HOURS
I	Introduction to Engineering Mechanics – statics – basic principles of statics – Parallelogram law, equilibrium law, principles of superposition and transmissibility, law of action and reaction(review), free body diagrams. Concurrent coplanar forces – composition and resolution of forces – resultant and equilibrium equations – methods of projections – methods of moments – Varignon's Theorem of moments.	7
II	Friction – sliding friction – Coulomb's laws of friction – analysis of single bodies –wedges, ladder analysis of connected bodies. Parallel coplanar forces – couple – resultant of parallel forces – centre of parallel forces – equilibrium of parallel forces – Simple beam subject to concentrated vertical loads. General coplanar force system – resultant and equilibrium equations.	7
III	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,cylinder and disc. Theorem of PappusGuldinus(demonstration only) Forces in space –vectorial representation of forces, moments and couples – resultant and equilibrium equations – concurrent forces in space (simple problems only)	7
IV	Dynamics – rectilinear translation –equations of kinematics(review) Kinetics – equation of motion – D'Alembert's principle – motion on horizontal and inclined surfaces, motion of connected bodies. Impulse momentum equation and work energy equation (concepts only). Curvilinear translation –equations of kinematics –projectile motion(review), kinetics – equation of motion. Moment of momentum and work energy equation (concepts only).	7
V	Rotation – kinematics of rotation – equation of motion for a rigid body rotating about a fixed axis – rotation under a constant moment. Plane motion of rigid body – instantaneous centre of rotation (concept	7

MODULE	DETAILS	HOURS
	only). Simple harmonic motion – free vibration –degree of freedom – undamped free vibration of spring mass system – effect of damping(concept only)	
TOTAL HOURS		35

TEXT/REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION
T1	Timoshenko and Young, Engineering Mechanics, McGraw Hill Publishers
T2	Shames, I. H., Engineering Mechanics – Statics and Dynamics, Prentice Hall of India.
T3	R. C. Hibbeler and Ashok Gupta, Engineering Mechanics, Vol. I statics, Vol II Dynamics, Pearson Education.
R1	Merriam J. L and Kraige L. G., Engineering Mechanics – Vols. 1 and 2, John Wiley.
R2	Tayal A K, Engineering Mechanics – Statics and Dynamics, Umesh Publications
R3	Bhavikkatti, S.S., Engineering Mechanics, New Age International Publishers
R4	F.P.BeerabdE.R.Johnston (2011), Vector Mechanics for Engineers, Vol.I – Statics, Vol.II – Dynamics, 9th Ed, Tata McGraw Hill
R5	Rajasekaran S and Sankarasubramanian G, Engineering Mechanics - Statics and Dynamics, VikasPublishing House Pvt Ltd.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEMESTER
	NIL		

COURSE OBJECTIVES:

1	To expose the students to the fundamental concepts of mechanics and enhance their problem-solving skills.
2	It introduces students to the influence of applied force system and the geometrical properties of the rigid bodies while stationary or in motion.
3	After this course students will be able to recognize similar problems in real-world situations and respond accordingly.

COURSE OUTCOMES:

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

Sl No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	***Recall*** principles and theorems related to rigid body mechanics														
	2	2													
2	***Identify*** and ***describe*** the components of system of forces acting on the rigid body														
	3	3													
3	***Apply*** the conditions of equilibrium to various practical problems involving different force system.														
	3	3													
4	***Choose*** appropriate theorems, principles or formulae to solve problems of mechanics.														
	3	3													
5	***Solve*** problems involving rigid bodies, applying the properties of distributed areas and masses														
	3	3													

JUSTIFICATION FOR CO-PO MAPPING:

CO	PO	MAPPING	JUSTIFICATION
CO1	PO1	2	Principles and theorems related to rigid body mechanics are applied to solve engineering problems
	PO2	2	Principles and theorems related to rigid body mechanics are usedto identify, formulate, and analyze complex engineering problems
CO2	PO1	3	Components of system of forces acting on the rigid body are used to solve engineering problems
	PO2	3	Components of system of forces acting on the rigid bodyused to identify, formulate, and analyze complex engineering problems
CO3	PO1	3	Conditions of equilibrium are important in solving engineering problems
	PO2	3	Conditions of equilibriumusedtoformulate and analyze complex engineering problems
CO4	PO1	3	Theorems, principles or formulae should be appropriately usedto solve engineering problems
	PO2	3	Theorems, principles or formulae should be appropriately usedtoformulate, review research literature, and analyze complex engineering problems
CO5	PO1	3	Knowledge in the properties of distributed areas and masses

CO	PO	MAPPING	JUSTIFICATION
			is necessary to solve engineering problems
	PO2	3	Properties of distributed areas and masses is usedto identify, formulate, and analyze complex engineering problems

GAPS IN THE SYLLABUS - TO MEET INDUSTRY/PROFESSION REQUIREMENTS:

Sl No	DESCRIPTION	PROPOSED ACTIONS	RELEVANT POs
1	Product of Inertia	NPTEL & Additional Study Materials Shared	PO1
2	Problems on theorem of Pappus Guldinus		
3	Problems on instantaneous centre		

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:

Sl No	DESCRIPTION
1	Principle of Virtual Work
2	Simple Pendulum

WEB SOURCE REFERENCES:

Sl No	DESCRIPTION
1	www.nptel.ac.in/courses/112/106/112106286/ https://nptel.ac.in/courses/122/104/122104014/ https://nptel.ac.in/courses/112/103/112103108/

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

CHALK & TALK	□	**STUD. ASSIGNMENT**	□	WEB RESOURCES	
LCD/SMART BOARDS		STUD. SEMINARS		ADD-ON COURSES	

ASSESSMENT METHODOLOGIES-DIRECT

ASSIGNMENTS	□	STUD. SEMINARS		**TESTS/MODEL EXAMS**	□	**UNIV. EXAMINATION**	□
STUD. LAB PRACTICES		STUD. VIVA		MINI/MAJOR PROJECTS		CERTIFICATIONS	
ADD-ON COURSES		OTHERS					

ASSESSMENT METHODOLOGIES-INDIRECT

ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	□	**STUDENT FEEDBACK ON FACULTY (TWICE)**	□
ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS		OTHERS	

Prepared by
Dr Indu Geevar

Approved by
Prof. Vincent K. John

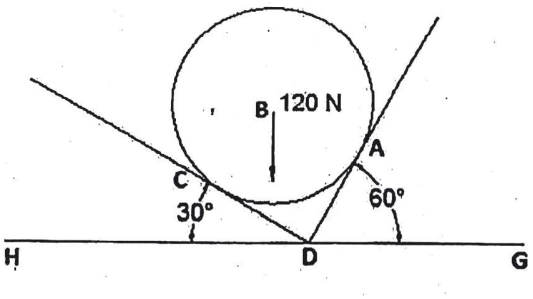
COURSE PLAN

HOUR	MODULE	TOPICS PLANNED
HOUR 1	1	Introduction to engineering mechanics – introduction on statics and dynamics – Basic principles of statics
HOUR 2		Parallelogram law, equilibrium law – Superposition and transmissibility, law of action and reaction (review the topics)
HOUR 3		Free body diagrams. Degree of freedom – types of supports and nature of reactions – exercises for free body diagram preparation
HOUR 4		Composition and resolution of forces, resultant and equilibrium equations (review the topics) – numerical exercises for illustration.
HOUR 5		numerical exercises for illustration
HOUR 6		Concurrent coplanar forces - analysis of concurrent forces – methods of projections – illustrative numerical exercise – teacher assisted problem solving.
HOUR 7		Analysis of concurrent forces – methods of moment – Varignon's Theorem of Moments – illustrative numerical exercise– teacher assisted problem solving.
HOUR 8		Analysis of concurrent force systems – extended problem solving – Session I.
HOUR 9		Analysis of concurrent force systems – extended problem solving – Session II – learning review quiz.
HOUR 10		Analysis of concurrent force systems – extended problem solving – Session III.
HOUR 11		Analysis of concurrent force systems – extended problem solving – Session IV.
HOUR 12	2	Friction – sliding friction - Coulomb's laws of friction – analysis of single bodies
HOUR 13		Illustrative examples on wedges and ladder-teacher assisted problem solving tutorials using problems from wedges and ladder.
HOUR 14		Problems on friction – analysis of connected bodies. Illustrativenumerical exercise– teacher assisted problem solving.
HOUR 15		Problems on friction – extended problem solving
HOUR 16		Parallel coplanar forces – couple – resultant of parallel forces – centre of parallel forces
HOUR 17		Equilibrium of parallel forces – Simple beam subject to concentrated vertical loads.
HOUR 18		General coplanar force system – resultant and equilibrium equations – illustrative examples – teacher assisted problem solving.
HOUR 19		General coplanar force system – resultant and equilibrium equations – illustrative example

HOUR	MODULE	TOPICS PLANNED
HOUR 20		General coplanar force system – Extended problem solving – Quiz to evaluate learning level.
HOUR 21	3	Centroid of simple and regular geometrical shapes – centroid of figures in combination –
HOUR 22		composite areas – examples for illustration
HOUR 23		Moment of inertia – parallel axis theorem –examples for illustration – problems for practice
HOUR 24		Moment of inertia – perpendicular axis theorem – example for illustration to be given as hand out and discussion on the solved example.
HOUR 25		Moment of inertia – perpendicular axis theorem – example for illustration to be given as hand out and discussion on the solved example.
HOUR 26		Solutions to practice problems – problems related to centroid and moment of inertia – problems for practice
HOUR 27		Polar moment of inertia, Radius of gyration. Mass moment of inertia of ring, cylinder and uniform disc. Theorem of PappusGuldinus– Demonstration
HOUR 28		Theorem of Pappus Guldinus - Demonstration
HOUR 29		Introduction to forces in space – vectorial representation of forces, moments and couples – simple problems to illustrate vector representations of forces, moments and couples to be done in class.
HOUR 30		Solution to practice problems – resultant and equilibrium equations for concurrent forces in space – concurrent forces in space
HOUR 31		2 simple problems to illustrate the application of resultant and equilibrium equations for concurrent forces in space.
HOUR 32	4	Introduction to dynamics – review of rectilinear translation – equations of kinematics – problems to review the concepts – additional problems involving extended application as exercises.
HOUR 33		Solutions to exercises with necessary explanation
HOUR 34		Solutions to exercises with necessary explanation given as hand out – introduction to kinetics – equation of motion
HOUR 35		D'Alembert's principle – illustration of the concepts using one numerical exercise from motion on horizontal and inclined surfaces
HOUR 36		Motion of connected bodies - example for illustration to be given as hand out and discussion on the solved example – problems for practice to be done by self. .
HOUR		Motion of connected bodies-extended problem

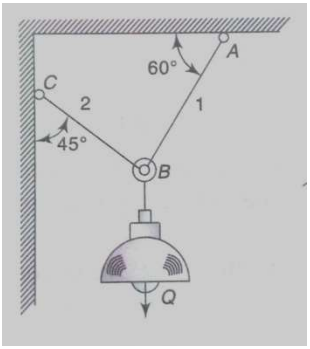
HOUR	MODULE	TOPICS PLANNED
37		solving.Curvilinear translation – Review of kinematics – projectile motion – simple problems to review the concepts
HOUR 38		Introduction to kinetics – equation of motion – illustration of the concepts using numerical exercises.
HOUR 39		Extended problem solving – rectilinear and curvilinear translation.
HOUR 40		Concepts on Impulse momentum equation and work energy equation (rectilinear translation – discussions to bring out difference between elastic and inelastic collusions).
HOUR 41		Concepts on Moment of momentum and work energy equation (curvilinear translation)
HOUR 42	5	Rotation – kinematics of rotation – equation of motion for a rigid body rotating about a fixed axis – simple problems for illustration.
HOUR 43		Rotation under a constant moment – teacher assisted problem solving.
HOUR 44		Rotation under a constant moment – extended problem solving.
HOUR 45		Rotation under a constant moment – extended problem solving.
HOUR 46		Plane motion of rigid body – instantaneous centre of rotation (concept only).
HOUR 47		Introduction to harmonic oscillation –free vibrations – simple harmonic motion – differential equation and solution.
HOUR 48		Degree of freedom – examples of single degree of freedom (SDOF) systems – Idealisation of mechanical systems as spring-mass systems (concept only).
HOUR 49		SDOF spring mass system –equation of motion – undamped free vibration response – concept of natural frequency.
HOUR 50		Free vibration response due to initial conditions.
HOUR 51		Simple problems on determination of natural frequency and free vibration response to test the understanding level.
HOUR 52		Free vibration analysis of SDOF spring-mass systems – Problem solving. Effect of damping on free vibration response (concept only).

1. A ball of weight 120N rests in a rightangled groove as shown in Figure. If all the surfaces are smooth, determine the reactions at all points of contact. (Co2, Co3)



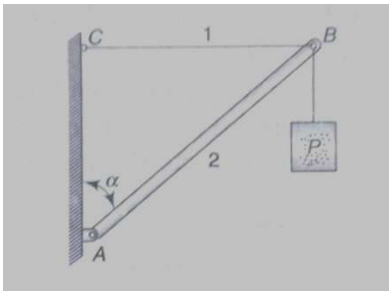
L3

2. An electric-light fixture of weight Q = 178 N is supported as shown in Figure. Determine the tensile forces S1 and S2 in the wires BA and BC if their angles of inclination are as shown.(Co1, Co2, Co3)



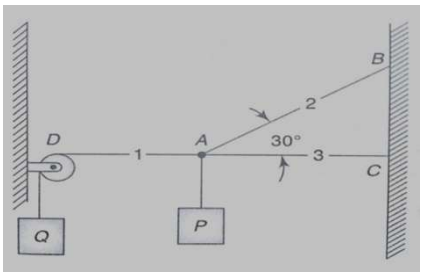
L3

3. What member forces does the vertical load P=100 N induce in the members of the system shown in Figure if angle α = 40 degrees. Neglect the weights of the members themselves and assume an ideal hinge at A and a perfectly flexible string BC. Is the member AB subjected to tension (pull) or compression (push)?(Co2, Co3)



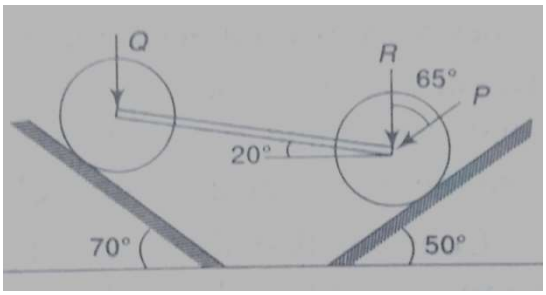
L3

4. In Figure, weights P and Q are suspended in a vertical plane by strings 1, 2, 3, arranged as shown. Find the tension induced in each string if P = 2225 N and Q = 4450 N.(Co2, Co3)



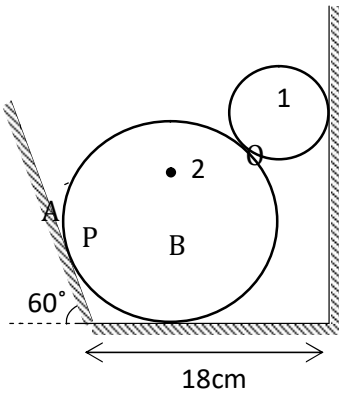
L4

5. Two cylinders of weights Q and R are interconnected by a bar of negligible weight hinged to each cylinder at its geometric center by ideal pins. Determine the magnitude of P applied at the center of cylinder R to keep the cylinders in equilibrium in the position shown in Fig. 4. The following numerical data are given: Q = 2000 N and R = 1000 N.(Co2, Co3)



L4

6. Two cylinders A and B rest as shown in Fig. 2. Cylinder A has a diameter of 10 cm and weight 15N. Cylinder B has a diameter of 18 cm and weight 45 N. Determine the reactions at all the points of contact. (Hint: Use congruency of triangles AOP and POB to find distance PB)(Co2, Co3)

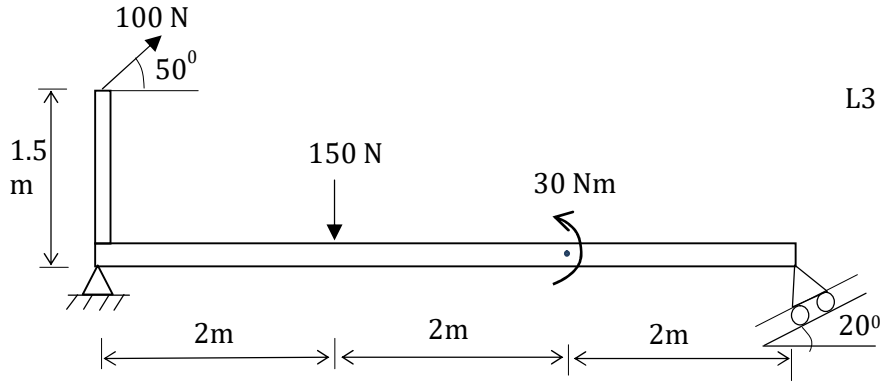


L4

ASSIGNMENT – 2

Module 2

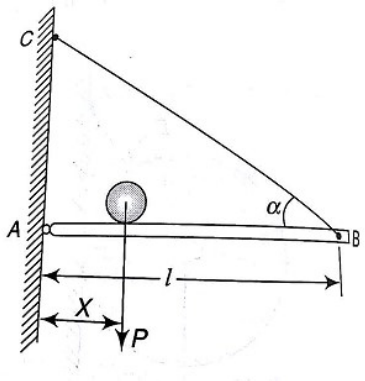
1. Find the reactions at supports of a simply supported beam shown in Fig. 3 (CO2, CO3)



L3

Fig. 3

2. A horizontal prismatic bar AB, of negligible weight and length 4m, is hinged to a vertical wall at A and supported at B by a tie rod BC that makes the angle 30 degrees with the horizontal. A weight P = 100 Nis at a distance of x = 1m from A. Determine the tensile force in the tie bar BC.(CO1, CO2, CO3)



L3

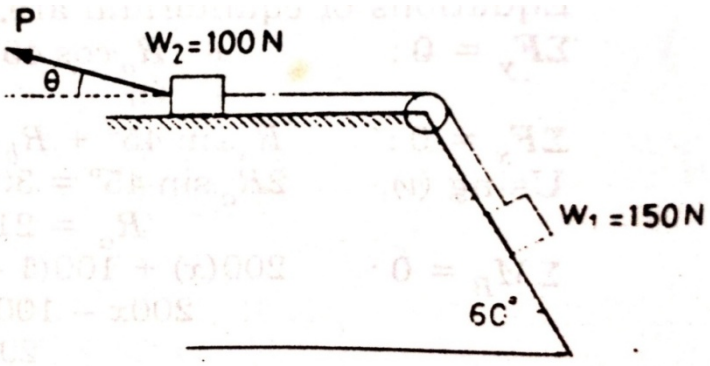
3. A uniform ladder AB of length l=20 m and weight W is supported by the horizontal floor at A and by a vertical wall at B. It makes an angle 45° with horizontal. If a man, whose weight is one-half that of the ladder, ascends the ladder, how much length x of the ladder he shall climb before the ladder slips. If a boy now stands on the end A of the ladder, what must be his least weight w so that the man may go on the top of the ladder? Assume coefficient of friction between the ladder and the wall as 1/3 and that between the ladder and floor as ½.(CO2, CO3)

L3

4. Two rectangular blocks of weight W1 = 150 N and W2 = 100 N are connected by a string and rest on an inclined on a horizontal surface. The coefficient of friction for all contact surfaces is μ = 0.2.

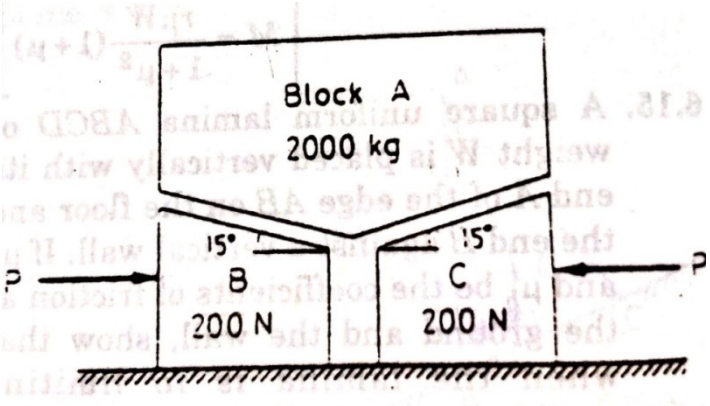
L4

Find the magnitude and direction of the least force *P* at which the motion of the blocks will impend.(CO2, CO3)



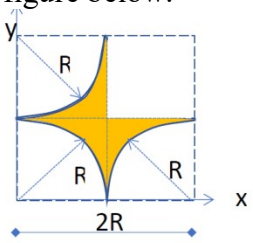
5. A block of mass 2000 kg is to be raised upwards by simultaneously pushing two identical wedges B and C under it. Each wedge weighs 200 N and the wedge angle is 15°. If the coefficient of friction at all surfaces in contact is 0.3, find the minimum value of forces P required for doing the job.(CO2, CO3)

L4



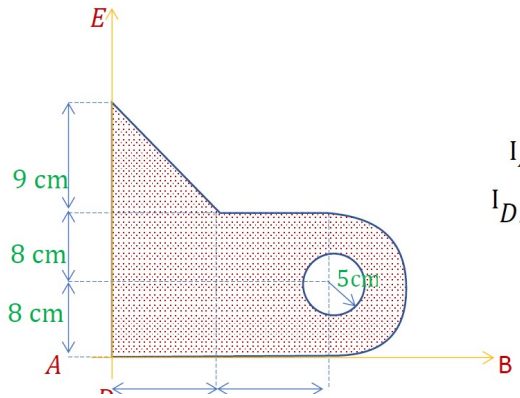
ASSIGNMENT 3

1. Find the centroid of any shape using experiment and verify with calculations.
2. Find the centroid of the figure below.



Ans. 0.925R, 0.925R

3. Find the moment of inertia about the axis DE and AB.

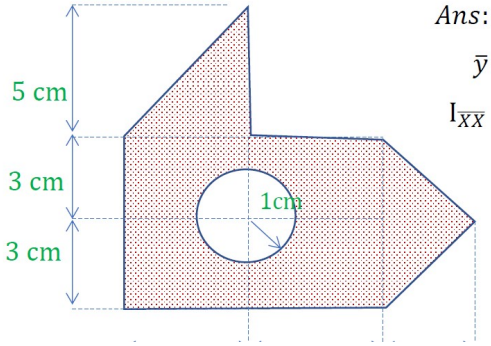


$Ans:$

$I_{AB} = 68155\ cm^4$

$I_{DE} = 187886\ cm^4$

4. Find the centroidal moment of inertia



$Ans: \bar{x} = 5.42\ cm,$

$\bar{y} = 3.74\ cm$

$I_{\overline{XX}} = 438.2\ cm^4,$

$I_{\overline{YY}} = 865.9\ c$

TUTORIAL QUESTIONS

MODULE I

7. Concurrent forces of 1, 3, 5, 7, 9 and 11 N are applied at the centre of regular hexagon acting towards its vertices as shown in Figure 1.1. Determine the magnitude and direction of the resultant.

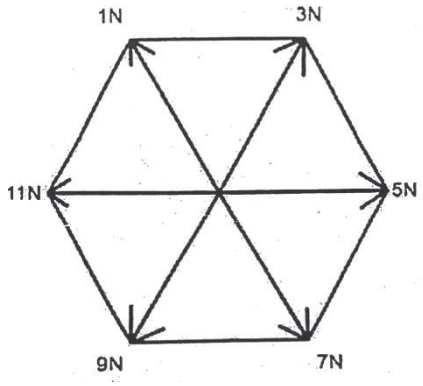


Figure 1.1

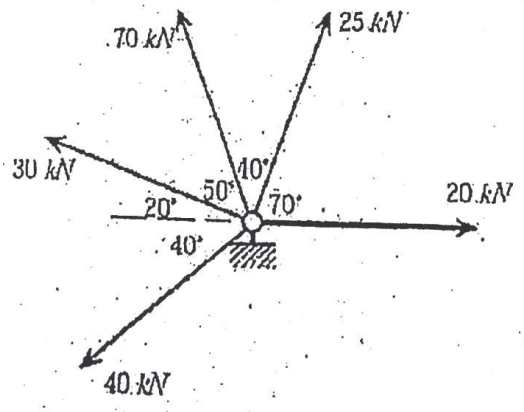


Figure 1.2

8. Determine the magnitude and direction of the resultant of the forces acting on the ring as shown in Figure 1.2
9. A ball of weight 120N rests in a right angled groove as shown in Figure 1.3. If all the surfaces are smooth, determine the reactions at all points of contact.

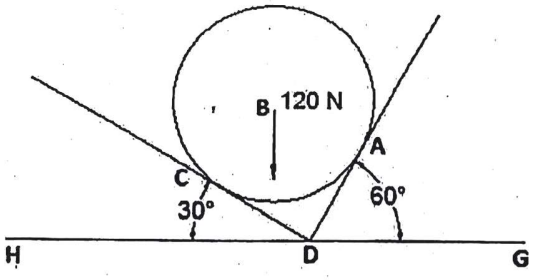


Figure 1.3

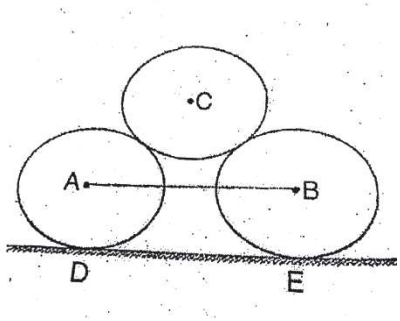


Figure 1.4

10. Two smooth circular cylinders each of weight 100 N and radius 15 cm are connected at their centres by a string AB of length 40 cm and rest upon a horizontal plane as shown in Figure 1.4. The cylinder above them has a weight of 200 N and a radius of 15 cm. Find the force in the string AB and the reactions at points D and E.
11. Block P=5kg and block Q of mass "m" kg are suspended through a cord which is in equilibrium as shown in Figure 1.5. Determine the mass of block Q.

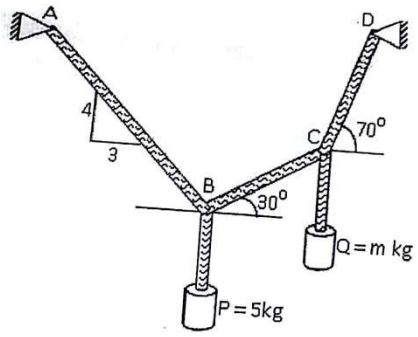


Figure 1.5

12. An electric-light fixture of weight Q = 178 N is supported as shown in Figure 1.6. Determine the tensile forces S1 and S2 in the wires BA and BC if their angles of inclination are as shown.

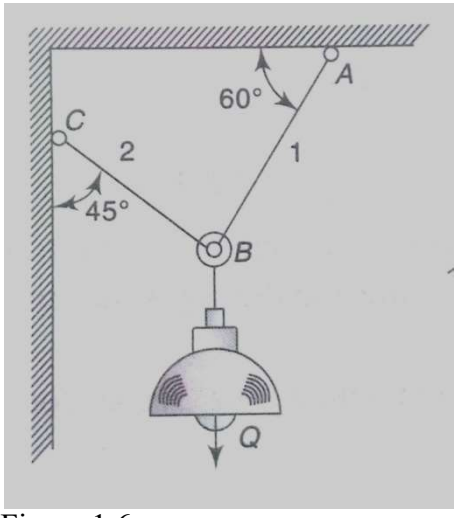


Figure 1.6

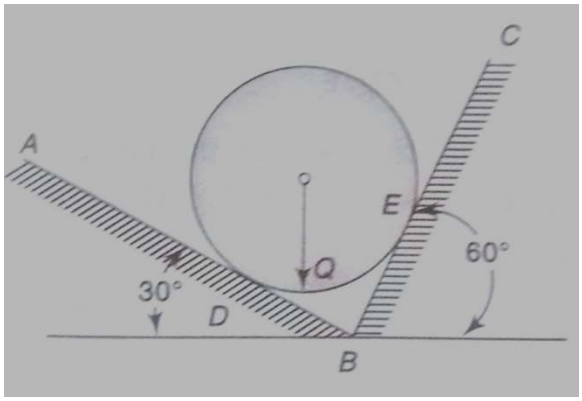


Figure 1.7

13. A ball of weight Q = 53.4 N rests in a right-angled trough as shown in Figure 1.7. Determine the forces exerted on the sides of the trough at D and E if all surfaces are perfectly smooth.
14. A ball rests in a trough as shown in Figure 1.8 Determine the angle of tilt θ with the horizontal so that the reactive force at B will be one-third at A if all surfaces are perfectly smooth.

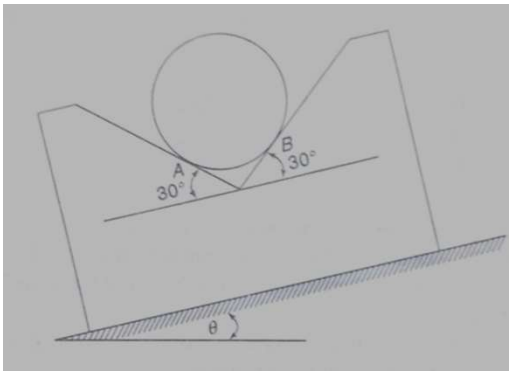


Figure 1.8

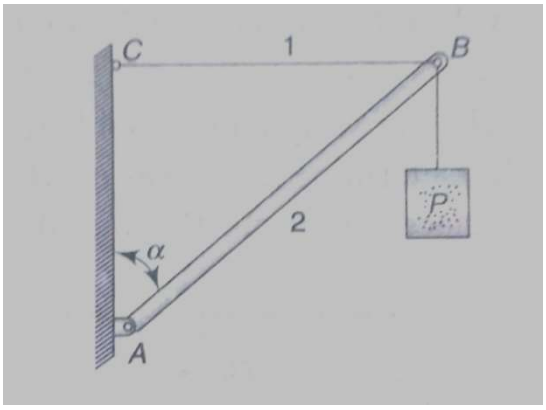


Figure 1.9

15. What axial forces does the vertical load P induce in the members of the system shown in Figure 1.9. Neglect the weights of the members themselves and assume an ideal hinge at A and a perfectly flexible string BC.
16. A right circular roller of weight W rests on a smooth horizontal plane and is held in position by an inclined bar AC as shown in Figure 1.10. Find the tension S in the bar AC and the vertical reaction Rb at B if there is also a horizontal force P acting at.

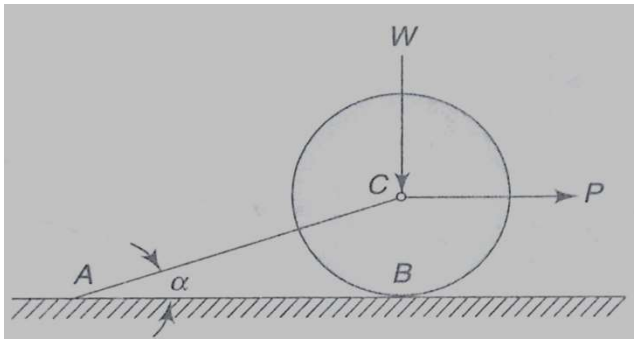


Figure 1.10

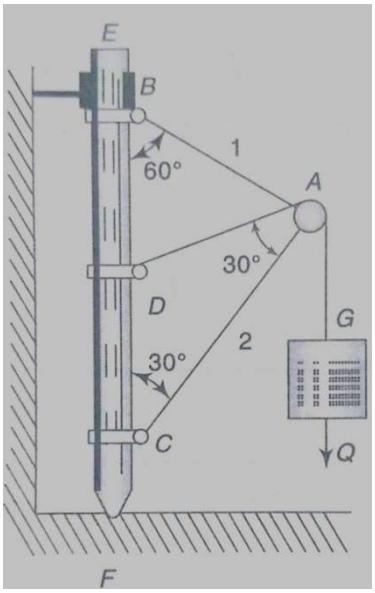


Figure 1.11

17. A pulley A is supported by two bars AB and AC which are hinged at points B and C to a vertical mast EF (Figure 1.11). Over the pulley hangs a flexible cable DG which is fastened to the mast at D and carries at the other end G a load Q = 20 kN. Neglecting friction in the pulley, determine the forces produced in the bars AB and AC. The angles between the various members are shown in the figure.
18. Two smooth circular cylinders, each of weight W = 445 N and radius r = 152 mm, are connected at their centers by a string AB of length l = 406 mm and rest upon a horizontal plane, supporting above them a third cylinder of weight Q = 890 N and radius r = 152 mm (Figure 1.12). Find the forces S in the string and the pressures produced on the floor at the points of contact D and E

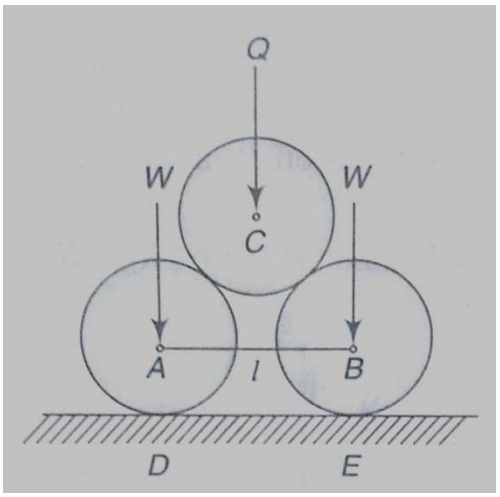


Figure 1.12

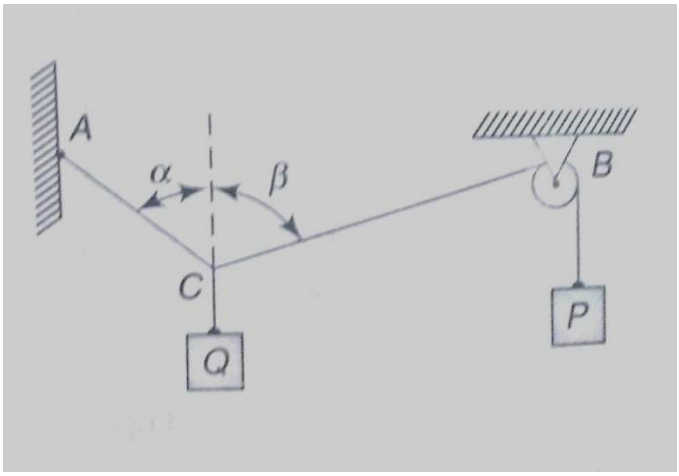


Figure 1.13

19. A weight Q is suspended from a small ring C, supported by two cords AC and BC (Figure 1.13) The cord AC is fastened at A while the cord BC passes over a frictionless pulley at B and carries the weight P as shown. If P = Q and α = 500, find the value of the angle β.
20. A force P is applied at point C as shown in (Figure 1.14). Determine the value of angle α for which the larger of the string tension is as small as possible and the corresponding values of tension in the strings 1 and 2.

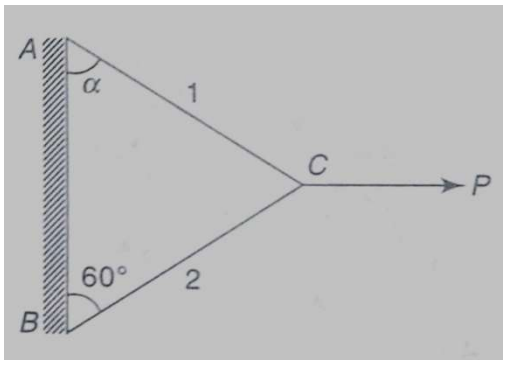


Figure 1.14

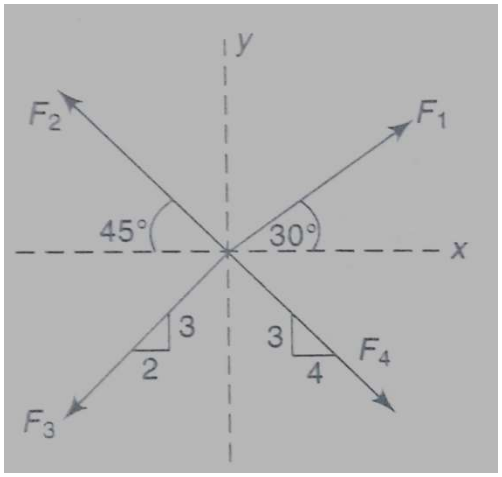


Figure 1.15

21. Using the method of projections, find the magnitude and direction of the resultant R of the four concurrent forces shown in Figure 1.15 and having the magnitudes F1 = 1500 N, F2 = 2000 N, F3 = 3500 N and F4 = 1000 N.
22. Forces of 2, 3, 4, 5 and 6 kN are acting at one of the angular points of a regular hexagon towards the other angular points taken in order. Find the resultant of the system of forces.
23. In Figure 1.16, weights P and Q are suspended in a vertical plane by strings 1, 2, 3, arranged as shown. Find the tension induced in each string if P = 2225 N and Q = 4450 N.

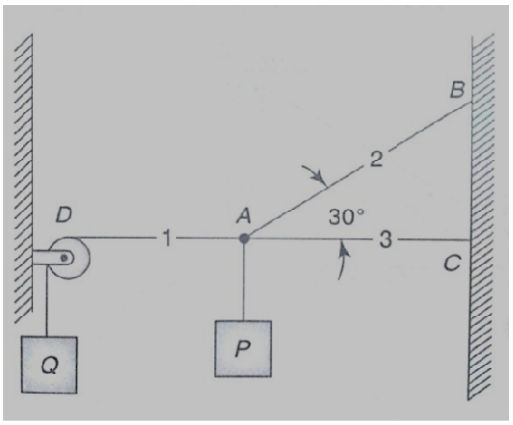


Figure 1.16

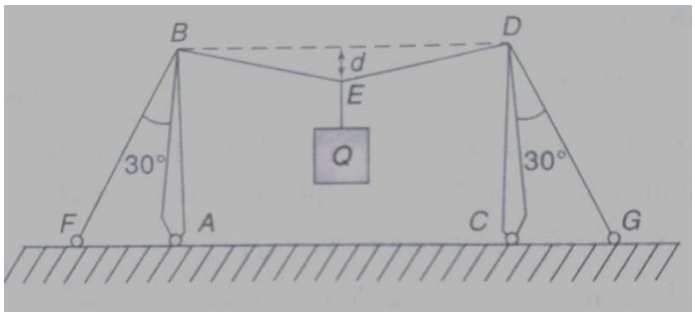


Figure 1.17

24. Two vertical masts AB and CD are guyed by the wires BF and DG, in the same vertical plane and connected by a cable BD of length l, from the middle point E of which is suspended a load Q (Figure 1.17). Find the tensile force S in each of the two guy wires BF and BG if the load Q = 445 N and the length l = 6.1 m and sag d = 0.305 m.
25. A ball of weight W rests upon a smooth horizontal plane and has attached to its centre two strings AB and AC which pass over frictionless pulleys at B and C and carry loads P and Q, respectively, as shown in Figure 1.18. If the string AB is horizontal, find the angle α that is string AC makes with horizontal when the ball is in a position of equilibrium. Also find the pressure R between the ball and the plane.

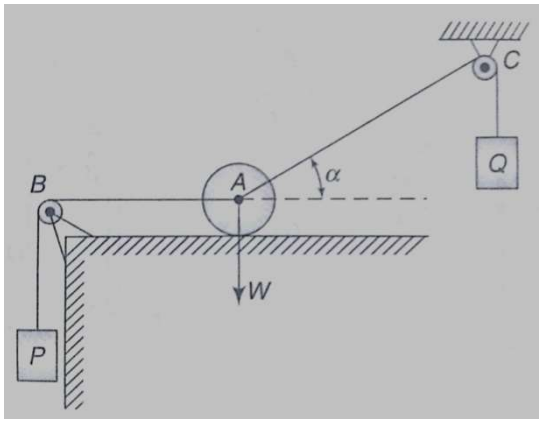


Figure 1.18

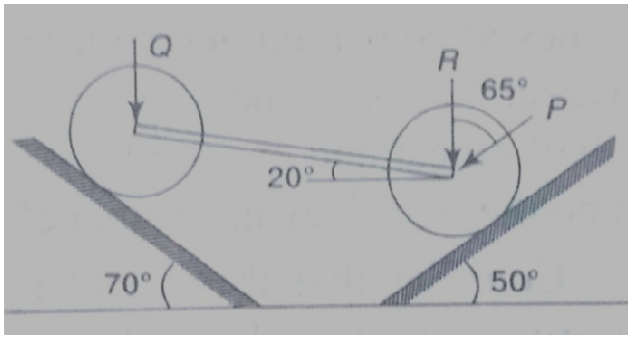


Figure 1.19

26. Two cylinders of weights Q and R are interconnected by a bar of negligible weight hinged to each cylinder at its geometric center by ideal pins. Determine the magnitude of P applied at the center of cylinder R to keep the cylinders in equilibrium in the position shown in Figure 1.19. The following numerical data are given: Q = 2000 N and R = 1000 N.
27. Determine the magnitude of a horizontal force P applied at the centre C of a roller of weight Q =4450 N and radius r = 380 mm which will be necessary to pull it over a 76 mm curb. Also find

what is the magnitude and the direction of the least force P min applied at C that will lift the roller over the curb in Figure 1.20.

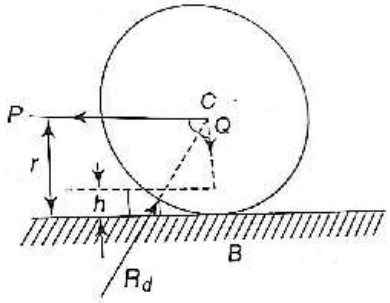


Figure 1.20

MODULE II

1. A system of parallel forces is acting on a rigid bar as shown in Figure 2.1. Reduce this system into
   a) a single force
   b) a force and a couple at A.

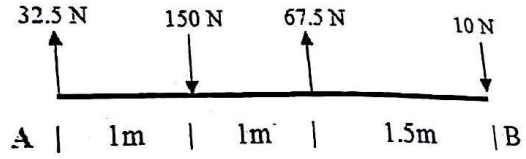


Figure 2.1

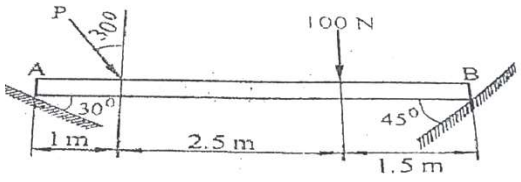


Figure 2.2

2. A 5m bar of negligible weight rests in a horizontal position on the smooth planes as shown in Figure 2.2. Determine the load P and the reactions at supports.
3. A beam ABCD as shown in Figure 2.3 is simply supported on a hinged support at A and on a roller support at D inclined at 450 with the vertical. Determine the horizontal and vertical components of reaction at support A. Also find the direction and magnitude of the resultant at A.

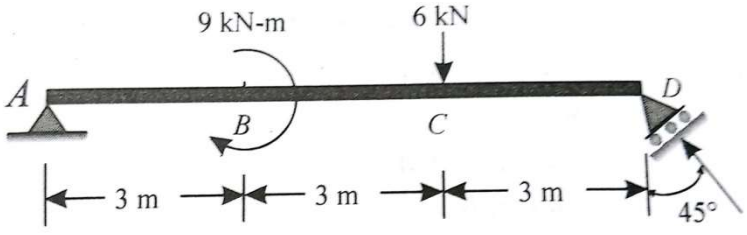


Figure 2.3

4. A block of weight W1= 900N rests on the horizontal surface and supports on top of it another block of weight W2 = 225N. The block W2 is attached to a vertical wall by an inclined string AB. Find the magnitude of the horizontal force P applied to the lower block that will be necessary for the slipping to impend as shown in Figure 2.4. The coefficient of friction for all contact surfaces is 0.3.

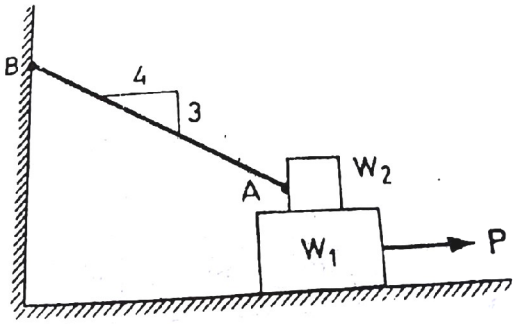


Figure 2.4

5. A uniform ladder of 4m length rests against a wall at an angle of 45° with the vertical. The coefficient of friction between the ladder and the wall is 0.4 and that between the ladder and the floor is 0.5. If a man whose weight is one half of that of ladder ascends it, how high will he be when the ladder slips.
6. Two identical blocks A and B of weight W are supported by a rigid bar inclined at 45° with the horizontal as shown in Figure 2.5. If both the blocks are in limiting equilibrium, find the coefficient of friction between the block and the wall assuming it to be the same.

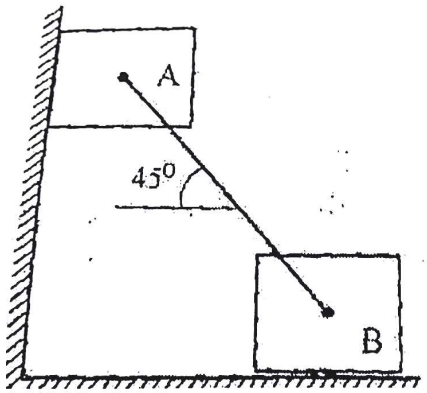


Figure 2.5

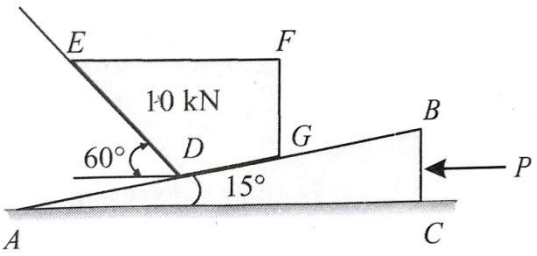


Figure 2.6

7. A block weighing 10 kN is to be raised against a surface which is inclined at 60° with the horizontal by means of 15° wedge as shown in Figure 2.6. Find the horizontal force (P) which will just start the block to move, if the coefficient of friction between all the surfaces of contact be 0.2.
8. A system of coplanar parallel forces acting on a rigid bar as shown in Figure 2.7. Reduce this force system to (a) a single force, (b) a single force and a couple at A and (c) a single force and a couple at B.

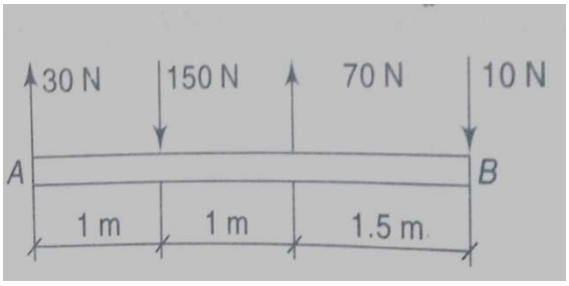


Figure 2.7

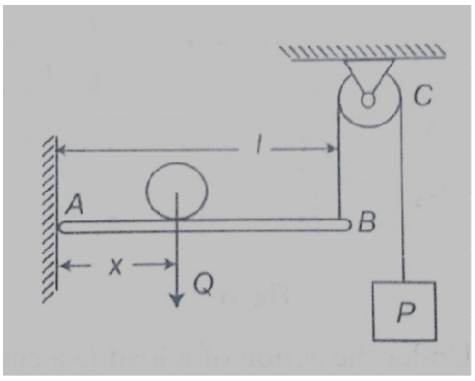


Figure 2.8

9. The beam AB in Figure 2.8 is hinged at A and supported at B by a vertical cord which passes over a frictionless pulley at C and carries at its end a load P as shown. Determine the distance x from A at which a load Q must be placed on the beam if it is to remain in equilibrium in a horizontal position. Neglect the weight of the beam.
10. A boat is suspended on two identical davits like ABC which is pivoted at A and supported by a guide at B (Figure 2.9). Determine the reactions RA and RB at the points of support A and B if the vertical load transmitted to each davit at C is 4272 N. Friction in the guide at B should be neglected.

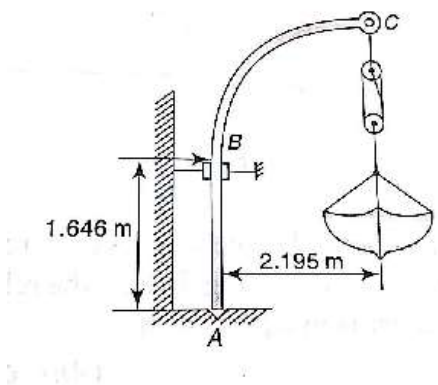


Figure 2.9

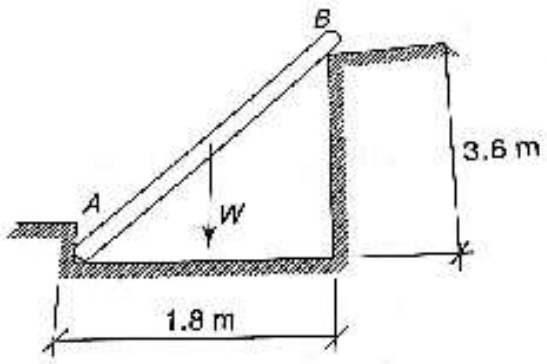


Figure 2.10

11. A man with weight 667.5 N stands on the middle rung of a 227.5 N ladder, as shown in Figure 2.10. Assuming the end B rests on the corner of a wall and a stop at A to prevent slipping, find the reactions at A and B.
12. A horizontal prismatic bar AB, of negligible weight and length l, is hinged to a vertical wall at A and supported at B by a tie rod BC that makes the angle α with the horizontal (Figure 2.11). A weight P can have any position along the bar as defined by the distance x from the wall. Determine the tensile force S in the tie bar.

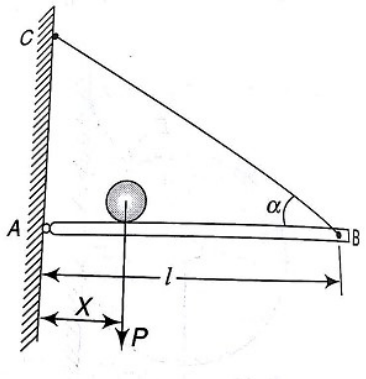


Figure 2.11

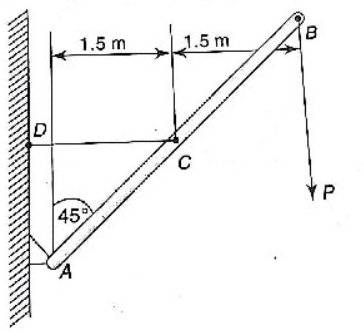


Figure 2.12

13. A weightless bar AB is supported in a vertical plane by a hinge at A and a tie bar DC, as shown in Figure 2.12. Determine the axial force S induced in the tie bar by the action of a vertical load P applied at B.
14. A bar AB hinged to the foundation at A and supported by a strut CD is subjected to a horizontal 50kN load at B, as shown in Figure 2.13. Find the tensile force S in the strut and the reaction R_A.

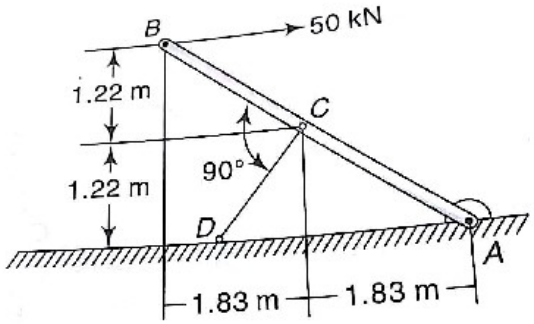


Figure 2.13

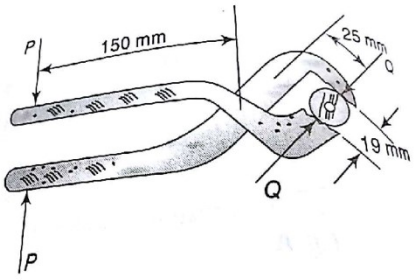


Figure 2.14

15. A pair of adjustable players is used for turning a piece of 19 mm pipe as shown in Figure 2.14. For the dimensions shown, what compressive forces Q are applied to the sides of the pipe when the hand grip is represented by applied collinear forces P?
16. Two blocks connected by a link AB are supported on two rough planes as shown in Figure 2.15. The coefficient of friction for block A on the horizontal plane is $\mu = 0.4$. The angle of friction for block A on the plane is $\emptyset = 15°$ .What is the smallest weight W of block A for which equilibrium of the system can exist?

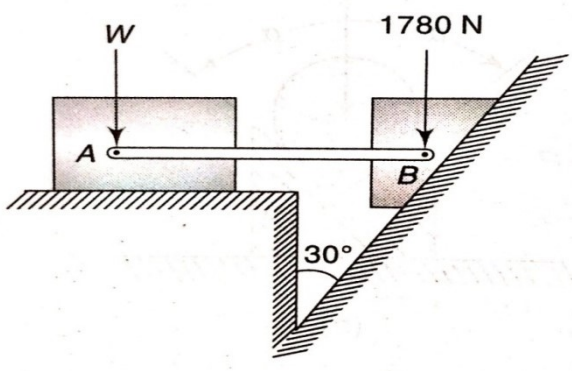


Figure 2.15

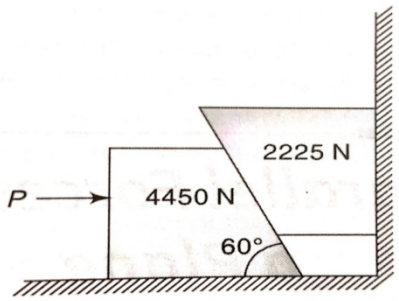


Figure 2.16

17. Referring to the Figure 2.16, the coefficients of friction are as follows: 0.25 at the floor, 0.30 at the wall, and 0.20 between blocks. Find the minimum value for a horizontal force P applied to the lower block that will hold the system in equilibrium.
18. Two rectangular blocks of weight W1 = 150 N and W2 = 100 N are connected by a string and rest on an inclined on a horizontal surface as shown in Figure 2.17. The coefficient of friction for all contiguous surfaces is $\mu = 0.2$. Find the magnitude and direction of the least force P at which the motion of the blocks will impend.

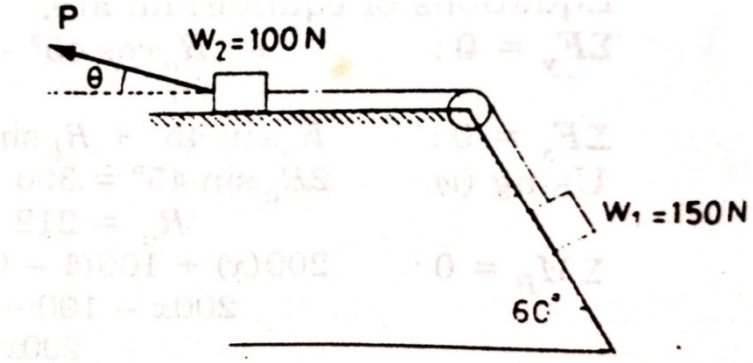


Figure 2.17

19. A uniform ladder AB of length l=20 m and weight W is supported by the horizontal floor at A and by a vertical wall at B. It makes an angle 45° with horizontal. If a man, whose weight is one-half that of the ladder, ascends the ladder, how much length x of the ladder he shall climb before the ladder slips. If a boy now stands on the end A of the ladder, what must be his least weight w so that the man may go on the top of the ladder? Assume coefficient of friction between the ladder and the wall as 1/3 and that between the ladder and floor as ½. (Figure 2.18)

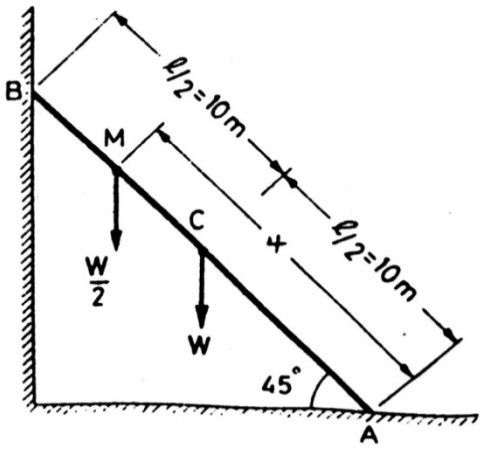


Figure 2.18

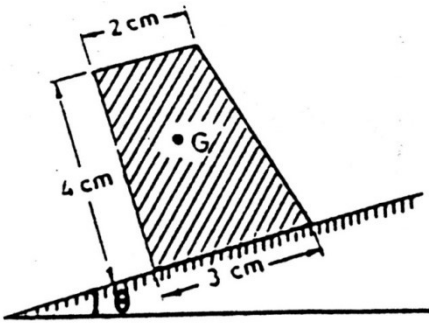


Figure 2.19

20. A block shown in Figure 2.19 weighing 1000 N is resting on a rough horizontal plane. The plane is gradually lifted to increase the angle θ. Determine whether sliding of block or overturning about A will occur first and the angle at which it occurs. Assume μ = 0.3.
21.

MODULE III

1. Locate the centroid of the of a plane uniform lamina shown in Figure 3.1.

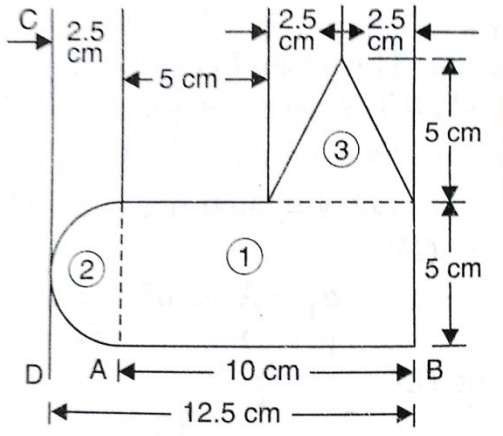


Figure 3.1

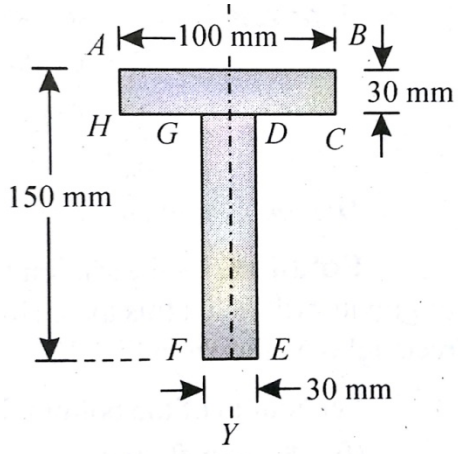


Figure 3.2

2. Locate the centroid of the T section shown in Figure 3.2.
3. Determine the coordinates of the centroid of the circular hole having 100 mm diameter to be cut in thin plate so that this point will be the centroid of the remaining shaded as shown in Figure 3.3

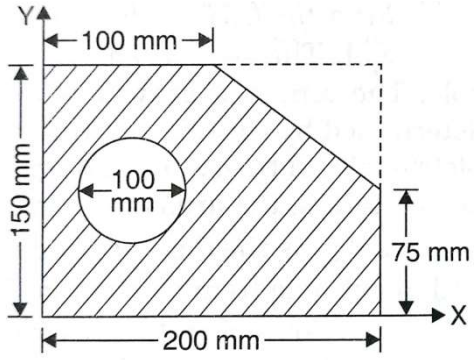


Figure 3.3

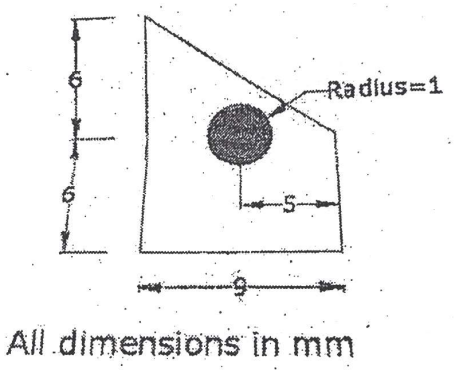


Figure 3.4

4. Determine the moment of inertia of the unshaded composite area with respect to its centroidal axes as shown in Figure 3.4.
5. Determine the moment of inertia of the shaded area with respect to both axes shown in Figure 3.5.

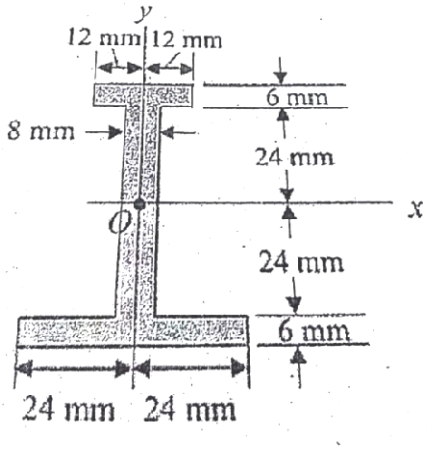


Figure 3.5

6. Locate the centroid of the shaded area shown in Figure 3.6

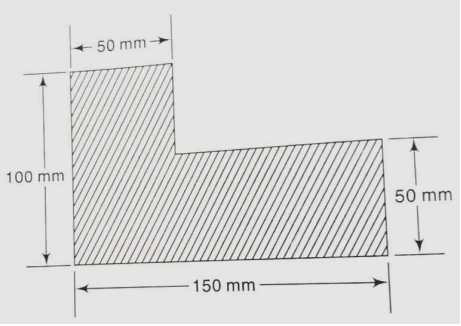


Figure 3.6

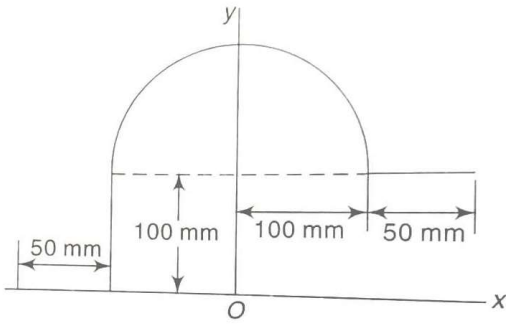


Figure 3.7

7. Referring to the Figure 3.7, locate the centroid of length of the mean centre line of the stirrup with the dimensions shown
8. Locate the centroid C of the shaded area obtained by cutting a semicircle of diameter ‘a’ from the quadrant of a circle of radius ‘a’ as shown in the Figure 3.8

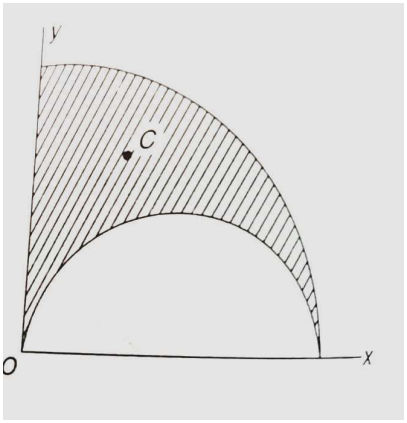


Figure 3.8

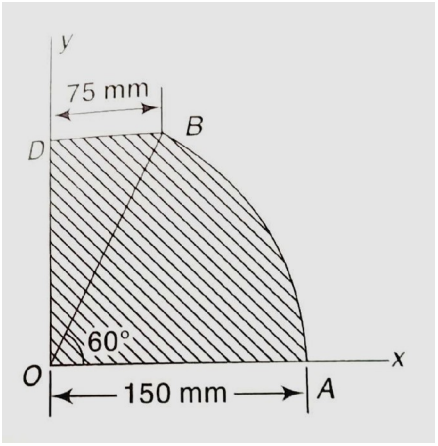


Figure 3.9

9. Locate the centroid of the shaded area OADB shown in Figure 3.9.
10. An isosceles triangle ADE is to be cut from a square ABCD of dimension a as shown in Figure 3.10. Find the altitude y of this triangle so that its vertex E will be the centroid of the remaining shaded area.

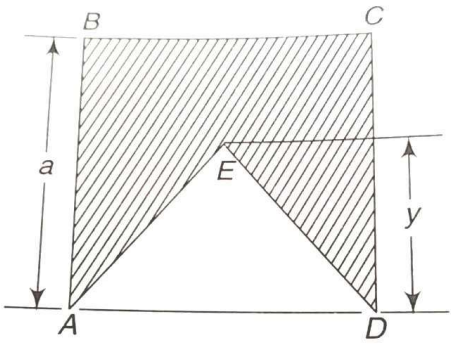


Figure 3.10

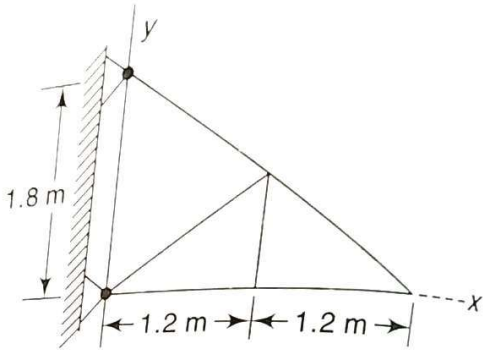


Figure 3.11

11. Locate the centre of gravity of the plane truss shown in Figure 3.11, if all the bars have the same weight per unit length.
12. A plane lamina ABCD is hung freely from point D. Find the angle made by DB with the vertical. (Figure 3.12)

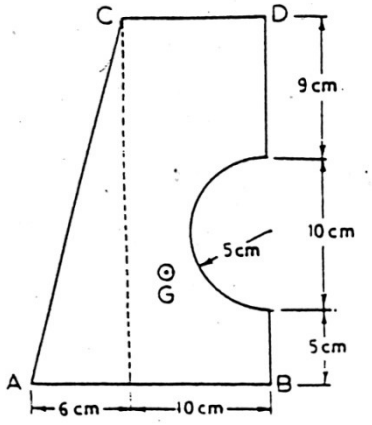


Figure 3.12

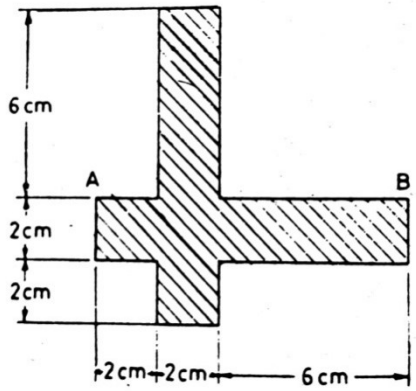


Figure 3.13

13. Determine the moment of inertia of the shaded area with respect to the centroidal axis parallel and perpendicular to the side AB as shown in Figure 3.13
14. Determine the moments of inertia of the cross section of an iron beam with respect to the centroidal axes parallel and perpendicular to the axis AB as shown in Figure 3.14.

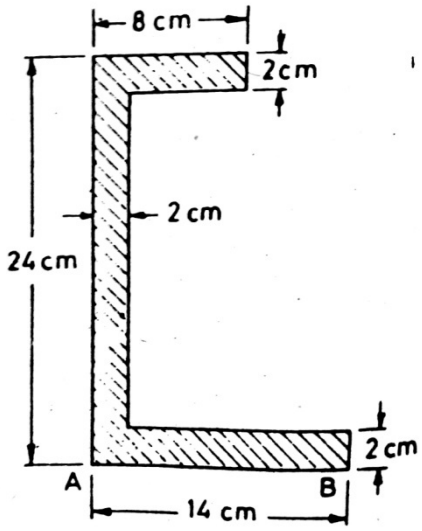


Figure 3.14

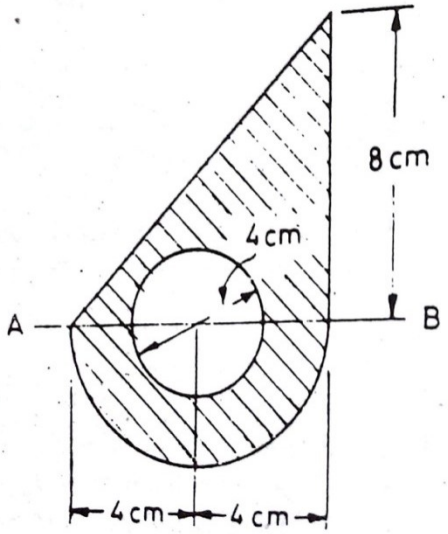


Figure 3.15

15. Determine the moment of inertia of the shaded area with respect to the centroidal axes parallel to AB as shown in Figure 3.15.

MODULE IV

1. An elevator has an upward acceleration of $1 m/s^2$, what pressure will be transmitted to the floor of the elevator by a man weighing 600N travelling in the elevator? What pressure will be transmitted if the elevator has a downward acceleration of $2 m/s^2$? Also find the upward acceleration of the elevator which could cause the man to exert a pressure of 1200N on the floor

2. A lift carries a weight of 100N and is moving with a uniform acceleration of 2.45m/s^2. Determine the tension in this cables supporting the lift, when
    a. Lift is moving upward
    b. Lift is moving downward
3. A lift has an upward acceleration of 1.225 m/s^2
    a. What force will a man weighing 500N exert on the floor of the lift?
    b. What force would he exert if the lift had an acceleration of 1.225m/s^2 downwards?
    c. What upward acceleration would cause his weight to exert a force of 600N on the floor?
4. An elevator of weight 5kN starts from rest and moves upward with constant acceleration, travelling a distance of 10m is 5s. Find the tensile force in the cable during this accelerated motion. Neglect friction.
5. An elevator weighs 2500N and is moving vertically downwards with a constant acceleration. Write the equation for the elevator cable tension. Starting from rest it travels a distance of 25m during an interval of 15seconds. Find the cable tension during this time. Neglect all other resistance to motion.
6. An elevator weighing 5000N is ascending with an acceleration of 3m/s^2. During this ascend, its operator whose weight is 700N is standing on the weighing pan placed on the floor. What is the weighing pan reading? What will be the total tension in the cables of elevator during this motion?

MODULE V

1. A helical spring with negligible mass extends 0.3mm under a mass of 1.5kg and is made to support a mass of 50kg. The spring and the mass system is displaced vertically through 13mm and released. Determine the frequency of natural vibration of system. Find also the velocity of the mass, when it is 6mm below its rest position.
2. Find the natural frequency of the system shown in Figure 5.1 below with k1=2000N/m, k2= 2500N/m, k3 = 3000N/m, m= 5kg

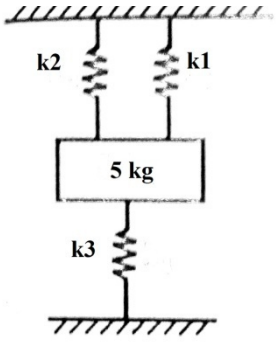


Figure 5.1

3. Find the natural frequency of the system shown in Figure 5.2. Here k = 5×10^3 N/m, m = 40kg

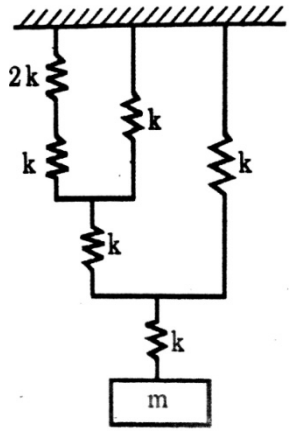


Figure 5.2

BASICS OF ELECTRICAL &ELECTRONICS ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: **AEI/AI&DS/EE//EC/AD**	DEGREE: **BTECH**
COURSE: **Basics of Electrical Engineering**	SEMESTER:2 CREDITS:**3**
COURSECODE:**1OO908/CO900F** REGULATION: **2020UG**	COURSE TYPE:CORE
COURSE AREA/DOMAIN:	CONTACT HOURS: **2+1 (Lecture hours/Week.)**
CORRESPONDING LAB COURSE CODE (IF ANY):**Yes**	LAB COURSE NAME: **Electrical Workshop**

SYLLABUS:

UNIT	DETAILS	HOURS
I	MODULE 1: Elementary Concepts of Electric Circuits Elementary concepts of DC electric circuits: Basic Terminology including voltage, current, power, resistance, emf; Resistances in series and parallel; Current and Voltage Division Rules; Capacitors & Inductors: V-I relations and energy stored. Ohms Law and Kirchhoff's laws-Problems; Star-delta conversion (resistive networks only-derivation not required)- problems. Analysis of DC electric circuits: Mesh current method - Matrix representation - Solution of network equations. Node voltage methods-matrix representation-solution of network equations by matrix methods. Numerical problems.	8
II	MODULE 2: Elementary Concepts of Magnetic circuits, Electromagnetic Induction and AC fundamentals Magnetic Circuits: Basic Terminology: MMF, field strength, flux density, reluctance - comparison between electric and magnetic circuits- Series and parallel magnetic circuits with composite materials, numerical problems. Electromagnetic Induction: Faraday's laws, problems, Lenz's law- statically induced and dynamically induced emfs - Self-inductance and mutual inductance, coefficient of coupling Alternating Current fundamentals: Generation of alternating voltages-Representation of sinusoidal waveforms: frequency, period, Average, RMS values and form factor of waveforms-Numerical Problems.	8
III	MODULE 3: AC Circuits AC Circuits: Phasor representation of sinusoidal quantities. Trignometric, Rectangular, Polar and complex forms. Analysis of simple AC circuits: Purely resistive, inductive & capacitive circuits; Inductive and capacitive reactance, concept of impedance. Average Power Power factor. Analysis of RL, RC and RLC series circuits-active, reactive and apparent power. Simple numerical problems. Three phase AC systems: Generation of three phase voltages; advantages of three phase systems, star and delta connections (balanced only), relation between line and phase voltages, line and phase currents- Numerical problems	8
TOTAL HOURS		24

TEXT/REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION

T	1. D P Kothari and I J Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.
T	2. D C Kulshreshtha, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.
T	3. ChinmoySaha, ArindhamHalder and DebaratiGanguly, Basic Electronics - Principles and Applications, Cambridge University Press, 2018.
T	4. M.S.Sukhija and T.K.Nagsarkar, Basic Electrical and Electronics Engineering, Oxford University Press, 2012.
T	5. Wayne Tomasi and Neil Storey, A Textbook On Basic Communication and Information Engineering, Pearson, 2010.
R	1. Del Toro V, “Electrical Engineering Fundamentals”, Pearson Education..
R	2. T. K. Nagsarkar, M. S. Sukhija, “Basic Electrical Engineering”, Oxford Higher Education.
R	3. Hayt W H, Kemmerly J E, and Durbin S M, “Engineering Circuit Analysis”, Tata McGraw-Hill
R	4. Hughes, “Electrical and Electronic Technology”, Pearson Education.
R	5. V. N. Mittle and Arvind Mittal, “Basic Electrical Engineering,” Second Edition, McGraw Hill.
R	6. Parker and Smith, “Problems in Electrical Engineering”, CBS Publishers and Distributors.
R	7. S. B. LalSeksena and KaustuvDasgupta, “Fundamentals of Electrical Engineering”, Cambridge University Press.
R	8. Anant Agarwal, Jeffrey Lang, Foundations of Analog and Digital Electronic Circuits, Morgan Kaufmann Publishers, 2005
R	9. Bernard Grob, Ba sic Electronics, McGraw Hill.
R	10. A. Bruce Carlson, Paul B. Crilly, Communication Systems: An Introduction to Signals and Noise in Electrical Communication, Tata McGraw Hill, 5th Edition.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
	11th and 12th Standard Physics and Mathematics	A thorough knowledge of 11th and 12th standard Physics and Mathematics	

COURSE OBJECTIVES:

1	To equip students of all branches of Engineering with an understanding of the fundamental principles of Electrical Engineering
2	To prepare students for learning advanced topics in Electrical Engineering

COURSE OUTCOMES:

Sl. No.	DESCRIPTION	BLOOMS’ TAXONOMY LEVEL
1	Students will be able to apply fundamental concepts and circuit laws to solve simple DC electric and magnetic circuits	Application[Level 3]
2	Students will be able to develop and solve models of magnetic circuits	Comprehension [Level 2]
3	Students will be able to apply the fundamental laws of electrical engineering to solve simple ac circuits in steady state	Application [Level 3]

MAPPING COURSE OUTCOMES (COs) – PROGRAM OUTCOMES (POs) AND COURSE OUTCOMES (COs) – PROGRAM SPECIFIC OUTCOMES (PSOs):

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C130.1	3	1										2		1	
C130.2	3	1										2		1	
C130.3	3	1										2		1	
EST 130	**3**	**1**										**2**			

JUSTIFATIONS FOR CO-PO MAPPING:

Mapping	L/H/M	Justification
C130.1-PO1	H	Students will be apply the knowledge of mathematics and science to solve various fundamental problems in simple DC circuits.
C130.1-PO2	L	Students will be able to formulate and analyze to find solution for circuit related problems in their higher semesters.
C130.1-PO12	M	Students will be able to recognize the need for life long learning in the broadest context of techonological change in the area of Electric circuits
C130.2-PO1	H	Students will be able to apply knowledge of magnetic circuits to solve engineering problems.
C130.2-PO2	L	Students will be able to analyze complex engineering problems using the first principles of magnetic circuits.
C130.2-PO12	M	Students will be able to do life long learning in the techonological change in the area of application of Magnetic circuits
C130.3-PO1	H	Students will be apply the knowledge of engineering fundamentals to solve complex problems in ac circuits.
C130.3-PO2	L	Students will be able to analyze complex engineering problems using the first principles of simple AC circuits.
C130.3-PO12	M	Students will be able to do life long learning in the techonological change in the area of application of AC circuits

GAPS IN THE SYLLABUS - TO MEET INDUSTRY/PROFESSION REQUIREMENTS:

Sl. No.	DESCRIPTION	PROPOSED ACTIONS	RELEVANCE WITH POs	RELEVANCE WITH PSOs
1	Introduction to Dependent Sources	Additional Class with Tutorials	1,2,12	2

PROPOSED ACTIONS: TOPICS BEYOND SYLLABUS/ASSIGNMENT/INDUSTRY VISIT/GUEST LECTURER/NPTEL ETC

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:

SI. No.	DESCRIPTION	PROPOSED ACTIONS	RELEVANCE WITH POs	RELEVANCE WITH PSOs
1	Basic principles of DC and AC Machines and their application	Additional Class	1,2,12	2

WEB SOURCE REFERENCES:

1	http://nptel.iitm.ac.in/

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☑CHALK & TALK	□ STUD. ASSIGNMENT	□ WEB RESOURCES	
☑ LCD/SMART BOARDS	□ STUD. SEMINARS	□ ADD-ONCOURSES	

ASSESSMENT METHODOLOGIES-DIRECT

☑ASSIGNMENTS	□ STUD. SEMINARS	☑ TESTS/MODEL EXAMS	☑ UNIV. EXAMINATION
□ STUD. LAB PRACTICES	□ STUD. VIVA	□ MINI/MAJOR PROJECTS	□ CERTIFICATIONS
□ ADD-ONCOURSES	□ OTHERS		

ASSESSMENT METHODOLOGIES-INDIRECT

☑ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	☑STUDENT FEEDBACK ON FACULTY (TWICE)
□ ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT.EXPERTS	□ OTHERS

Preparedby

Ms. Jayasri R. Nair

Ms. Prathibha P.K., Ms. Soniya Raju Fr. Mejo Paul, Ms. Renu George
Ms. Tintu Pious

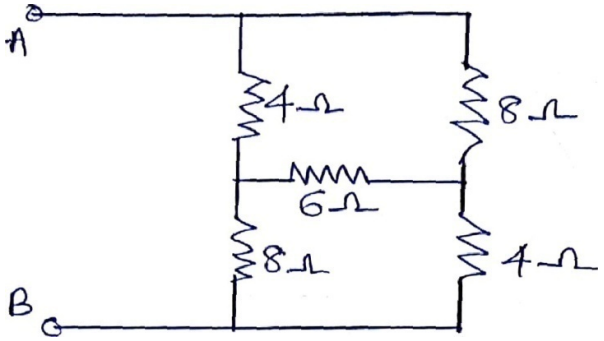
Approved by

HOD

Course Contents and Lecture Schedule

No	Topic	No of Lectures
1	**Module 1(8 hours)**	
1.1	Introduction to Electrical Engineering	1
1.2	Basic Terminology including voltage, current, power, resistance, emf; Resistances in series and parallel; Current and Voltage Division Rules;	1
1.3	Capacitors & Inductors: V-I relations and energy stored. Ohms Law and Kirchhoff's Laws-Problems; Star-delta conversion	2
1.4	Analysis of DC electric circuits: Mesh current method - Matrix representation - Solution of network equations.	1
1.5	Node voltage methods-matrix representation-solution of network equations by matrix methods. Numerical problems.	1
1.6	Analysis of DC electric circuits: Mesh current method - Matrix representation - Solution of network equations.	1
1.7	Numerical problems.	1
2	**Module 2(10 hours)**	
2.1	Basic Terminology: MMF, field strength, flux density, reluctance – comparison between electric and magnetic circuits	1
2.2	Series magnetic circuits with composite materials - numerical problems	1
2.3	Parallel magnetic circuits with composite materials - numerical problems	1
2.4	Faraday's laws, problems, Lenz's law	1
2.5	Statically induced and dynamically induced emfs	1
2.6	Self-inductance and mutual inductance, coefficient of coupling-numerical problems	2
2.7	Generation of alternating voltages-Representation of sinusoidal waveforms: frequency, period	1
2.8	Average values, RMS values and form factor of waveforms	2
3	**Module 3 (7 hours)**	
3.1	Phasor representation of sinusoidal quantities. Trigonometric, Rectangular, Polar and complex forms.	1
3.2	Analysis of simple AC circuits: Purely resistive, inductive & capacitive circuits	1
3.3	Inductive and capacitive reactance, concept of impedance, Average Power, Power factor.	1
3.4	Analysis of RL, RC and RLC series circuits-active, reactive and apparent power. Simple numerical problems.	1
3.5	Generation of three phase voltages; advantages of three phase systems, star connections	1
3.6	Generation of three phase voltages; advantages of three phase systems, delta connections	2

1)



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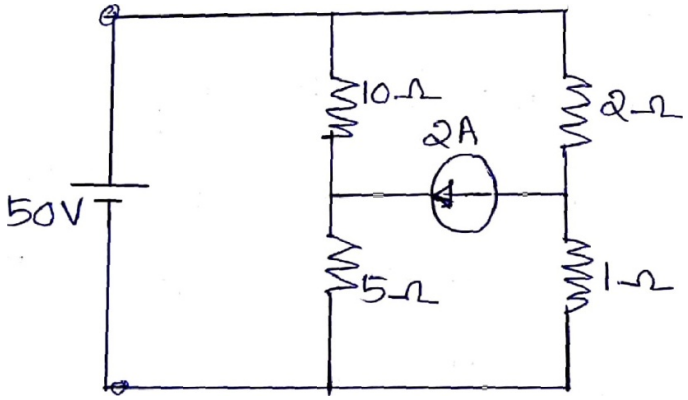

3)

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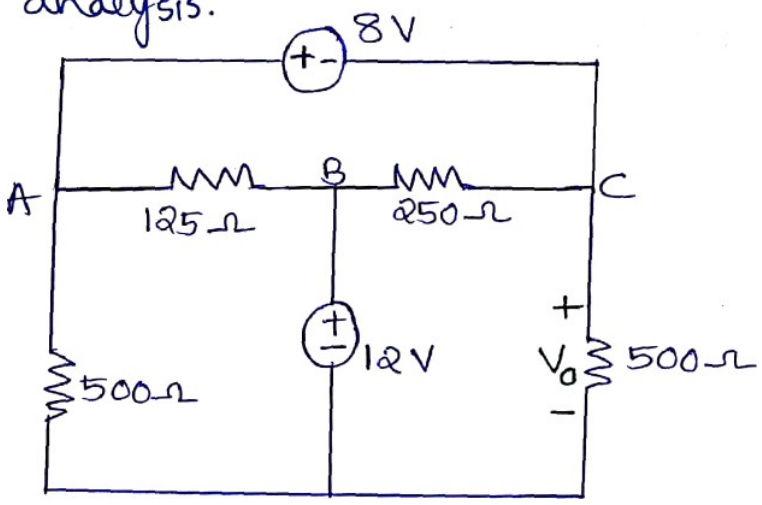
analysis.



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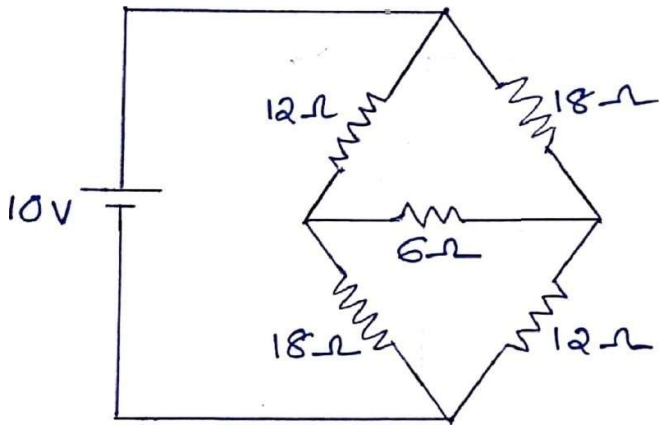
Star-



Answer-Key.

1) R_{AB} 5.6667Ω

¿;)g, xos , •i; 1=i.ss n , n2 ‹s s3e

$I_{5\Omega}$ =

V_0 V_C = 4V

.) Ω

Assignment -2

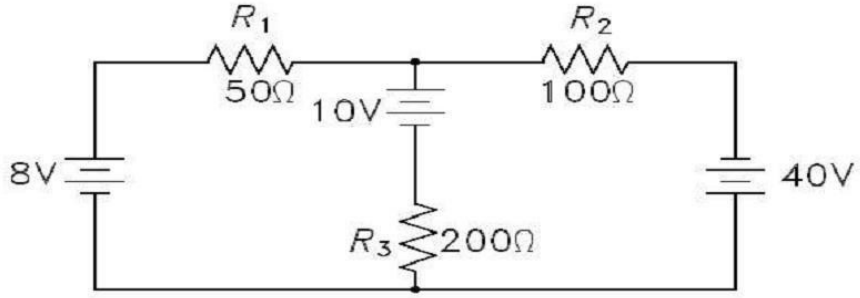
1. A100ohmresistorinserieswith120micro-Faradcapacitorisconnectedtoa 230V,50Hzsupply.Find1)CircuitImpedance2)Current3)Powerfactor 4) phase angle 5) Voltage across R 6) Voltage across C

2. A resistor of resistance 10 ohm, inductance 0.3 H and capacitance of 100 micro-Farad are connected across 230 V, 50 Hz mains. Calculate 1) Impedance 2) Current 3) Voltage across R,L,C 4) Power consumed 5) Power factor

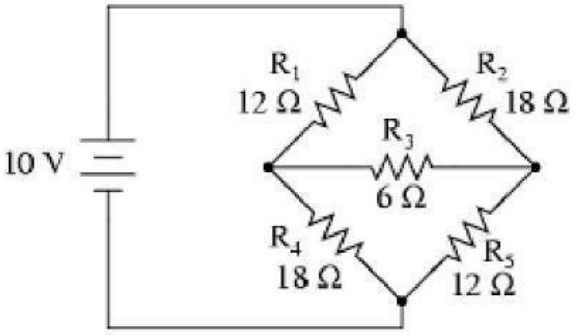
TUTORIAL QUESTIONS

Module 1

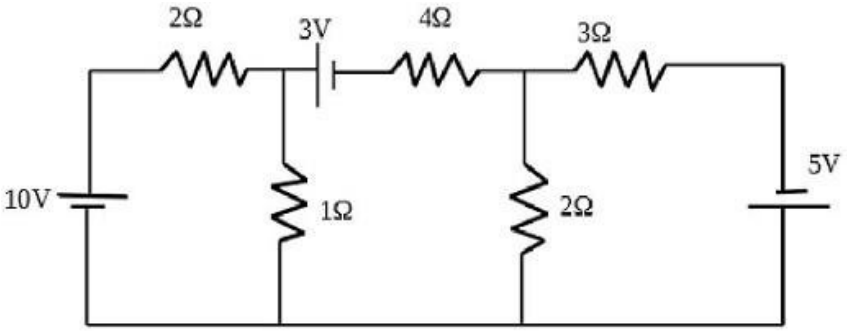
1. A resistor of 5 Ω is connected in parallel with a resistor of R1 Ω. This combination is connected in series with an unknown resistor of R2 Ω and the complete circuit is then connected to 50 V dc supply. Calculate the values of R1 and R2, if the power dissipated by the unknown resistor R1 is 150 W with 5A passing through it.
2. Determine the power dissipated in all the three resistors in the following figure using mesh current analysis.



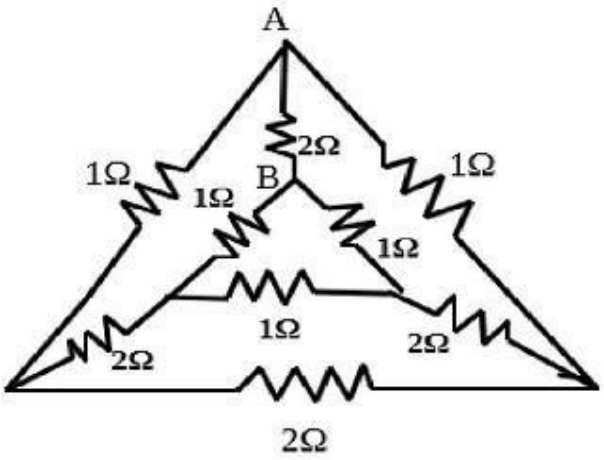
3.
4. Determine the current drawn from the supply using start delta conversion.



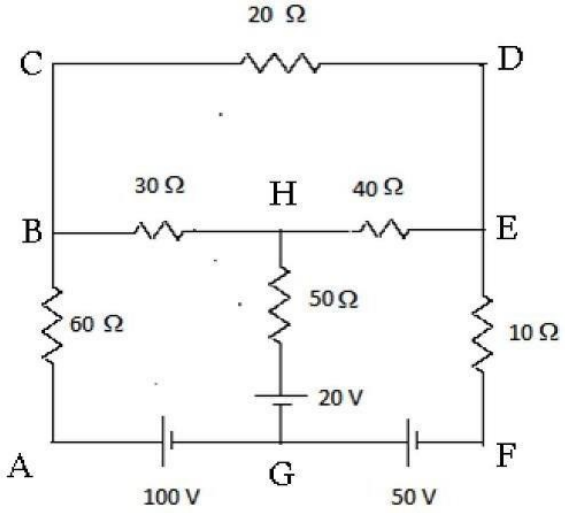
5. Distinguish between ideal voltage source and practical voltage source?
6. Differentiate between Constant voltage and constant current sources.
7. State and explain Kirchoff'slaws?
8. Calculate the power dissipated in 1 ohm resistor in the following figure using node voltage method.



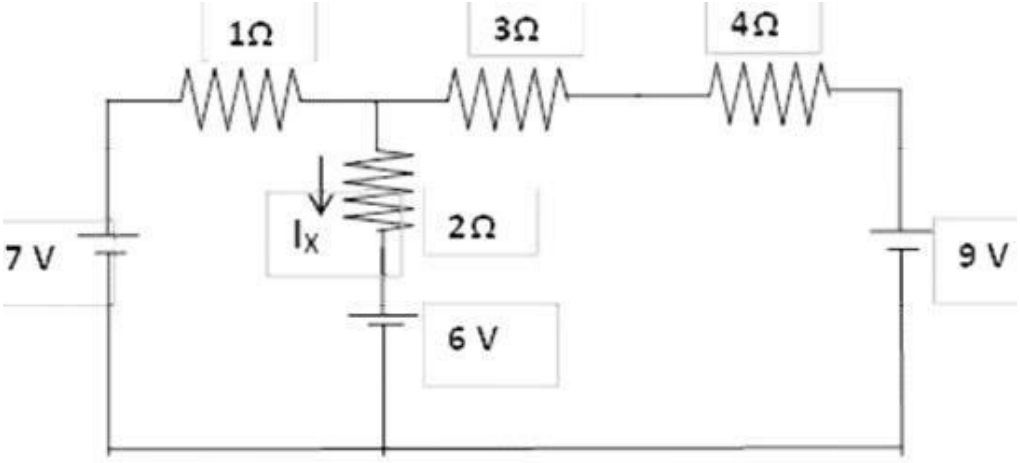
9. Using star delta conversion, calculate the effective resistance between A and B of the following figure



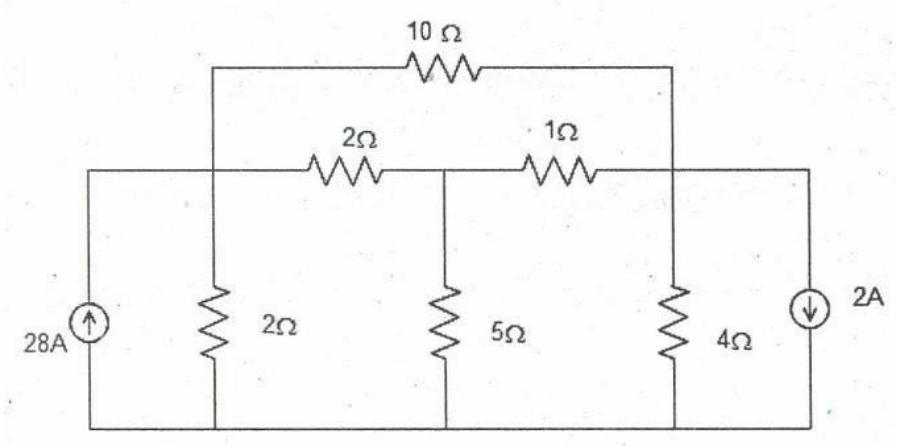
10. Three resistors R1= 30 ohm, R2 = 60 ohm, and R3 =10 ohm are connected in star. Obtain the equivalent delta circuit.
11. Three resistors R1=20 ohm, R2=90 ohm and R3=10 ohm are connected in star. Obtain the equivalent delta circuit.
12. Calculate the current in each branch of the following circuit using mesh analysis.(2)



13. Solve the following circuit using mesh analysis and find ix



14. With a sample circuit, explain the step-by-step procedure of nodal analysis.
15. What are constant voltage and constant current sources? Voltage and current sources are mutually transferable. Explain. Derive the relationship between line and phase voltage in a star connected system.
16. Use nodal analysis to term network equations and solve the nodal voltages using matrix method. Also calculate the current in different branches.



Module 2

1. A steel ring of 20 cm^2 cross-section having a mean diameter of 50 cm is wound uniformly with 500 turns. Flux density of 1.0 Wb/ m^2 is produced by 4000 ampere turns per metre. Calculate (i) the inductance (ii) the exciting current and (iii) the inductance when a gap of 1 mm long is cut in the ring, the flux density being 1.0 Wb/ m^2. Neglect leakage and fringing.
2. A conductor of length 0.5 m moves in a uniform magnetic field of density 1.1 T at a velocity of 30 m/s. Calculate the induced voltage in the conductor when the direction of motion is inclined at 60^0 to the direction of the field.
3. An iron ring of 15 cm mean diameter and 10 cm^2cross-section is wound with 200 turns of wire. For a flux density if 1 Wb/m^2 and a relative permeability of 500, calculate the exciting current, inductance and energy stored when there is 2mm air gap.
4. An iron ring of mean length 50cm has an air gap of 1 mm and a winding of 200 turns. If the relative permeability of iron is 300 when a current of lA flows through the coil, find flux density. Take permeability of air as $4\pi \times 10^{-7}$H/m
5. A steel ring of circular cross section of 1 cm in radius and having a mean circumference of 94.3 cm has an air gap of 1 mm long. It is uniformly wound with an exciting coil consisting of 600 turns and excited with a current of 2.5 A. Neglecting magnetic leakage calculate (i) m.m.f. (ii) Reluctance (iii) Magnetic flux (iv) Flux density (v) Relative permeability of steel. Assume that steel part takes about 40% of total ATs.
6. Compare electric and magnetic circuits?(3)
7. Derive an expression for energy stored in a magnetic circuit.(2)
8. Distinguish between self-inductance and mutual inductance
9. With suitable example, explain statically and dynamically induced emf

10. Define coefficient of coupling in a magnetic circuit.
11. Explain Faraday's laws of electromagnetic induction and Lenz'slaws.

Module 3

1. What are the advantages of three phase systems?
2. Derive an expression for three phase power in a star connected system.
3. Write the expression for three phase power in a delta connected system.
4. Explain the 2 wattmeter method of power measurement using the circuit arrangement.
5. Deduce the relationship between line and phase voltage in a star connected system.
6. Define and Derive the form factor of a pure sinusoidal waveform.
7. Explain the method for three phase power measurement in a star connected system using two wattmeter method with necessary diagrams.
8. Define peak factor and form factor of an alternating quantity.
9. Derive the rms and average value of a sinusoidal waveform.
10. Define and obtain the expression for power factor, active power, reactive power and apparent power of a series RLC circuit.
11. Prove that in a purely inductive circuit the current lags behind the applied voltage by 90 degree and the power consumed is zero.
12. A Series RC circuit takes a power of 7000W when connected to 200V, 50Hz supply. The voltage across the resistor is 130V.
13. Calculate: i)Resistance ii)Current iii) Power factor
    i. iv)Capacitance v)Impedance
    ii. vi) Equations for instantaneous values of voltage and current.
14. An alternating voltage of (80 + j60) V is applied to a circuit and the current flowing is (-4 + j10) A. Find (i) the impedance of the circuit, (b) the power consumed and (c) the phase angle.
15. A series RC circuit takes a power of 7000W when connected to 200V, 50 Hz supply. The voltage across the resistor is 130V. Calculate a.) Resistance b.) Power factor c.) Current d.) Capacitance e.) Impedance of the circuit.
16. A 10 ohm resistor and 300 mH inductor are connected in series to a 230V sinusoidal supply. The circuit current is 4A. Calculate the supply frequency and phase angle between current and voltage.
17. A 50Ω resistor in series with 120μF capacitor is connected to 230V 50Hz supply. Find i) impedance ii) current iii) power factor iv) Voltage across the resistor v) voltage across the capacitor.
18. A 10Ω resistor & 400μF capacitor are connected in series to a 240V sinusoidal ac supply. The circuit current is 5A. Calculate the supply frequency & phase angle between current & voltage.
19. A resistance of 10 ohm and an inductive reactance of 10 ohm are connected in series. Calculate the value of impedance and draw the impedance triangle
20. Three identical resistors of 20Ω each are connected in star to 415V, 50Hz three phase supply. Calculate (i) the total power consumed, (ii) total power consumed if they are connected in delta (iii) total power consumed, if one of the resistors is opened in both star connection and delta connections

21. Each phase of a delta connected load has a resistance of 25 Ω and an inductance of 0.15 H. The load is connected across a 400 V, 50 Hz, three phase supply. Determine the line current, power factor and power consumed
22. A balanced three phase star connected load is connected across a 400 V three phase ac supply. Power consumed by the load is measured using two wattmeter method. The readings of the two wattmeters are -500 W and 1500 W. Find the current drawn from the supply and the power factor of the load.
23. A balanced star connected load of (8+j6) ohm per phase is connected to a three phase 230 V supply. Find the line current, power factor and power consumed by the load.
24. Three inductive coils, each with a resistance of 22 ohm and an inductance of .05 H are connected in (i) in star and (ii) in delta, to a three phase 415 V, 50 Hz supply.
    Calculate
    for each of the above case (i) phase current and line current and (ii) total power absorbed.
25. A 3 phase 4 wire 400V system feeds three loads 10- j8Ω each connected in star. Calculate the line currents in each phase.
26. In the two wattmeter method of power measurement in a three phase circuit, the readings of the wattmeters are 4800W and - 400W. Find the total power and power factor of the load, percentage slip. Supply frequency is 50Hz.

BASICS OF ELECTRONICS ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: Artificial Intelligence and Data Science	DEGREE: B.Tech
COURSE: BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING	SEMESTER: 2 CREDITS: 4
COURSE CODE: 100908/CO900F REGULATION: 2020	COURSE TYPE: CORE
COURSE AREA/DOMAIN: ELECTRICAL AND ELECTRONICS ENGINEERING	CONTACT HOURS: 2 hours /Week.
CORRESPONDING LAB COURSE CODE (IF ANY):	LAB COURSE NAME: ELECTRICAL AND ELECTRONICS ENGINEERING WORKSHOP

SYLLABUS (PART-II):

UNIT	DETAILS	HOURS
1.	MODULE 4 Introduction to Semiconductor devices: Evolution of electronics – Vacuum tubes to nano electronics. Resistors, Capacitors and Inductors (constructional features not required): types, specifications. Standard values, color coding. PN Junction diode: Principle of operation, V-I characteristics, principle of avalanche breakdown. Bipolar Junction Transistors: PNP and NPN structures, Principle of operation, relation between current gains in CE, CB and CC, input and output characteristics of common emitter configuration.	10
2.	MODULE 5 Basic electronic circuits and instrumentation: Rectifiers and power supplies: Block diagram description of a dc power supply, Working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator. Amplifiers: Block diagram of Public Address system, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response, Concept of voltage divider biasing. Electronic Instrumentation: Block diagram of an electronic instrumentation system.	8
3.	MODULE 6 Introduction to Communication Systems: Evolution of communication systems – Telegraphy to 5G. Radio communication: principle of AM & FM, frequency bands used for various communication systems, block diagram of super heterodyne receiver, Principle of antenna – radiation from accelerated charge. Mobile communication: basic principles of cellular communications, principle and block diagram of GSM.	7
	TOTAL HOURS	N.A

TEXT/REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION
1.	Electronic Devices and Circuits/Bell. D. A/Oxford University Press
2.	Electronic Devices and Circuit Theory/Boylested, R.L Nashelsky/Pearson Education
3.	Basic Electronic Devices, Circuits and Fundamentals/Kal. S/PHI Learning
4.	Integrated Electronics/Millman J, Hawkins C and Parikhu C D/Tata McGraw Hill
5.	Electronics Circuit Analysis and Design/ Neeman D.A/ Tata McGraw Hill
6.	Microelectronic Circuits/Sedra A S and Smith K C/Oxford University Press

COURSE PRE-REQUISITES: NIL

COURSE OBJECTIVES:

1	To get basic idea about types, specification and common values of passive and active components.
2	To familiarize the working of diodes and transistors
3	To understand the working of rectifiers and amplifiers
4	To provide an overview of evolution of communication systems, and introduce the basic concepts in radio communication

COURSE OUTCOMES:

Sl. No.	DESCRIPTION
CO 1	Describe working of a voltage amplifier.
CO 2	Outline the principle of an electronic instrumentation system.
CO 3	Explain the principle of radio and cellular communication.

CO-PO-PSO MAPPING:

	Programme Outcomes (POs)												Programme-specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO 1	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO 2	2	-	-	-	-	-	-	-	-	-	-	2	1	-	-
CO 3	2	-	-	-	-	-	-	-	-	-	-	2	2	-	-
ESL 130															

JUSTIFICATION FOR CO-PO-PSO CORRELATION:

	PO1	PO12	PSO1
CO1	Apply the basic knowledge of passive and active components for understanding the working of a amplifier		Acquire basic knowledge of basic electronic components and its operation, needed for problem analysis
CO2	Acquire a basic knowledge of rectifiers, regulators and instrumentation	Motivate the students to further explore their knowledge to quickly adapt to technology changes	Basic understanding of voltage regulators & instrumentation helps in analyzing wide range of problems
CO 3	Apply the basic knowledge of radio communication in solving problems encountered	Motivate the students to further explore their knowledge to quickly adapt to technology changes	Knowledge of radio communication helps in development of algorithms suitable for the mobile, IoT applications

GAPS IN THE SYLLABUS - TO MEET INDUSTRY/PROFESSION REQUIREMENTS:

SNO	DESCRIPTION	PROPOSED ACTIONS
1	(Not identified)	(N. A.)

PROPOSED ACTIONS: TOPICS BEYOND SYLLABUS/ASSIGNMENT/INDUSTRY VISIT/GUEST LECTURER/NPTEL ETC

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:

1.	Hobby circuits to practice

WEB SOURCE REFERENCES:

1	*https://nptel.ac.in/courses/117103063/*
2	*http://opencircuitdesign.com/xcircuit/*
3	*www.electronics-tutorials.ws*
4	*https://www.pcbway.com/blog/Engineering_Technical/Analysis_of_the_Methods_of_PCB_Interconnection.html*
5	*https://www.electronics-notes.com/articles/electronic_components/*

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☐ CHALK & TALK	☐ ~~STUD. ASSIGNMENT~~	☐ WEB RESOURCES	
☐ LCD/SMART BOARDS	☐ STUD. SEMINARS	☐ ADD-ON COURSES	

ASSESSMENT METHODOLOGIES-DIRECT

☐ ~~ASSIGNMENTS~~	☐ ~~STUD. SEMINARS~~	☐ TESTS/MODEL EXAMS	☐ ~~UNIV. EXAMINATION~~
☐ STUD. LAB PRACTICES	☐ STUD. VIVA	☐ ~~MINI/MAJOR PROJECTS~~	☐ ~~CERTIFICATIONS~~
☐ ~~ADD ON COURSES~~	☐ ~~OTHERS~~		

ASSESSMENT METHODOLOGIES-INDIRECT

☐ ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	☐ STUDENT FEEDBACK ON FACULTY (TWICE)
☐ ~~ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS~~	☐ ~~OTHERS~~

Prepared by **Approved by**

Dr. Poornima S **(HOD)**

COURSE PLAN

Days	Topics
1.	**Module 4:** Introduction to Applications of Electronics
2.	Evolution of electronics – Vacuum tubes to nano electronics.
3.	Resistors, Capacitors and Inductors(constructional features not required): Types, specifications. Standard values, color coding.
4.	Resistors, Capacitors and Inductors: Standard values, color coding.
5.	PN Junction diode: Principle of operation, V-I characteristics, principle of avalanche breakdown.
6.	PN Junction diode: Principle of avalanche breakdown.
7.	Bipolar Junction Transistors: PNP and NPN structures.
8.	Bipolar Junction Transistors: Principle of operation.
9.	CE,CB, CC configurations, Relation between their current gains
10.	Bipolar Junction Transistors: Input and output characteristics of common emitter configuration.
11.	Circuit diagram and working of a RC coupled CE amplifier
12.	Concept of voltage divider biasing. Frequency response of CE amplifier.
13.	**Module 5:** Rectifiers and power supplies: Block diagram description of a dc power supply.
14.	Working of a half wave rectifier, need for a capacitor filter.
15.	Working of a full wave bridge rectifier, need for a capacitor filter.
16.	Working of simple zener voltage regulator - Line and load regulation.
17.	Amplifiers: Block diagram of Public Address system.
18.	Electronic Instrumentation: Block diagram of an electronic instrumentation system.
19.	**Module 6:** Evolution of communication systems – Telegraphy to 5G.
20.	Radio communication: Principle of AM with waveforms, equation, applications.
21.	Radio communication: Principle of FM with waveforms, equation, applications.
22.	Radio communication: Frequency bands used for various communication systems
23.	Radio communication: Block diagram of super heterodyne receiver
24.	Radio communication: Principle of antenna
25.	Radio communication: Antenna - radiation from accelerated charge
26.	Mobile communication: Basic principles of cellular communications
27.	Mobile communication: Principle and block diagram of GSM.

ASSIGNMENT QUESTIONS

Assignment -1

1. Find the resistance value, the minimum and maximum resistance values expected from that resistance?Give the specifications of a resistor as follows:
    a) Brown, Gray, Green, Silver
    b) Brown, Red, Silver, Gold
    c) Gray, White, Gray, Gold, Red
    d) Orange, Violet, Yellow, Red, Brown
2. Calculate the DC resistance of a diode for the following values of V_F and I_F:

    a) $V_F = 0.5$ V, $I_F = 50$ μA. b) $V_F = 0.55$ V, $I_F = 500$ μA.

Assignment 2

1. Explain the role of each component in the circuit of an RC coupled amplifier. (3)
2. How does voltage amplification occur in an RC coupled amplifier? (3)
3. Draw an explain the block diagram of an electronic instrumentation system. (4)

Assignment 3 (Submit before Sep 4, 2021)
Max marks: 5marks

Problems on Module 6

1) What are the merits of AM compared to FM (any 2)? The carrier amplitude of a given AM wave is 5V and the message signal amplitude is 3V. Find the modulation index.
2) Define modulation index in AM and compute the percentage of modulation, when the maximum amplitude is 10V and minimum is 6V.
3) A signal m(t) =5 cos (2pi 10^3t) frequency modulates a 1MHz carrier to produce a frequency deviation of 4kHz. Calculate i) modulation index of frequency modulation ii) frequency sensitivity kf in Hz/V.
4) The output signal from an AM modulator is: $u(t) = 5\cos(1800\pi t) + 20\cos(2000\pi t) + 5\cos(2200\pi t)$ a) Determine the modulating signal m(t) and the carrier c(t). b) Determine the modulation index. c) Determine the ratio of the power in the sidebands to the power in the carrier.

PROFESSIONAL COMMUNICATION

COURSE INFORMATION SHEET (2020 - 2021)

PROGRAMME: All programmes	**DEGREE: B.TECH**
COURSE: Professional Communication	**SEMESTER: II** **CREDITS: ---**
COURSE CODE: 100908/EN200E **REGULATION: 2019**	**COURSE TYPE: MANDATORY NON-CREDIT**
COURSE AREA/DOMAIN: HUMANITIES	**CONTACT HOURS: 4 hours/week – 2 L + 2P**

SYLLABUS:

UNIT	DETAILS
I	Use of language in communication: Significance of technical communication Vocabulary Development: technical vocabulary, vocabulary used in formal letters/emails and reports, sequence words, misspelled words, compound words, finding suitable synonyms, paraphrasing, verbal analogies. Language Development: subject-verb agreement, personal passive voice, numerical adjectives, embedded sentences, clauses, conditionals, reported speech, active/passive voice. Technology-based communication: Effective email messages, slide presentations, editing skills using software. Modern day research and study skills: search engines, repositories, forums such as Git Hub, Stack Exchange, OSS communities (MOOC, SWAYAM, NPTEL), and Quora; Plagiarism
II	Reading, Comprehension, and Summarizing: Reading styles, speed, valuation, critical reading, reading and comprehending shorter and longer technical articles from journals, newspapers, identifying the various transitions in a text, SQ3R method, PQRST method, speed reading. Comprehension: techniques, understanding textbooks, marking and underlining, Note-taking: recognizing non-verbal cues.
III	Oral Presentation: Voice modulation, tone, describing a process, Presentation Skills: Oral presentation and public speaking skills, business presentations, Preparation: organizing the material, self-Introduction, introducing the topic, answering questions, individual presentation practice, presenting visuals effectively. Debate and Group Discussions: introduction to Group Discussion (GD), differences between GD and debate; participating GD, understanding GD, brainstorming the topic, questioning and clarifying, GD strategies, activities to improve GD skills.
IV	Listening and Interview Skills Listening: Active and Passive listening, listening: for general content, to fill up information, intensive listening, for specific information, to answer, and to understand. Developing effective listening skills, barriers to effective listening, listening to longer technical talks, listening to classroom lectures, talks on engineering /technology, listening to documentaries and making notes, TED talks. Interview Skills: types of interviews, successful interviews, interview etiquette, dress code, body language, telephone/online (skype) interviews, one-to-one interview & panel interview, FAQs related to job interviews
V	Formal writing: Technical Writing: differences between technical and literary style. Letter Writing (formal, informal and semi-formal), Job applications, Minute preparation,

	CV preparation (differences between Bio-Data, CV and Resume), and Reports. Elements of style, Common Errors in Writing: describing a process, use of sequence words, Statements of Purpose, Instructions, Checklists. Analytical and issue-based Essays and Report Writing: basics of report writing; Referencing Style (IEEE Format), structure of a report; types of reports, references, bibliography.
LAB	Written: Letter writing, CV writing, Attending a meeting and Minute Preparation, Vocabulary Building
LAB	Spoken: Phonetics, MMFS (Multimedia Feedback System), Mirroring, Elevator Pitch, telephone etiquette, qualities of a good presentation with emphasis on body language and use of visual aids.
LAB	Listening: Exercises based on audio materials like radio and podcasts. Listening to Song. practice and exercises.
LAB	Reading: Speed Reading, Reading with the help of Audio Visual Aids, Reading Comprehension Skills
LAB	Mock interview and Debate/Group Discussion: concepts, types, Do's and don'ts- intensive practice

TEXT/REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION
R	*English for Engineers and Technologists (Combined edition, Vol. 1 and 2)*, Orient Blackswan 2010.
R	Meenakshi Raman and Sangeetha Sharma,"*Technical Communication: Principles and Practice"*, 2nd Edition, Oxford University Press, 2011
R	Stephen E. Lucas, *"The Art of Public Speaking"*, 10th Edition; McGraw Hill Education, 2012.
R	Ashraf Rizvi, *"Effective Technical Communication"*, 2nd Edition, McGraw Hill Education, 2017.
R	William Strunk Jr. & E.B. White, *"The Elements of Style"*, 4th Edition, Pearson, 1999.
R	David F. Beer and David McMurrey, *Guide to writing as an Engineer*, John Willey. New York, 2004.
R	Goodheart-Willcox, *"Professional Communication"*, First Edition , 2017.
R	*Training in Interpersonal Skills: Tips for Managing People at Work*, Pearson Education, India, 6th edition, 2015.
R	*The Ace of Soft Skills: Attitude, Communication and Etiquette for Success*, Pearson Education; 1edition, 2013.
R	Anand Ganguly, *"Success in Interview"*, RPH, 5th Edition, 2016.
R	Raman Sharma, *"Technical Communications"*, Oxford Publication, London, 2004.

COURSE PRE-REQUISITES:

1	A basic level ability to read, write and speak in English.

COURSE OBJECTIVES:

1	Students should have their vocabulary augmented and be able to understand the basic rules of grammar.

2	Students should be able to employ reading strategies to effectively read and understand works of literature and to critically analyse these texts.
3	Students should be able to create a presentation on a given topic and deliver it in front of an audience using the correct pronunciation and diction as well as take part in a group discussion with the same techniques.
4	Students should be able to list the different types of listening and speaking techniques and employ these in their regular communication.
5	Students should be able to adopt effective writing strategies used for technical as well as non-technical communication.

COURSE OUTCOMES:

NO	DESCRIPTION
CO1	Develop vocabulary and language skills relevant to engineering as a profession.
CO2	Analyze, interpret and effectively summarize a variety of textual content.
CO3	Create effective technical presentations.
CO4	Discuss a given technical/ non-technical topic in a group setting and arrive at generalizations/consensus.
CO5	Identify drawbacks in listening patterns and apply listening techniques for specific needs.
CO6	Create professional and technical documents that are clear and adhering to all the necessary conventions

MAPPING OF COURSE OUTCOMES TO PROGRAMME OUTCOMES:

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

JUSTIFICATION:

CO	PO	JUSTIFICATION
CO 1	PO6	Knowledge and mastery of life skills will enable the student to effectively function at both the professional and personal levels.
	PO8	The skills of analysis, logical reasoning and problem-solving will enable the student to make the right decision when faced with moral dilemmas in personal and professional life.

	PO9	Developing an awareness of the self, learning to work in groups and teams, and learning about leadership enables the student to effectively carry out his responsibilities at both the individual and team level.
	PO10	Developing an understanding of oneself, and learning the tools of effective communication enables the student to become a successful communicator.
	PO11	Learning about problem-solving and decision making, and individual and team work enables the student to become efficient leaders and managers.
	PO12	Understanding the importance of engaging in continuous personal and professional development motivates the student to become a lifelong learner.
CO 2	PO9	Gaining an insight into the self and learning to cope with emotions and stress will help the student to be more effective at the individual level and as a team player.
	PO12	Understanding one's priorities and learning to set clear goals will motivate the student to engage in lifelong learning.
CO 3	PO6	Learning about and practising effective communication strategies will make the student successful in interacting with others in both professional and personal life.
	PO9	Effective communication strategies will help the student to be more successful at the individual level and in groups: as a leader and as a team player.
	PO10	Mastering the theoretical and practical aspects of communication will lay the foundation for effective personal and professional communication.
CO 4	PO10	Taking part in group discussions and developing the skills of listening and responding to others' opinions helps the student to learn the rudiments of effective group communication.
	PO12	By engaging in group discussions on contemporary topics the student will realize the need to keep oneself abreast of current developments thereby engaging in lifelong learning.
CO 5	PO2	The exposure to effective thinking and problem-solving techniques enables the student to learn the rudiments of problem analysis.
	PO3	Having gained an insight into creative and critical thinking techniques, the student will be better equipped to design and develop solutions.
	PO4	The student will learn how to apply logical and creative thinking as the situation demands while encountering complex problems.
CO 6	PO6	Learning about teamwork and leadership will help the student in both professional and personal life.
	PO9	The theoretical framework and practical exposure provided will enhance the efficiency of the student in individual and team contexts.

GAPS/TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:

	TOPICS	**PROPOSED ACTION**

1	Social skills	Presentation/Activity
2	Current Affairs and awareness	Activity
3	Industrial Knowledge and context	Presentation
4	Gender Sensitivity in communication	Presentation/Activity
5	Civic responsibilities	Presentation/Activity

WEB SOURCE REFERENCES:

1	https://www.thoughtco.com/what-is-communication-1689877
2	https://youtu.be/MXlK4vj4x4U
3	https://www.grammarbook.com/grammar/subjectVerbAgree.asp
4	https://grammar.yourdictionary.com/grammar-rules-and-tips/basic-english-grammar-rules.html
5	https://jerz.setonhill.edu/writing/e-text/email/amp/
6	https://www.toppr.com/guides/english/reading-comprehension/summarizing/
7	https://iedunote.com/reading-techniques
8	https://www2.le.ac.uk/offices/ld/resources/writing/writing-resources/critical-reading
9	https://www.eapfoundation.com/writing/cohesion/transitions/
10	https://youtu.be/0dhcSP_Myjg
11	https://youtu.be/fZbIjlUchOg
12	https://www.readnaturally.com/research/5-components-of-reading/comprehension
13	https://medium.goodnotes.com/the-best-note-taking-methods-for-college-students-451f412e264e
14	http://tutorials.istudy.psu.edu/oralpresentations/oralpresentations3.html
15	https://www.managementstudyguide.com/group-discussion-and-debate.htm
16	https://peptalkindia.com/9-important-tips-to-succeed-in-a-group-discussion/
17	https://virtualspeech.com/blog/guide-for-handling-questions-after-a-presentation
18	https://saylordotorg.github.io/text_developing-new-products-and-services/s15-06-business-presentation.html
19	https://www.orchard.co.uk/blog/different-types-of-interviews-1536.aspx
20	https://www.job-interview-wisdom.com/interview-etiquette.html
21	https://socialmettle.com/what-is-difference-between-passive-active-listening
22	https://www.skillsyouneed.com/ips/ineffective-listening.html

23	https://youtu.be/1mHjMNZZvFo
24	https://youtu.be/MmFuWmzeiDs
25	https://youtu.be/cSohjlYQI2A
26	https://www.skillsyouneed.com/write/report-writing.html
27	https://rodrigo75.wordpress.com/2011/01/18/technical-and-literary-writing-whats-the-difference/amp/
28	https://www.naukri.com/blog/how-to-write-a-job-application/amp/
29	https://www.wildapricot.com/articles/how-to-write-meeting-minutes
30	https://zety.com/blog/how-to-write-a-cv
31	https://www.toppr.com/guides/business-correspondence-and-reporting/report-writing/introduction-essential-elements/
32	https://www.toppr.com/guides/business-correspondence-and-reporting/report writing/introduction-essential-elements/
33	https://www.getsetresumes.com/blog/143-difference-between-resume-cv-and-biodata/

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

√CHALK & TALK	**√STUD. ASSIGNMENT**	**√WEB RESOURCES**	
LCD/SMART BOARDS	**√STUD. SEMINARS**	**ADD-ON COURSES**	

ASSESSMENT METHODOLOGIES-DIRECT

√ASSIGNMENTS	**√STUD. SEMINARS**	**√TESTS/MODEL EXAMS**	**√UNIV. EXAMINATION**
STUD. LAB PRACTICES	**STUD. VIVA**	**MINI/MAJOR PROJECTS**	**CERTIFICATIONS**
ADD-ON COURSES	**OTHERS**		

ASSESSMENT METHODOLOGIES-INDIRECT

√ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	**√STUDENT FEEDBACK ON FACULTY (TWICE)**
ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS	**OTHERS**

Prepared by **Approved by**

MsJosiya P. Shaju **Dr. Sonia Paul**
Ms Parvathy N, Mr Vinay Menon **s.**
Sangeetha Mathew Reji **(HOD, DBSH)**

Course Plan

Sl no	Module	Topic	Subtopics	Gaps/Topic Beyond the Syllabus to be addressed	Mode of delivery (Lecture/PPT/ other aids used)	Pre-session work (Teacher & Students)	Post-session work (Teacher & Students)	Assignment to be given	CO
1	1	Introduction to Professional Communication	Introducing the students to the modules, the question paper and the assignments	NA	Lecture + PPT	nil	Teacher: Share the assignment schedules with the students	nil	NA
2	5	Assignments	Theory: CV/Resume/Bio-data	NA	Lecture + PPT	Teacher: Sample CVs for showing students	Students: Prepare to create CV	nil	CO 6
3	5	Assignments	Lab: CV writing	NA	Google Docs	nil	nil	Assignment 1: CV	CO 6
4	5	Assignments	Lab: Letter writing	NA	Google Docs	nil	nil	Letter writing assignment	CO 6
5	5	Assignments	Theory: Interview	Interview process	Lecture + PPT Videos	Teacher: Video samples of the interview process	nil	nil	CO 1 CO 5
6	1	Vocabulary	Theory: Vocabulary Development: technical vocabulary, vocabulary used in formal letters/emails and reports,	NA	Lecture	Teacher: Checking English profeciency level of students	Students: Vocabulary Practice	Vocabulary Assignment	CO 1

			sequence words, misspelled words, compound words, finding suitable synonyms, paraphrasing, verbal analogies.						
7	1	Vocabulary	Lab: Vocabulary practice, Modern day research and study skills: search engines, repositories, forums such as Git Hub, Stack Exchange, OSS communities (MOOC, SWAYAM, NPTEL), and Quora	NA	Google Docs Videos	Teacher: Checking English profeciency level of students	Students: Vocabulary Practice	nil	CO 1
8	1	Grammar	Theory: subject-verb agreement, personal passive voice, numerical adjectives, embedded sentences, clauses, conditionals, reported speech, active/passive voice	Common mistakes	Lecture	Teacher: Checking English profeciency level of students	Students: Grammar practice	nil	CO 1
9	1	Grammar	Theory: Reported speech, active/passive	NA	Lecture	Teacher: Checking English profecien	Students: Grammar practice	nil	CO 1

			voice, plagiarism			cy level of students			
10	1	Grammar	Lab: Report writing	NA	Google Docs	nil	nil	Report Writing assignement	CO 1
11	1	Grammar	Lab: Grammar practice 1 (Subject-verb agreement, active/passive voice, reported speech)	NA	Google Docs	Teacher: Checking English profeciency level of students	Students: Grammar practice	nil	CO 1
12	1	Grammar	Theory: Tenses, articles, common mistakes in grammar	Tenses Articles	Lecture	Teacher: Checking English profeciency level of students	Students: Grammar practice	nil	CO 1
13	1	Communication	Phonetics	Phonetics, syllables and tones	Lecture	Teacher: Checking English profeciency level of students	nil	nil	CO 1
14	1	Grammar	Lab: Grammar practice 2 (Tenses, articles)	NA	Google Docs Quizizz	Teacher: Checking English profeciency level of students	Students: Grammar practice	nil	CO 1
15	1	Vocabulary	Lab: Vocabulary Quiz and phonetics practice	NA	Google Docs Phonetic chart Videos Quizizz	Teacher: Checking English profeciency level of students	nil	nil	CO 1
16	2	Reading	Theory: Reading Comprehension, and Summarizing:	NA	Lecture + PPT	Teacher: Checking English profeciency level	nil	nil	CO 2

			Reading styles, speed, valuation, critical reading			of students			
17	2	Reading	Theory: SQ3R method, PQRST method, speed reading, Reading and comprehending shorter and longer technical articles from journals, newspapers, identifying the various transitions in a text, Types of reading	NA	Lecture + PPT	nil	nil	nil	CO 2
18	2	Reading	Lab: Reading practice	NA	Google Docs	Teacher: Checking English profeciency level of students	nil	nil	CO 2
19	2	Reading	Lab: Reading Comprehension	NA	Google Docs	Teacher: Checking English profeciency level of students	nil	nil	CO 2
20	3	Speaking	Theory: Voice modulation, tone, describing a process, Presentation Skills: Oral presentation and public speaking skills, business	NA	Lecture + PPT	nil	nil	nil	CO 3

			presentations						
21	3	Speaking	Theory: Debate and Group Discussions: introduction to Group Discussion (GD), differences between GD and debate; participating GD, understanding GD, brainstorming the topic, questioning and clarifying, GD strategies, activities to improve GD skills	NA	Lecture + PPT	nil	nil	nil	CO 4 CO 5
22	3	Speaking	Lab: Presentation skills	NA	Video Google Docs Quizizz	nil	nil	nil	CO 3
23	3	Speaking	Lab: GD skills	NA	Video Google Docs Quizizz	nil	nil	nil	CO 4 CO 5
24	4	Listening	Theory: Listening and Interview Skills Listening: Active and Passive listening, listening: for general content, to fill up information, intensive	NA	Lecture + PPT	nil	nil	nil	CO 5

			listening, for specific information, to answer, and to understand.						
25	4	Listening	Theory: Developing effective listening skills, barriers to effective listening, listening to longer technical talks, listening to classroom lectures, talks on engineering /technology, listening to documentaries and making notes, TED talks.	NA	Lecture + PPT	nil	nil	nil	CO 5
26	4	Listening	Lab: Listening practice, listening to different sources of audio	NA	Video Google Docs	nil	nil	nil	CO 5
27	4	Listening	Lab: Interview Skills: types of interviews, successful interviews, interview etiquette, dress code, body language, telephone/online (skype) interviews, one-to-one interview & panel	Answering specific Interview questions	Video Google Docs	nil	nil	nil	CO 5

			interview, FAQs related to job interviews						
28	5	Writing	Theory: Formal writing: Technical Writing: differences between technical and literary style. Job applications, Minute preparation.	NA	Lecture	nil	nil	nil	CO 6
29	5	Writing	Theory: Elements of style, Common Errors in Writing: describing a process, use of sequence words, Instructions, Checklists	NA	Lecture	nil	nil	nil	CO 6
30	5	Writing	Lab: Writing MOM	NA	Google Docs	nil	nil	nil	CO 6

ASSIGNMENT QUESTIONS

Assignment schedule

Sno.	Task	Deadline
1	Describing the assignments and evaluation method	First week of the semester
2	Submission of CV	Second week of the semester
3	Starting with the mock interview	Third week of the semester
4	Fixing topics for presentations	First week after first internal exam
5	Submission of PPTs of presentations	Second week after first internal exam
6	Completion of individual presentations and submission of reports (submission of presentation videos for online classes)	Second internal exam
7	Listening Test	First week after second internal exam

Assignment Mapping:

Sno.	**Assignment**	Module (s)	CO
1	CV	1, 5	CO1
2	Mock Interview	1, 3	CO1 CO3
3	Individual Presentation and Report	1, 2, 3, 5	CO1 CO2 CO3
4	Listening Test	1, 4	CO1

Sno.	CaseStudy
1	Introduction to CSE (Basics and Careers)
2	ENAC
3	ARPANET

4	Alan Turing & ENIGMA
5	Bill Gates, Microsoft and Personal Computers
6	Free Software Movement
7	Linus Torvalds and Linux
8	How Google works?
9	Gloga Positioning System (GPS)
10	Wireless Technology (3G/4G/5G)
11	Smart Glasses
12	3D-Doctor
13	Femtocell
14	Honeypot
15	TeleKinect
16	EyeRing
17	MemTable
18	Microsoft HoloLens
19	Brain ComputerInterface (BCI)
20	Indian Regiona Navigation Satellite System (IRNSS)
21	Augumented Reality vs VirtualRea lity
22	Electronic Watse (E-Waste)
23	Lie-Detector
24	Super Computers
25	Summit
26	Param 10000
27	Green Computing
28	Phishing
29	CAPTCHA
30	Face Detection and Recognition Technology
31	Digital Jewelry

32	Self Driving Cars
33	Cyber Crimes and Security
34	Braingate Technology
35	Cyborgs
36	E-cash Payment System
37	Geographic Information System
38	BioChip

Sno.	CaseStudy
1	NetNeutrality
2	SophiaRobot
3	Ethical/Patriotic Hacking
4	Tay (bot)
5	WannaCry ransomware attack
6	Cyberbullying
7	Internet activism
8	Clickbait headlines
9	Sexism on the web
10	Racism on the web
11	Content leak
12	Online character assasination
13	Content theft
14	Censorship on the internet
15	Invasion of privacy

PROGRAMMING IN C

COURSE INFORMATION SHEET

PROGRAMME: INFORMATION TECHNOLOGY	DEGREE: BTECH
COURSE: PROGRAMMING IN C	SEMESTER: II CREDITS: 4
COURSE CODE100908/CO200F REGULATION: 2019	COURSE TYPE: CORE
COURSE AREA/DOMAIN: PROGRAMMING, DATA STRUCTURES AND ALGORITHMS	CONTACT HOURS: 2+1(Tutorial) +2 (Lab) =5 hours/Week.
CORRESPONDING LAB COURSE CODE (IF ANY): NIL	LAB COURSE NAME: NIL

SYLLABUS:

UNIT	DETAILS	HOURS
I	Basics of Computer Architecture: processor, Memory, Input& Output devices Application Software & System software: Compilers, interpreters, High level and low level languages Introduction to structured approach to programming, Flow chart Algorithms, Pseudo code (bubble sort, linear search - algorithms and pseudo code	7
II	Basic structure of C program: Character set, Tokens, Identifiers in C, Variables and Data Types , Constants, Console IO Operations, printf and scanf Operators and Expressions: Expressions and Arithmetic Operators, Relational and Logical Operators, Conditional operator, size of operator, Assignment operators and Bitwise Operators. Operators Precedence Control Flow Statements: If Statement, Switch Statement, Unconditional Branching using goto statement, While Loop, Do While Loop, For Loop, Break and Continue statements.(Simple programs covering control flow).	7
III	Arrays Declaration and Initialization, 1-Dimensional Array, 2-Dimensional Array String processing: In built String handling functions (strlen, strcpy, strcat and strcmp, puts, gets) Linear search program, bubble sort program, simple programs covering arrays and strings	7
IV	Working with functions Introduction to modular programming, writing functions, formal parameters, actual parameters Pass by Value, Recursion, Arrays as Function Parameters structure, union, Storage Classes, Scope and life time of variables, simple programs using functions	7
V	Pointers and Files Basics of Pointer: declaring pointers, accessing data though pointers, NULL pointer,array access using pointers, pass by reference effect File Operations: open, close, read, write, append Sequential access and random access to files: In built file	7

	handlingfunctions(rewind() ,fseek(), ftell(), feof(), fread(), fwrite()), simple programs covering pointers and files.	
TOTAL HOURS		**35**

Text Books

1. Schaum Series, Gottfried B.S.,Tata McGraw Hill,Programming with C
2. E. Balagurusamy, McgrawHill,Programming in ANSI C
3. Asok N Kamthane, Pearson, Programming in C
4. Anita Goel, Pearson, Computer Fundamentals

Reference Books

1. Anita Goel and Ajay Mittal, Pearson, Computer fundamentals and Programming in C
2. Brian W. Kernighan and Dennis M. Ritchie, Pearson, C Programming Language
3. Rajaraman V, PHI, Computer Basics and Programming in C
4. Yashavant P, Kanetkar, BPB Publications, Let us C Course Contents and Lecture

COURSE OBJECTIVES:

1	The objective of the course is to prepare the Engineering Graduates capable of writing readable C programs to solve computational problems that they may have to solve in their professional life. The course content is decided to cover the essential programming fundamentals which can be taught within the given slots in the curriculum

COURSE OUTCOMES:

SNO	DESCRIPTION
100908/CO200G.1	Analyze a computational problem and develop an algorithm/flowchart to find its solution
100908/CO200G.2	Develop readable* C programs with branching and looping statements, which uses Arithmetic, Logical, Relational or Bitwise operators
100908/CO200G.3	Write readable C programs with arrays, structure or union for storing the data to be processed
100908/CO200G.4	Divide a given computational problem into a number of modules and develop a readable multi-function C program by using recursion if required, to find the solution to the computational problem
100908/CO200G.5	Write readable C programs which use pointers for array processing and parameter passing
100908/CO200G.6	Develop readable C programs with files for reading input and storing output

readable* - readability of a program means the following:

1. Logic used is easy to follow
2. Standards to be followed for indentation and formatting
3. Meaningful names are given to variables
4. Concise comments are provided wherever needed

CO-PO AND CO-PSO MAPPING

	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P010	PO11	PO12
100908/CO200G.1	3	3	3	2		1	-	-	-	1	1	2
100908/CO200G.2	2	2	2	1	1	-	-	-	-	1	-	2
100908/CO200G .3	2	2	2	1	2	-	-	-	-	1	-	2
100908/CO200G.4	3	3	3	2	3	-	-	-	-	1	1	2
100908/CO200G.5	3	2	-	-	2	-	-	-	-	1	-	2
100908/CO200G.6	3	3	-	-	3					3		3
100908/CO200G (overall level)	2.67	2.5	2.5	1.5	2.2	1	-	-	-	1.33	1	2.17

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	**LOW/MEDIUM/HIGH**	**Justification**
100908/CO200G.1-PO1	H	Students will study the fundamental of programming by analyzing a problem and develop an algorithm/ flowchart to find its solution.
100908/CO200G.1-PO2	H	The students will be able to analyze a given complex problem since they have to understand the problem in depth to write an algorithm/ flowchart
100908/CO2	H	The students will be able to develop and design solution to

00G.1-PO3		complex problems and express the solution they have designed using flowchart/ algorithm/ pseudocode.
100908/CO2 00G.1-PO4	M	The students will be able to use the skills of algorithm design in design of experiments and interpretation of data
100908/CO2 00G.1-PO6	L	The students will be able to write algorithm / draw flowchart for a solution catering to the needs of the society.
100908/CO2 00G.1-PO10	L	The students will be able to communicate the idea of their solution effectively in a step by step manner using algorithm or pictorially by using a flowchart.
100908/CO2 00G.1-PO11	L	The students will be able to write algorithm / draw flowchart for a solution catering to the needs of the society.
100908/CO2 00G.1-PO12	M	The students will be able to use their algorithm writing / flowchart drawing skills whenever they need to design solutions to complex real life problems.
100908/CO2 00G.2-PO1	M	The concepts of branching, looping and operators are fundamental to our engineering specialization of problem solving.
100908/CO2 00G.2-PO2	M	The concepts of branching, looping and operators are needed in analyzing complex engineering problems.
100908/CO2 00G.2-PO3	M	The concepts of branching, looping and operators are inevitable when designing solutions to complex problems.
100908/CO2 00G.2-PO4	L	The concepts of branching, looping and operators are used in the design of experiments and data interpretation.
100908/CO2 00G.2-PO5	L	The concepts of branching, looping and operators are useful in usage of different tools since every tool makes use of these fundamentals.
100908/CO2 00G.2-PO10	L	The concepts of branching, looping and operators are used in the design of solutions which is efficient for communicating the design to others.
100908/CO2 00G.2-PO12	M	The concepts of branching, looping and operators are used in all areas of research as well as industry.
100908/CO2 00G.3-PO1	M	The concepts of arrays and structure for data storage are fundamental to our engineering specialization of problem solving.
100908/CO2 00G.3-PO2	M	The concepts of arrays and structure for data storage are needed in analyzing complex engineering problems.
100908/CO2 00G.3-PO3	M	The concepts of arrays and structure for data storage are inevitable when designing solutions to complex problems.
100908/CO2	L	The concepts of arrays and structure for data storage are used in

00G.3-PO4		the design of experiments and data interpretation.
100908/CO2 00G.3-PO5	M	The concepts of arrays and structure for data storage are useful in usage of different tools since every tool makes use of these fundamentals.
100908/CO2 00G.3-PO10	L	The concepts of arrays and structure for data storage are used in the design of solutions which is efficient for communicating the design to others.
100908/CO2 00G.3-PO12	M	The concepts of arrays and structure for data storage are used in all areas of research as well as industry.
100908/CO2 00G.4-PO1	H	The concepts of dividing the complex problem into modules forming multi function programs and the concept of recursive functions are fundamental to our engineering specialization of problem solving.
100908/CO2 00G.4-PO2	H	The concepts of dividing the complex problem into modules forming multi function programs and the concept of recursive functions are needed in analyzing complex engineering problems.
100908/CO2 00G.4-PO3	H	The concepts of dividing the complex problem into modules forming multi function programs and the concept of recursive functions are inevitable when designing solutions to complex problems.
100908/CO2 00G.4-PO4	M	The concepts of dividing the complex problem into modules forming multi function programs and the concept of recursive functions are used in the design of experiments and data interpretation.
100908/CO2 00G.4-PO5	H	The concepts of dividing the complex problem into modules forming multi function programs and the concept of recursive functions are useful in usage of different tools since every tool makes use of these fundamentals.
100908/CO2 00G.4-PO10	L	The concepts of dividing the complex problem into modules forming multi function programs and the concept of recursive functions are used in the design of solutions which is efficient for communicating the design to others.
100908/CO2 00G.4-PO11	L	The concepts of dividing the complex problem into modules forming multi function programs and the concept of recursive functions are fundamental to any application related to engineering.
100908/CO2 00G.4-PO12	M	The concepts of dividing the complex problem into modules forming multi function programs and the concept of recursive

		functions are used in all areas of research as well as industry.
100908/CO200G.5-PO1	H	The concepts of pointers for array processing and parameter passing are fundamental to our engineering specialization.
100908/CO200G.5-PO2	M	The concepts of pointers for array processing and parameter passing are needed in analyzing complex engineering problems
100908/CO200G.5-PO5	M	The concepts of pointers for array processing and parameter passing are useful in modern tool usage and helps in modeling and predicting complex engineering problems.
100908/CO200G.5-PO10	L	The concepts of pointers for array processing and parameter passing are useful in giving more clear instructions to the user and thereby enabling effective communication.
100908/CO200G.5-PO12	M	The concepts of pointers for array processing and parameter passing are important in all areas of research and also help in adapting to technological changes.
100908/CO200G.6-PO1	H	The concept of files for data input and output are fundamental to CS and are very helpful in manipulating large amount of data input and output of complex problems.
100908/CO200G.6-PO2	H	The concept of files for data input and output are helpful in analyzing problems and reviewing the output obtained after doing complex programs in C.
100908/CO200G.6-PO5	H	The concept of files for data input and output will be very useful when we use modern tools for data analysis and prediction
100908/CO200G.6-PO10	H	The concept of files for data input and output helps to store the results in an organized manner so that it can be effectively communicated to outside world
100908/CO200G.6-PO12	H	The concept of files for data input and output is an inevitable concept that can be used with almost every real life engineering problem and this helps to manipulate data effectively.

GAPS IN THE SYLLABUS - TO MEET INDUSTRY/PROFESSION REQUIREMENTS:

SNO	DESCRIPTION	PROPOSED ACTIONS
1	NIL	

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:

SL NO	DESCRIPTION	PROPOSED ACTIONS
1	Dynamic Memory Allocation	Lecture
2	Command Line Arguments	Reading assignment

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

✓ CHALK & TALK	✓ STUD. ASSIGNMENT	✓ WEB RESOURCES	
✓ LCD/SMART BOARDS	STUD SEMINARS	ADD-ON COURSES	

ASSESSMENT METHODOLOGIES-DIRECT

✓ ASSIGNMENTS	STUD. SEMINARS	✓ TESTS/MODEL EXAMS	✓ UNIV. EXAMINATION
✓ STUD. LAB PRACTICES	✓ STUD. VIVA	Micro/Mini/Main PROJECTS	CERTIFICATIONS
ADD-ON COURSES	OTHERS		

ASSESSMENT METHODOLOGIES-INDIRECT

✓ ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	✓ STUDENT FEEDBACK ON FACULTY (TWICE)
ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS	OTHERS

Prepared by **Approved by**

Ms. Nikhila T Bhuvan **Dr. Neeba E A, HOD**

COURSE PLAN

Sl.No	Module	Planned Date	Planned
1	1	04-May-21	Basics of Computer Architecture: processor, Memory, Input& Output devices -
2	1	05-May-21	Basics of Computer Architecture: processor, Memory, Input& Output devices -
3	1	07-May-21	Basics of Computer Architecture: processor, Memory, Input& Output devices -
4	1	11-May-21	Application Software & System software: Compilers, interpreters, High level and low level languages
5	1	12-May-21	Application Software & System software: Compilers, interpreters, High level and low level languages
6	1	13-May-21	Introduction to structured approach to programming, Flow chart Algorithms, Pseudocode (bubble sort, linear search - algorithms and pseudocode)
7	1	14-May-21	Introduction to structured approach to programming, Flow chart Algorithms, Pseudocode (bubble sort, linear search - algorithms and pseudocode)
8	1	18-May-21	Introduction to structured approach to programming, Flow chart Algorithms, Pseudocode (bubble sort, linear search - algorithms and pseudocode)
9	1	19-May-21	Introduction to structured approach to programming, Flow chart Algorithms, Pseudocode (bubble sort, linear search - algorithms and pseudocode)
10	2	19-May-21	Basic structure of C program: Character set, Tokens, Identifiers in C, Variables and Data Types, Constants, Console IO Operations, printf and scanf
11	2	20-May-21	Basic structure of C program: Character set, Tokens, Identifiers in C, Variables and Data Types, Constants, Console IO Operations, printf and scanf
12	2	21-May-21	Basic structure of C program: Character set, Tokens, Identifiers in C, Variables and Data Types, Constants, Console IO Operations, printf and scanf
13	2	25-May-21	Operators and Expressions: Expressions and Arithmetic Operators, Relational and Logical Operators, Conditional operator, size of operator, Assignment operators and Bitwise Operators. Operators Precedence

14	2	26-May-21	Operators and Expressions: Expressions and Arithmetic Operators, Relational and Logical Operators, Conditional operator, size of operator, Assignment operators and Bitwise Operators. Operators Precedence
15	2	27-May-21	Operators and Expressions: Expressions and Arithmetic Operators, Relational and Logical Operators, Conditional operator, size of operator, Assignment operators and Bitwise Operators. Operators Precedence
16	2	28-May-21	Operators and Expressions: Expressions and Arithmetic Operators, Relational and Logical Operators, Conditional operator, size of operator, Assignment operators and Bitwise Operators. Operators Precedence
17	2	01-Jun-21	Control Flow Statements: If Statement, Switch Statement, Unconditional Branching using goto statement, While Loop, Do While Loop, For Loop, Break and Continue statements
18	2	02-Jun-21	Control Flow Statements: If Statement, Switch Statement, Unconditional Branching using goto statement, While Loop, Do While Loop, For Loop, Break and Continue statements
19	2	03-Jun-21	Control Flow Statements: If Statement, Switch Statement, Unconditional Branching using goto statement, While Loop, Do While Loop, For Loop, Break and Continue statements
20	2	04-Jun-21	Loops practice- LAB
21	2	08-Jun-21	Control Flow Statements: If Statement, Switch Statement, Unconditional Branching using goto statement, While Loop, Do While Loop, For Loop, Break and Continue statements
22	2	09-Jun-21	Control Flow Statements: If Statement, Switch Statement, Unconditional Branching using goto statement, While Loop, Do While Loop, For Loop, Break and Continue statements
23	2	10-Jun-21	Control Flow Statements: If Statement, Switch Statement, Unconditional Branching using goto statement, While Loop, Do While Loop, For Loop, Break and Continue statements
24	2	11-Jun-21	Control Flow Statements: If Statement, Switch Statement, Unconditional Branching using goto statement, While Loop, Do While Loop, For Loop, Break and Continue statements

25	2	15-Jun-21	Control Flow Statements: If Statement, Switch Statement, Unconditional Branching using goto statement, While Loop, Do While Loop, For Loop, Break and Continue statements
26	2	16-Jun-21	Control Flow Statements: If Statement, Switch Statement, Unconditional Branching using goto statement, While Loop, Do While Loop, For Loop, Break and Continue statements
27	2	17-Jun-21	Control Flow Statements: If Statement, Switch Statement, Unconditional Branching using goto statement, While Loop, Do While Loop, For Loop, Break and Continue statements
28	2	22-Jun-21	Control Flow Statements: If Statement, Switch Statement, Unconditional Branching using goto statement, While Loop, Do While Loop, For Loop, Break and Continue statements
29	3	29-Jun-21	Arrays
30	3	30-Jun-21	Arrays
31	3	01-Jul-21	Arrays
32	3	02-Jul-21	Arrays practice programs-LAB
33	3	06-Jul-21	Arrays Declaration and Initialization, 1-Dimensional Array
34	3	07-Jul-21	Arrays Declaration and Initialization, 1-Dimensional Array
35	3	08-Jul-21	2-Dimensional Array
36	3	09-Jul-21	2-Dimensional Array
37	3	12-Jul-21	Strings
38	1	14-Jul-21	Strings
39	1	15-Jul-21	Strings Practice programs-LAB
40	2	16-Jul-21	String processing: In built String handling functions
41	3	20-Jul-21	String processing: In built String handling functions
42	1	21-Jul-21	String processing: In built String handling functions
43	3	22-Jul-21	Linear search program
44	1	23-Jul-21	Bubble sort program
45	3	27-Jul-21	Array of Strings
46	3	28-Jul-21	Array of Strings
47	3	29-Jul-21	Array of Strings -LAB
48	3	30-Jul-21	Array of Strings
49	4	03-Aug-21	writing functions, formal parameters, actual parameters Pass by Value,

50	4	04-Aug-21	writing functions, formal parameters, actual parameters Pass by Value,
51	4	05-Aug-21	writing functions, formal parameters, actual parameters Pass by Value,
52	4	06-Aug-21	Practice programs using function-LAB
53	4	10-Aug-21	Recursion
54	1	11-Aug-21	Recursion
55	4	12-Aug-21	Scope and life time of variables
56	4	13-Aug-21	Basics of Pointer: declaring pointers, accessing data though pointers,
57	5	01-Sep-21	Basics of Pointer: declaring pointers, accessing data though pointers,
58	5	02-Sep-21	Basics of Pointer: declaring pointers, accessing data though pointers,
59	5	03-Sep-21	Programs using pointers-LAB
60	5	07-Sep-21	File Operations: open, close, read, write, append Sequential access and random access to file
61	5	08-Sep-21	File Operations: open, close, read, write, append Sequential access and random access to file
62	5	09-Sep-21	File Operations: open, close, read, write, append Sequential access and random access to file
63	5	10-Sep-21	File Operations: open, close, read, write, append Sequential access and random access to file

Programming in C:Tutorial -1

1. Write a c program to find the perfect numbers within a given number of range
2. Write a program in C to find the prime numbers within a range of numbers
3. Write a program in C to find the number and sum of all integer between 100 and 200 which are divisible by 9
4. Write a C program to find HCF (Highest Common Factor) of two numbers.
5. Write a C program to find the length of a string without using the library function.
6. Write a C program to print all natural numbers in reverse (from n to 1). - using while loop.
7. Write a C program to find frequency of each digit in a given integer

Programming in C: Tutorial -2

1. Write a C Program to Copy a String
2. Write a C Program remove all characters in a string except alphabets
3. Write a C Program sort elements in the lexicographical order (dictionary order)
4. Write a program in C to count a total number of duplicate elements in an array
5. Write a program in C to find the maximum and minimum element in an array
6. Write a program in C to separate odd and even integers in separate arrays
7. Write a program in C to find the second largest element in an array

LAB CYCLE

LIST OF LAB EXPERIMENTS/ ASSIGNMENT QUESTIONS

WEEK 1

1. Display “Hello World”
2. Read two numbers, add them and display their sum
3. Read the radius of a circle, calculate its area and display it
4. Evaluate the arithmetic expression ((a -b / c * d + e) * (f +g)) and display its solution. Read the values of the variables from the user through console.

WEEK 2 AND 3

1. Read 3 integer values and finds the largest among them.
2. Read a Natural Number and check whether the number is prime or not.
3. Read a Natural Number and check whether the number is Armstrong or not.

WEEK 4

1. Read n integers, store them in an array and find their sum and average.
2. Read n integers, store them in an array and search for an element in the array using an algorithm for Linear Search.
3. Read n integers, store them in an array and sort the elements in the array using Bubble Sort Algorithm.

WEEK 5

1. Read a string (word), store it in an array and check whether it is a palindrome word or not.
2. Read two strings (each one ending with a $ symbol), store them in arrays and concatenate them without using library functions.
3. Read a string (ending with a $ symbol), store it in an array and count the number of vowels, consonants and spaces in it.

WEEK 6

1. Read a string (word), store it in an array and obtain its reverse by using a user defined function.
2. Write a menu driven program for performing matrix addition, multiplication and finding the transpose. Use functions to (i) read a matrix, (ii) find the sum of two matrices, (iii) find the product of two matrices, (i) find the transpose of a matrix and (v) display a matrix.

WEEK 7

1. Read four inputs representing four points in the Euclidean space, store these values in structure variables.

   i) Compute the Euclidean distance between two pair of points.

   ii) Find the sum of those two distance values.

2 . Using structure, read and print data of n employees (Name, Employee Id and Salary)

3. Declare a union containing 5 string variables (Name, House Name, City Name, State and Pin code) each with a length of C_SIZE (user defined constant). Then, read and display the address of a person using a variable of the union.

WEEK 8

1. Find the factorial of a given natural number 'N' using recursive and non-recursive functions.

   (Last Day to complete all the pending programs **till WEEK 8**)

WEEK 9

1. Do the following using pointers

   i) Add two numbers

   ii) Swap two numbers using a user defined function

2. Input and Print the elements of an array using pointers.
3. Compute sum of the elements stored in an array using pointers and user defined function.

WEEK 10

1.Create a file and perform the following

   i) Write data to the file

   ii) Read the data in a given file & display the file content on console

   iii) Append new data and display on console

2. Open a text input file and count number of characters, words and lines in it; and store the results in an output file.

Additional Sessions Provided

1. Familiarization of Hardware Components of a Computer.
2. Familiarization of Linux environment – How to do Programming in C with Linux
3. Familiarization of console I/O and operators in C

ENGINEERING PHYSICS LAB

COURSE INFORMATION SHEET- ENGINEERING PHYSICS LAB

PROGRAMME: ENGINEERING	**DEGREE: BTECH**
COURSE: ENGINEERING PHYSICS LAB	**SEMESTER: 1 AND 2** **CREDITS: 4**
COURSE CODE: 100908/PH922S **REGULATION: 2020**	**COURSE TYPE: CORE**
COURSE AREA/DOMAIN: Engineering Physics	**CONTACT HOURS: 2 hours/Week.**
CORRESPONDING THEORY COURSE CODE :100902/PH900B ,100906/PH900B	**LAB COURSE NAME: Engineering Physics Lab**

Preamble: The aim of this course is to make the students gain practical knowledge to correlate with the theoretical studies and to develop practical applications of engineering materials and use the principle in the right way to implement the modern technology.

Prerequisite: Higher secondary level Physics

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

CO1	Apply modern instruments like CRO, strain gauge to measure the basic physical quantities viz. frequency and amplitude of a wave pattern, strain etc. Carryout measurement of wave pattern in a stretched string and the corresponding frequency values using a Melde's string apparatus.
CO2	Determine the wavelength of monochromatic beam of light and thickness of micro-thin object etc. by forming Newton's rings pattern and an air wedge fringe pattern.
CO3	Carryout the measurement of wavelength by diffraction of plane transmission grating and the spectra formed by a monochromatic beam of light and a laser.
CO4	Determine the wavelength of a laser beam using the plane transmission grating. Measurement of Numerical aperture of an optic fibre and evaluate the properties of a solar cell and LED through its I-V characteristics
CO5	Determine the velocity of ultrasonic waves in liquid using ultrasonic diffracto meter. Compare the magnetic moment of various magnets and determine the magnetic flux density using deflection/vibration Magnetometer.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3				2			1	2			1
CO	3				2			1	2			1

2												
CO 3	3				2			1	2			1
CO 4	3				2			1	2			1
CO 5	3				2			1	2			1

CO1.PO1	Develop analytical/experimental skills and impart prerequisite hands-on experience for engineering laboratories
CO1.PO5	Review research literature to answer open questions assessed by viva
CO1.PO8	Professional punctuality and understanding professional ethics by self-reading posters
CO1.PO9	Effectively function individually and as a team in the laboratory
CO1.PO12	Capture the current and relevant innovations in the respective branch

CO2.PO1	Understand the need for precise measurement practices for data recording
CO2.PO5	Review research literature to answer open questions assessed by viva
CO2.PO8	Professional punctuality and understanding professional ethics by self-reading posters
CO2.PO9	Effectively function individually and as a team in the laboratory
CO2.PO12	Capture the current and relevant innovations in the respective branch

CO3.PO1	Understand the principle, concept, working and applications of relevant technologies and comparison of results with theoretical calculations
CO3.PO5	Review research literature to answer open questions assessed by viva
CO3.PO8	Professional punctuality and understanding professional ethics by self-reading posters
CO3.PO9	Effectively function individually and as a team in the laboratory
CO3.PO12	Capture the current and relevant innovations in the respective branch

CO4.PO1	Analyze the techniques and skills associated with modern scientific tools such as lasers and fiber optics
CO4.PO5	Review research literature to answer open questions assessed by viva
CO4.PO8	Professional punctuality and understanding professional ethics by self-reading posters
CO4.PO9	Effectively function individually and as a team in the laboratory
CO4.PO12	Capture the current and relevant innovations in the respective branch

CO5.PO1	Develop basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results
CO5.PO5	Review research literature to answer open questions assessed by viva
CO5.PO8	Professional punctuality and understanding professional ethics by self-reading posters
CO5.PO9	Effectively function individually and as a team in the laboratory
CO5.PO12	Capture the current and relevant innovations in the respective branch

WEB SOURCE REFERENCES:

1	http://www.animations.physics.unsw.edu.au/jw/oscillations.htm
2	http://www.itp.uni-hannover.de/~zawischa/ITP/diffraction.html
3	http://science.howstuffworks.com/environmental/energy/superconductivity.htm
4	http://plato.stanford.edu/entries/qm/
5	http://www.damtp.cam.ac.uk/user/tong/statphys.html
6	http://www.coherent.com/products/?834/Lasers

Mark distribution

Total Marks	**CIE Marks**	**ESE Marks**	**ESE Duration (Internal)**
100	100	-	1 hour

Continuous Internal Evaluation Pattern:

Attendance : 20marks
Class work/Assessment/Viva-voce : 50marks
Endsemesterexamination(Internallybycollege) : 30marks

End Semester Examination Pattern: Written Objective Examination of one hour

LIST OF EXPERIMENTS

(Minimum 8 experiments should be completed)

1. CRO-Measurement of frequency and amplitude of waveforms
2. Measurement of strain using strain gauge and wheatstone bridge
3. LCR Circuit – Forced and damped harmonic oscillations
4. Melde's string apparatus-Measurement of frequency in the transverse and longitudinal mode
5. Wavelength measurement of a monochromatic source of light using Newton's Rings method.
6. Determination of diameter of a thin wire or thickness of a thin strip of paper using air wedge method.
7. To measure the wavelength using a millimeter scale as a grating
8. Measurement of wavelength of a source of light using grating.
9. Determination of dispersive power and resolving power of a plane transmission grating
10. Determination of the particle size of lycopodium powder
11. Determination of the wavelength of He-Ne laserorany standard laser using diffraction grating
12. Calculate the numerical aperture and study the losses that occur in optical fiber cable.
13. I-V characteristics of solar cell.
14. LED Characteristics.
15. Ultrasonic Diffractometer Wavelength and velocity measurement of ultrasonic waves in a liquid.
16. Deflection magnetometer-Moment of a magnet- Tan A position.

Reference books

1. S.L.Gupta and Dr.V.Kumar, "Practical physics with viva voice", Pragati PrakashanPublishers, Revised Edition,2009
2. M.N.Avadhanulu,A.A.DaniandPokelyP.M,"ExperimentsinEngineeringPhysics",S.Chand&Co , 2008

3. S. K. Gupta, “Engineering physics practicals”, Krishna Prakashan Pvt. Ltd.,2014

4. P. R. Sasikumar “Practical Physics”, PHI Ltd.,2011.

ASSESSMENT METHODOLOGIES-DIRECT

☐ **ASSIGNMENTS**	☐ **STUD. SEMINARS**	☐ **TESTS/MODEL EXAMS**	☐ **UNIV. EXAMINATION**
☐ **STUD. LAB PRACTICES**	☐ **STUD. VIVA**	☐ **MINI/MAJOR PROJECTS**	☐ **CERTIFICATIONS**
☐ **ADD-ON COURSES**	☐ **OTHERS**	☐ **POSTER PRESENTATIONS**	

ASSESSMENT METHODOLOGIES-INDIRECT

☐ **ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)**	☐ **STUDENT FEEDBACK ON FACULTY (TWICE)**
☐ **ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS**	☐ **OTHERS**

Prepared by **Approved by**

JOSE ANTONY V J
RINKU JACOB
DEEPTHI JAYAN K
SUJITH S **(HOD)**

ENGINEERING PHYSICS LAB -COURSE PLAN			
Date	**Experiment No.**	**Experiment**	STATUS
Sat, 22-May-2021	Experiment 1	Experiment No.1 - The electrical oscillator	COMPLETED
Sat, 29-May-2021	Experiment 2	Experiment No.2 - Melde's string experiment	COMPLETED
Sat, 5-Jun-2021	Experiment 3	Experiment No.3 - Newton;s rings	COMPLETED
Sat, 26-Jun-2021	Experiment 4	Experiment No. 4- Spectrometer	COMPLETED
Sat, 17-Jul-2021	Experiment 5	Experiment No. 5- Laser grating	COMPLETED
Sat, 24-Jul-2021	Experiment 6	Experiment No. 6- Optical fiber	COMPLETED
Sat, 31-Jul-2021	Experiment 7	Experiment No. 7- Solar cell	COMPLETED
Sat, 7-Aug-2021	Experiment 8	Experiment No. 8- Ultrasonic diffractometer	COMPLETED
Sat, 11-Sep-2021	Experiment 9	Lab exam	COMPLETED

LIST OF EXPERIMENTS

1. The electrical oscillator (series LCR circuit)
2. Newton’s rings – wavelength measurement of a monochromatic light
3. Spectrometer – characteristic wavelengths
4. Ultrasonic diffractometer – wavelength of ultrasonic waves in a liquid (acoustic grating method)
5. The mechanical oscillator (melde’s string)
6. Wavelength determination of laser using transmission grating
7. Identification of MPP of a solar cell using its I-V characteristics
8. To find the numerical aperture of an optical fiber
9. Transmission of data using light

Engineering Physics Lab cycle 1/1

Sl No	Experiment	Name of the experiment
1	Experiment 1	LCR circuit
2	Experiment 2	Melde's string
3	Experiment 3	Newton's rings
4	Experiment 4	Spectrometer- Characteristic wavelengths
5	Experiment 5	Laser Diffraction Grating
6	Experiment 6	Solar Cell
7	Experiment 7	Numerical Aperture
8	Experiment 8	LiFi/Ultrasonic Diffractometer

OPEN QUESTIONS

RLC CIRCUIT

1. What does it mean to have a flat frequency response curve?
2. How does a microwave cavity work as resonant circuit like an RLC circuit?
3. How does a Joule thief circuit work?

CATHODE RAY OSCILLOSCSOPE

1. How can the brightness of the pattern on the screen of the cathode ray tube be changed?
2. How does a cathode ray tube in an LCD screen turn so bright?

NEWTON'S RINGS

1. Why does the fringes in Newton's rings crowd together as the radius of the fringe increases?
2. Why are Newton's rings circular?
3. How does Newton explained Newton's rings with corpuscular theory of light?
4. How a source which has specific frequency of vibration is able to produce waves of different wavelength?

AIR WEDGE

1. What happens when white or colored light is used for air wedge experiment?
2. What happens to the fringes in air wedge experiment when we apply stress?

SPECTROMETER EXPERIMENT

1. What are the differences between wavelength division multiplexing and time division multiplexing?
2. Do gravity waves have different lengths or frequencies like electromagnetic waves?
3. Why does a grating act as a super prism?

MALUS' LAW

1. A team of international researchers are working on developing a camera that can identify cancerous tissue. Which property of Mantis shrimp has inspired them?
2. Bats use echolocation to identify pray. But how do they navigate?

BOSE EINSTEIN CONDENSATION

1. At densities greater than that supported by degeneracy, the material inside a black hole convert from fermions to bosons. What type of boson is it?

2. Why at high temperature and low density, all statistics predict equivalently?
3. Why does quantum particles lose their distinguishability?

SCHRODINGER CAT PARADOX

1. Can gravity play a key role in destroying quantum superposition?
2. Will human teleportation ever possible?

MELDE'S STRING EXPERIMENT

1. Why are standing waves formed only when the medium is vibrated at specific frequencies?
2. Why are nodes alone formed at walls or boundaries?
3. Why are only antinodes formed at the open ends of a pipe?

LASER- DIFFRACTION GRATING

1. When we see an object, is it the diffracted image? If so, why we are not seeing more than one image at a time?
2. How can a photon having no mass and still travel?

I-V CHARACTERISTICS OF A SOLAR CELL

1. What type of electrical current I produced by solar panels. AC or DC?
2. Can we use solar panels to power a DC electric motor? How?
3. What limits the efficiency of solar cells?
4. What are the differences between solar panels and solar collectors?

NUMERICAL APERTURE OF AN OPTICAL FIBER

1. What happens when the numerical aperture of a fiber is zero?
2. How does the numerical aperture of a camera affect its resolution?

ADVANCED QUESTIONS

1. Why do we have equivalence between mechanical and electrical oscillators?
2. Why do we prefer phosphors for the production of photons in a CRT?
3. What is the difference between a spectrum analyzer and a cathode ray oscilloscope?
4. How do some smart phones enable us to see all of the emission spectra of light sources?
5. How certain wavelengths of light are used in forensic applications?
6. Which wavelength of light may fight fatigue round the clock?
7. Why do interference fringes due to air wedge have equal thickness?
8. Can gravitational waves from two or many events interact and cause constructive or destructive interference?
9. Why do radio waves and gamma rays pass through walls but visible light does not?
10. Does sound waves exhibit polarization?
11. Does Higg's Boson undergo Bose-Einstein condensation?
12. Does quantum entanglement provide communication at a velocity faster than that of light?
13. During an earth quake, buildings with a certain height may collapse more easily. Why?
14. What is the analogy between standing waves and matter waves?
15. Can you connect two computers with a laser data link?
16. How can solar cells bring a paradigm shift in the next generation energy production?
17. How is it possible to send a forward and backward message along the same cable?

ELECTRICAL & ELECTRONICS WORKSHOP

COURSE INFORMATION SHEET

PROGRAMME: **Electrical And Electronics Engineering**	DEGREE: **BTECH**
COURSE: **Electrical Workshop**	SEMESTER: **S2** CREDITS: **1**
COURSE CODE: **100908/CO922U** REGULATION: **2020 UG**	COURSE TYPE: **LAB**
COURSE AREA/DOMAIN: **ELECTRICAL WORKSHOP**	CONTACT HOURS: **1 hour/Week.**
CORRESPONDING LAB COURSE CODE (IF ANY): **NIL**	LAB COURSE NAME: **NIL**

SYLLABUS:

UNIT	DETAILS	HOURS
I A	Identification of cables, wires and switches	1
1B	Identification of fuses, MCB. ELCB	1
II	Wiring of simple light circuit for controlling light/ fan point. (PVC conduit wiring)	1
III	Wiring of light/fan circuit using Two way switches. (Staircase wiring)	1
IV	Wiring of Fluorescent lamps and light sockets (6A) with a power circuit for controlling power device. (16A socket)	1
V	Wiring of power distribution arrangement using single phase MCB distribution board with ELCB, main switch and Energy meter.	1
VI	Identify different types of batteries with their specifications.	1
VII	Demonstrate the Pipe and Plate Earthing Schemes using Charts/Site Visit.	1
TOTAL HOURS		8

TEXT/REFERENCEBOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION
R	Uppal S.L (2003) Electrical Wiring, Estimating and Costing, Khanna Publishers, Delhi.
T	Dhogal P S Basic Electrical Engineering I Tata Mc Grow Hill 2011
R	Singh R P. Electrical Workshop Safety, Commissioning, Maintenance and testing of electrical equipments I K International (P) Ltd 2013
R	AnwaniM.L ,Basic Wireman (Wiring, Estimating and Costing), Dhanpat Rai Publications (P) Ltd
T	Edward Hughes(Sept.2010), Electrical & Electronics Technology,(10thed.), Pearson Education India Ltd
R	Punmia B C(2005), Surveying Vol.1, (16thed), Laxmi Publications, New Delhi
T	T P Kanetkar and S V Kulkarni (1985), Surveying and Levelling, Part II,(23RDed), Pune VidarthiGriha Prakashan, Pune

COURSEPRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
-	Fundamental Physics	The course gives the students a general understanding of basic electrical	-

	(Grade XI & XII)	and electronic circuits	
-	Basic Mathematics	The course gives the students a general understanding of basic mathematical calculations and problems	-

COURSE OBJECTIVES:

1	Electrical Workshop is intended to impart skills to plan and carry out simple electrical wiring. It is essential for the practicing engineers to identify the basic practices and safety measures in electrical wiring.

COURSE OUTCOMES:

Sl. No.	DESCRIPTION	BLOOMS' TAXONOMY LEVEL
1	Demonstrate safety measures against electric shocks.	Knowledge [Level 1]
2	Identify the tools used for electrical wiring, electrical accessories, wires, cables, batteries and standard symbols	Comprehension [Level 2]
3	Develop the connection diagram, identify the suitable accessories and materials necessary for wiring simple lighting circuits for domestic buildings	Application [Level 3]

MAPPING COURSE OUTCOMES (COs) – PROGRAM OUTCOMES (POs) AND COURSE OUTCOMES (COs) –PROGRAM SPECIFIC OUTCOMES (PSOs)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1						3						1			
CO2	2									1					
CO3	2			1		1		1	2	2		2			
ESL 130	**2**	**0**	**0**	**1**	**0**	**2**	**0**	**1**	**1**	**2**	**0**	**2**	**0**	**0**	**0**

JUSTIFATIONS FOR CO-PO MAPPING

Mapping	L/H/ M	Justification
CO1-PO6	H	Student will be able to develop wiring arrangements that meets the specific needs with due consideration of the electrical safety aspects.
CO1-PO12	L	Student will get an initiation to explore various protective measures
CO2-PO1	M	Student will be able apply the knowledge about types of wires, cables & other accessories to propose innovative solutions in the area of domestic wiring
CO2-PO10	L	Students will be able to suggest appropriate back up supply based on the specific application

CO3-PO1	M	Student will be able to design wiring systems for domestic buildings applying the knowledge engineering fundamentals
CO3-PO4	L	Student will be able to analyze and solve the problems related to light and power circuits.
CO3-PO6	L	Students will be able to prepare estimate of wiring circuits considering the economic aspects
CO3-PO8	L	Will help the student for the better understanding of ethical principles and responsibilities in the area of energy conservation.
CO3-PO9	M	Students will conduct the experiments in groups thereby improving their ability to work as a team
CO3-PO10	M	Student will be able to identify and formulate engineering problems in wiring
CO3-PO12	M	Student will be able understand the need of energy conservation for sustainable development

GAPS IN THE SYLLABUS - TO MEET INDUSTRY/PROFESSION REQUIREMENTS:

Sl. No	DESCRIPTION	Proposed Action	RELEVANCE WITH POs	RELEVANCE WITH PSOs
1	Study of wiring tools and accessories	Familiarization of tools and accessories	PO1,PO3	-

PROPOSED ACTIONS: TOPICS BEYOND SYLLABUS/ASSIGNMENT/INDUSTRY VISIT/GUEST LECTURER/NPTEL ETC

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:

Sl. No	DESCRIPTION	Proposed Action	RELEVANCE WITH POs	RELEVANCE WITHPSOs
1	Hospital Wiring	Familiarization of Hospital Wiring	PO2,PO3,PO12	PSO1,PSO2

WEB SOURCE REFERENCES:

1	Bell & Gossett, Basic Wiring [Online], Available: http://www.gobookee.net/basic-home-electrical- wiring-diagrams/
2	Engineering Surveying [Online], Available: http://www. Isgi.polyu.edu.hk/geomatics/article/

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

□CHALK & TALK	□ STUD.ASSIGNMENT	□WEB RESOURCES	

□LCD/SMART BOARDS	□ STUD. SEMINARS	□ ADD-ONCOURSES	

ASSESSMENT METHODOLOGIES-DIRECT

□ ASSIGNMENTS	□ STUD. SEMINARS	□TESTS/MODEL EXAMS	□ UNIV.EXAMINATION
□STUD. LAB PRACTICES	□STUD. VIVA	□ MINI/MAJOR PROJECTS	□ CERTIFICATIONS
□ ADD-ONCOURSES	□ OTHERS		

ASSESSMENT METHODOLOGIES-INDIRECT

□ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	□STUDENT FEEDBACK ON FACULTY (TWICE)
□ ASSESSMENT OF MINI/MAJOR PROJECTS BYEXT. EXPERTS	□ OTHERS

Prepared by

Ms. Jayasri R. Nair, Fr. Mejo Paul, Ms. Prathibha P.K., Ms. Ms.Santhi B
Ms. Renu George, Mr. Unnikrishnan L
Ms.TintuPious

Approved by

(HOD)

COURSE PLAN

Day	*Date*	*Experiment*	*Cycle*
	22/05/2021	Introduction to EE Workshop	
1	29/05/2021	1.1 Study of Electrical Shock	I
2	5/6/2021	1.2 Study of Wires, Cables and Switches, Fuse	I
3	19/6/2021	2 One lamp controlled by One switch	I
4	26/6/2021	3 Staircase wiring	I
5	3/7/2021	4.1 Study of MCB, MCCB, ELCB	I
6	17/7/2021	Practice Tutorials	I
7	24/7/2021	4.2 Single phase distribution Board - Demo	I
8	31/7/2021	5 Wiring of Fluorescent Lamp, 6 A and 16 A plug	I
9	7/8/2021	6.1 Study of Batteries, 6.2 Study of Pipe and Plate Earthing	I
10.	04/09/2021	**End Semester Exam**	I

CYCLE I

1. Study of Electrical Shock, Wires, Cables and Switches
2. One lamp controlled by One switch
3. Staircase wiring
4. Study of fuses. MCB, ELCB &Single phase distribution Board - Demo
5. Wiring of Fluorescent Lamp, 6 A and 16 A plug
6. Study of Batteries & Study of Pipe and Plate Earthing

LIST OF EXERCISES / EXPERIMENTS

1. **a)** Demonstrate the precautionary steps adopted in case of Electrical shocks.
   b) Identify different types of **cables, wires, switches, fuses, fuse carriers**, MCB, ELCB and MCCB with ratings.
2. Wiring of simple light circuit for controlling light/ fan point (PVC conduit wiring).
3. Wiring of light/fan circuit using two way switches (Staircase wiring).
4. Wiring of Fluorescent lamps and light sockets (6A) with a power circuit for controlling power device. (16A socket)
5. Wiring of power distribution arrangement using single phase MCB distribution board with ELCB, main switch and Energy meter.
6. **a)** Identify different types of batteries with their specifications.
   b) Demonstrate the Pipe and Plate Earthing Schemes using Charts/Site Visit.

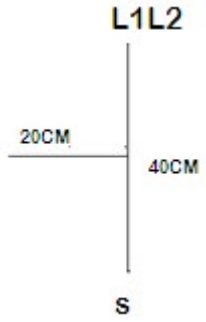
OPEN QUESTIONS

1. Draw the wiring of power distribution arrangement using single phase MCB distribution board with ELCB, Main switch and Energy meter.
2. Draw the circuit diagram for the measurement of voltage, current and power in single phase circuit using voltmeter, ammeter and wattmeter. Write the expression for power factor of the circuit.
3. In work area of kitchen the client desires to have one light and 5A plug point. Draw the circuit that satisfies the requirement with safety norms.
4. One lamp required at front yard and another at backyard of a house. Draw the layout and wiring diagram so that it can be controlled by one switch from bedroom.
5. Given three lamps, draw the layout and wiring diagram to operate the lamps in a sequential manner, i.e. only one lamp operates at a time.
6. One lamp required at front yard and another at backyard of a house. Draw the layout and wiring diagram so that, same can be controlled independently using two switches from bedroom.
7. A house owner wants one lamp at front veranda of the building. He requires the lamp to be operated from his bedroom as well as from his veranda. Draw the circuit with suitable layout.
8. House owner requires one lamp at veranda and one lamp at drawing room. But needs only one lamp to be bright at a time. Draw the wiring diagram with suitable layout.

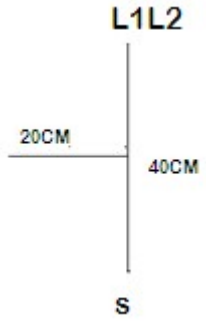
9. Draw the wiring diagram which is meant for switching on the lamp one by one while going forward and switching off the lamp one by one while returning back.

ADVANCED QUESTIONS

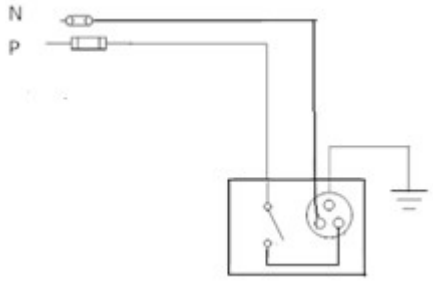
1. For the given layout having 2 lamps connected in parallel with one control switch, the minimum estimated cost in conduit wiring is



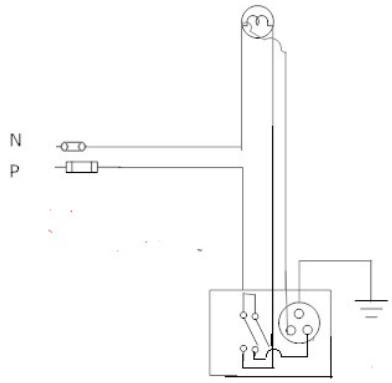
2. For the given layout having 2 lamps connected in series, the estimated cost in conduit wiring is



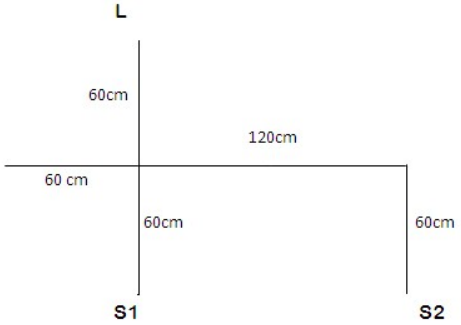
3. Estimated cost of given power circuit in casing and caping is----------(length of each section =20cm)



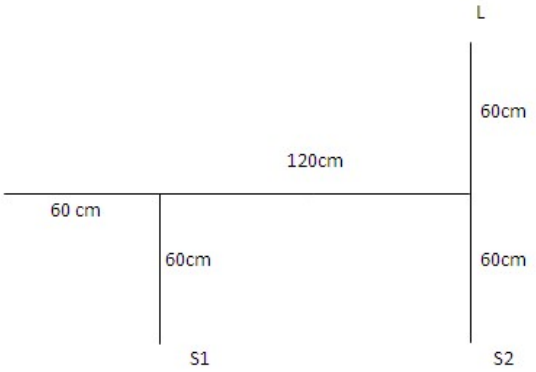
4. For the given wiring diagram the estimated cost in conduit wiring is ----------(length of each section =20cm)



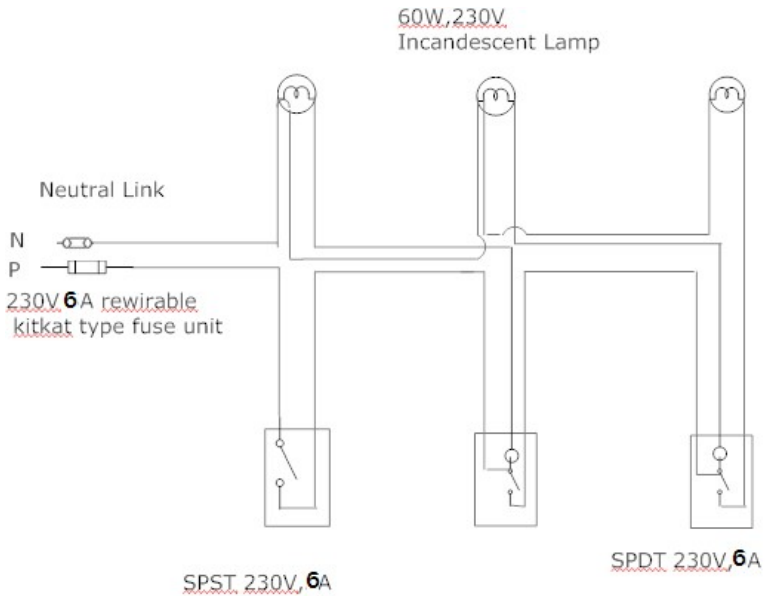
5. In a house one lamp needs to be controlled from drawing room as well as veanda. Estimated cost of conduit wiring of the same for the given layout is



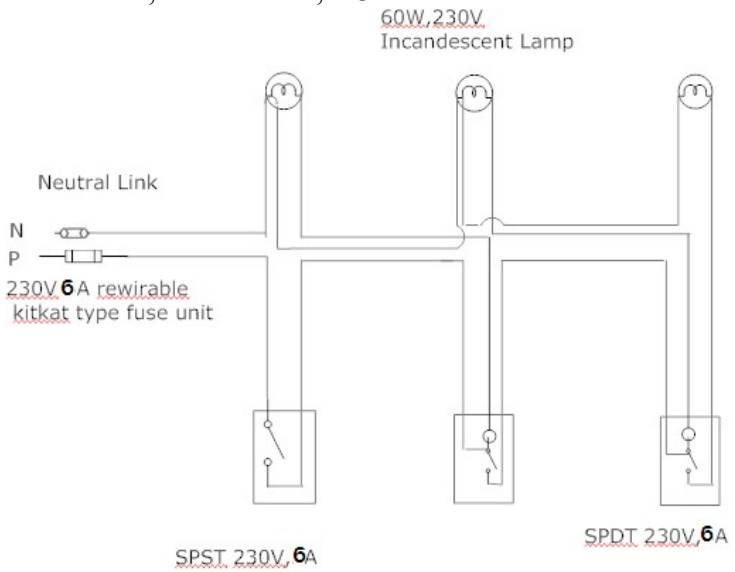
6. For the given layout the lamp is to be controlled from 2 different location. The estimated cost of the same in conduit wiring is



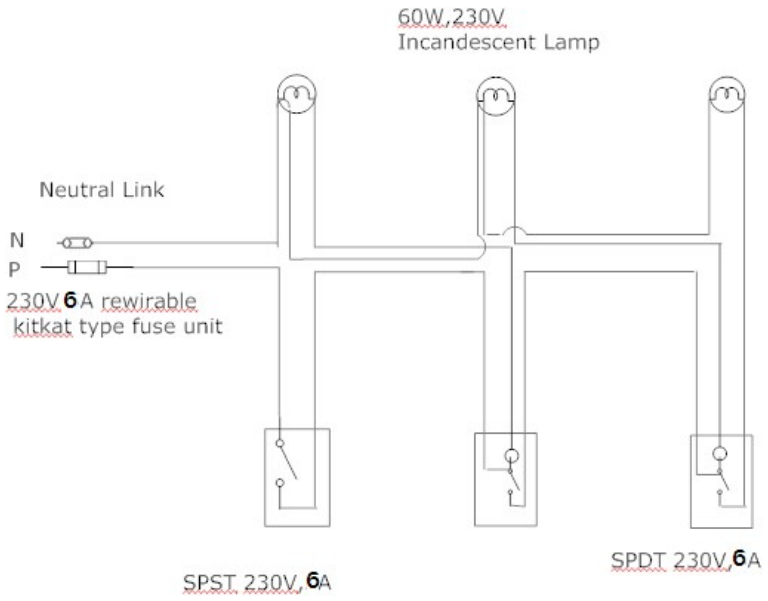
7. For the given condition which lamp will glow
S1-ON, S2-UP, S3-DOWN



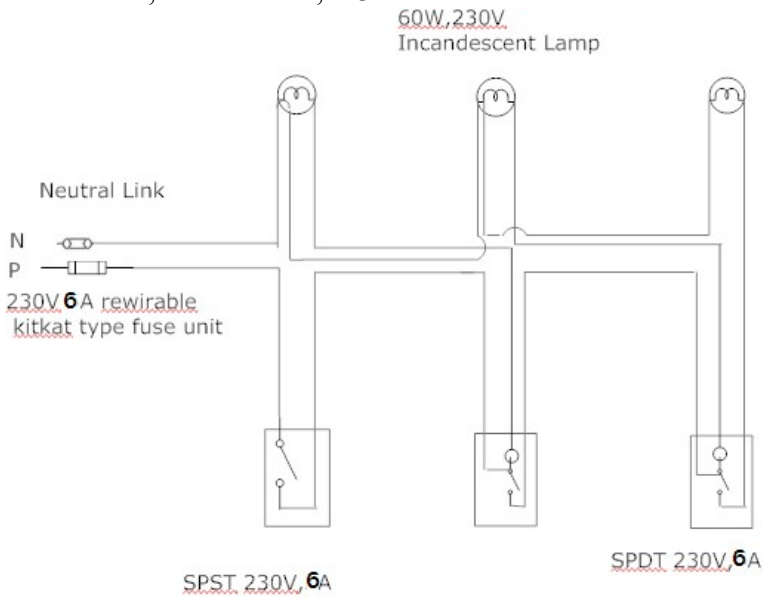
8. For the given condition which lamp will glow
   S1-ON, S2-DOWN, S3-DOWN



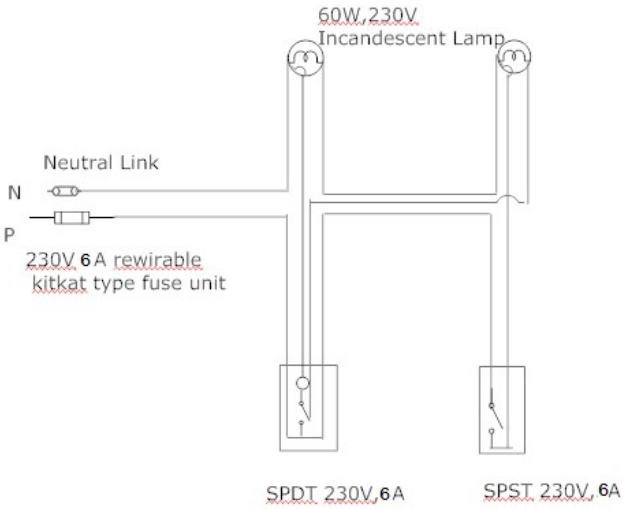
9. For the given condition which lamp will glow
   S1-ON, S2-UP, S3 -UP



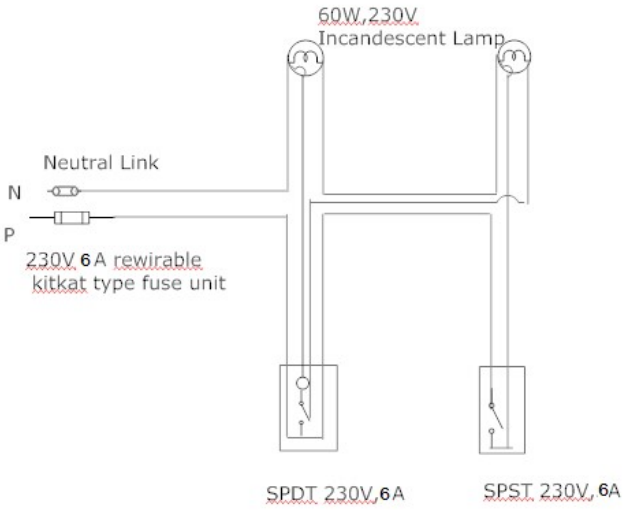
10. For the given condition which lamp will glow
S1-ON, S2-DOWN, S3-UP



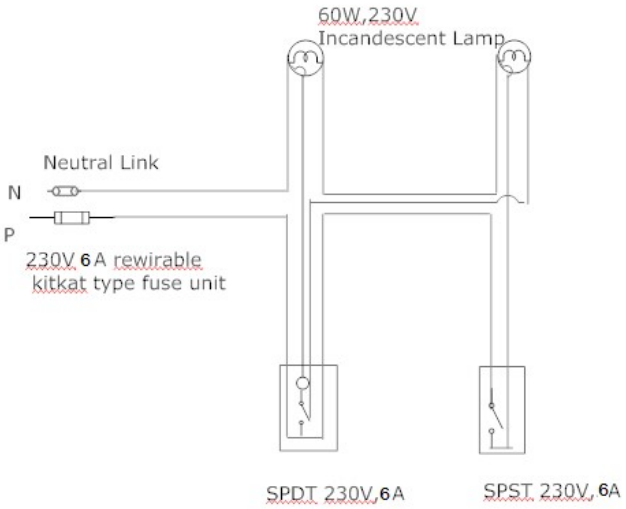
11. For the given condition which lamp will glow :S1-UP, S2-ON



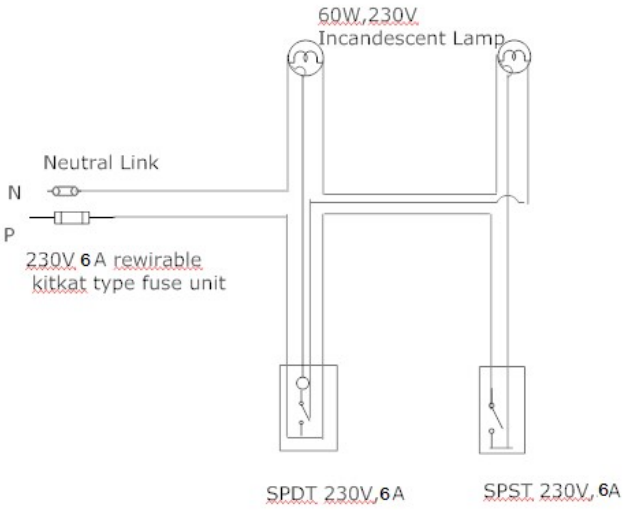
12. For the given condition which lamp will glow :S1-DOWN, S2-ON



13. For the given diagram in which condition both the lamps become parallel



14. For the given diagram in which condition both the lamps become series



ELECTRONICS WORKSHOP

COURSE INFORMATION SHEET

PROGRAMME: BTech in ECE	DEGREE: B. Tech
COURSE: Electronics Workshop	SEMESTER: 1 CREDITS: 1
COURSE CODE: 100908/CO922U REGULATION: 2019	COURSE TYPE: CORE
COURSE AREA/DOMAIN: Basics of Electrical and Electronics Engineering	CONTACT HOURS: 2 hours /Week.
CORRESPONDING LAB COURSE CODE (IF ANY): N.A	LAB COURSE NAME: N.A

SYLLABUS:

UNIT	DETAILS
1.	Familiarization/Identification of electronic components with specification (Functionality, type, size, colour coding, package, symbol, cost etc. [Active, Passive, Electrical, Electronic, Electro-mechanical, Wires, Cables, Connectors, Fuses, Switches, Relays, Crystals, Displays, Fasteners, Heat sink etc.)
2.	Drawing of electronic circuit diagrams using BIS/IEEE symbols and introduction to EDA tools (such as Dia or XCircuit), Interpret data sheets of discrete components and IC's, Estimation and costing.
3.	Familiarization/Application of testing instruments and commonly used tools. [Multimeter, Function generator, Power supply, DSO etc.] [Soldering iron, Desoldering pump, Pliers, Cutters, Wire strippers, Screw drivers, Tweezers, Crimping tool, Hot air soldering and de- soldering station etc.]
4.	Testing of electronic components [Resistor, Capacitor, Diode, Transistor and JFET using multimeter.]
5.	Inter-connection methods and soldering practice. [Bread board, Wrapping, Crimping, Soldering - types - selection of materials and safety precautions, soldering practice in connectors and general-purpose PCB, Crimping.]
6.	Printed circuit boards (PCB) [Types, Single sided, Double sided, PTH, Processing methods, Design and fabrication of a single sided PCB for a simple circuit with manual etching (Ferric chloride) and drilling.]
7.	Assembling of electronic circuits using SMT (Surface Mount Technology) stations.

8.	Assembling of electronic circuit/system on general purpose PCB, test and show the functioning (Any Two circuits). 1. Fixed voltage power supply with transformer, rectifier diode, capacitor filter, zener/IC regulator. 2. Square wave generation using IC 555 timer in IC base. 3. Sine wave generation using IC 741 OP-AMP in IC base. 4. RC coupled amplifier with transistor BC107.

TEXT/REFERENCE BOOKS:

T/R	AUTHORS "BOOK TITLE", PUBLICATION
1.	Bell. D. A , "Electronic Devices and Circuits", Oxford University Press
2.	Boylested, R.L Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education
3.	Kal. S "Basic Electronic Devices, Circuits and Fundamentals", PHI Learning
4.	Millman J, Hawkins C and Parikhu C D "Integrated Electronics", Tata McGraw Hill
5.	Neeman D.A "Electronics Circuit Analysis and Design", Tata McGraw Hill
6.	S M Dhir "Electronic Components and Materials", Tata McGraw Hills publishing company Ltd.
7.	Charles A. Harper, "Handbook of Components for Electronics",Laxmi Enterprise

COURSE PRE-REQUISITES: NIL

COURSE OBJECTIVES:

1	To get basic idea about types, specification and common values of passive and active components.
2	To familiarize the working of diodes and transistors
3	To understand the working of rectifiers and amplifiers
4	To provide an overview of evolution of communication systems, and introduce the basic concepts in radio communication

COURSE OUTCOMES:

Sl. No.	DESCRIPTION
CO 1	Describe working of a voltage amplifier.
CO 2	Outline the principle of an electronic instrumentation system.
CO 3	Explain the principle of radio and cellular communication.

CO-PO-PSO MAPPING:

	Programme Outcomes (POs)												Programme-specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO 1	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO 2	2	-	-	-	-	-	-	-	-	-	-	2	1	-	-
CO 3	2	-	-	-	-	-	-	-	-	-	-	2	2	-	-
ESL 130															

JUSTIFICATION FOR CO-PO-PSO CORRELATION:

	PO1	PO12	PSO1
CO1	Apply the basic knowledge of passive and active components for understanding the working of a amplifier		Acquire basic knowledge of basic electronic components and its operation, needed for problem analysis
CO2	Acquire a basic knowledge of rectifiers, regulators and instrumentation	Motivate the students to further explore their knowledge to quickly adapt to technology changes	Basic understanding of voltage regulators & instrumentation helps in analyzing wide range of problems
CO 3	Apply the basic knowledge of radio communication in solving problems encountered	Motivate the students to further explore their knowledge to quickly adapt to technology changes	Knowledge of radio communication helps in development of algorithms suitable for the mobile, IoT applications

GAPS IN THE SYLLABUS - TO MEET INDUSTRY/PROFESSION REQUIREMENTS:

SNO	DESCRIPTION	PROPOSED ACTIONS
1	Diode characteristic	Theory

PROPOSED ACTIONS: TOPICS BEYOND SYLLABUS/ASSIGNMENT/INDUSTRY VISIT/GUEST LECTURER/NPTEL ETC

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:

1	Transistor common emitter configuration.
2	Hobby circuits to practice "https://www.circuitstoday.com/simple-electronics-projects-and-circuits"

WEB SOURCE REFERENCES:

1	*https://nptel.ac.in/courses/117103063/*
2	*http://opencircuitdesign.com/xcircuit/*
3	*www.electronics-tutorials.ws*
4	*https://www.pcbway.com/blog/Engineering_Technical/Analysis_of_the_Methods_of_PCB_Interconnection.html*
5	*https://www.electronics-notes.com/articles/electronic_components/*

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☐ CHALK & TALK	☐ STUD. ASSIGNMENT	☐ WEB RESOURCES	
☐ LCD/SMART BOARDS	☐ STUD. SEMINARS	☐ ADD-ON COURSES	

ASSESSMENT METHODOLOGIES-DIRECT

☐ ~~ASSIGNMENTS~~	☐~~STUD. SEMINARS~~	☐ TESTS/MODEL EXAMS	☐ ~~UNIV. EXAMINATION~~
☐ STUD. LAB PRACTICES	☐ STUD. VIVA	☐~~MINI/MAJOR PROJECTS~~	☐~~CERTIFICATIONS~~
☐~~ADD-ON COURSES~~	☐~~OTHERS~~		

ASSESSMENT METHODOLOGIES-INDIRECT

☐ ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	☐ STUDENT FEEDBACK ON FACULTY (TWICE)
☐~~ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS~~	☐~~OTHERS~~

Prepared by **Approved by**

Dr. Poornima S **HoD (ECE)**

COURSE PLAN

Sl. No	Module	Planned Date	Planned
1	1	22-May-2021	Familiarization and Testing of Passive components and Introduction to Tinkercad
2	1	29-May-2021	Familiarization and testing of Passive components Part 2
3	1	5-Jun-2021	Familiarization and testing of Active components
4	1	26-Jun-2021	Familiarization of Switches, Electromechanical, Relays And Other Electronic components
5	1	17-Jul-2021	Assembling of Electronic Circuit

SL. NO	LIST OF EXPERIMENTS
1	Familiarization and Testing of Passive components and Introduction to Tinkercad
2	Familiarization and Testing of Passive components
3	Familiarization and Testing of Active Components
4	Familiarization of Switches, Electromechanical Relays and Other Electronic Components
5	Assembling of Electronic Circuit