

AN ARRSU KALAM
TECHNICAL
UNIVERSITY

SEMESTER I



MAP	COURSE SUBJECT AND LEVEL	CREDITS	P, CRREDIT		Year of introduction
			P	CREDIT	
MAP-100	Calculus I	900	3	3	2023

Possible: This course introduces students to some basic mathematical ideas and tools which are at the core of engineering courses. A brief overview can be given below. Functions associated with some basic techniques in mathematics, which are essential for analyzing linear systems. The calculus of functions of one or more variables taught in this course are useful in modelling and analysing physical phenomena involving continuous change of variables or parameters and hence applications across all branches of engineering.

Prerequisite: A basic knowledge in elementary mathematics and algebra theory.

Course Objectives: After the completion of the day, the student will be able to:

- (CO1) solve systems of linear equations, differentiation, continuity and theorems of calculus for functions of one variable.
- (CO2) compute the partial and total derivatives and maxima and minima of multivariable functions.
- (CO3) compute multiple integrals and apply them to find areas, volumes of geometrical shapes, mass and centre of gravity of planar laminae.
- (CO4) evaluate definite and improper integrals over a given area or volume, evaluate semi-implicit or conditionally convergent.
- (CO5) construct the Taylor series Taylor series expansions of functions and least error approximations.

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	3	3	2	2	2			3	3		2
CO-2	3	3	3	3	2	2			3	3		2
CO-3	3	3	3	2	2	2			3	3		2
CO-4	3	2	3	2	2	2			3	3		2
CO-5	3	3	3	2	2	2			3	3		2

Assessment Details

Blooms's Category	Continuous Assessment Tasks		Term Semester Evaluation Period
	Test 1 Material	Test 2 Material	
Remember	30	30	30
Understand	30	30	30
Apply	30	30	30
Analyze			
Evaluate			
Create			

Mark distribution

Total marks	CG marks	Max marks	Weighted score
20	20	100	0.1000

Continuous internal evaluation pattern

Summative 12 marks

Continuous Assessment Test (numbers)

assignments/Quizzes/online pretest

Assignments/Assignments should include specific problems highlighting the applications of the methods discussed in the course for science and engineering.

To deliver the syllabus pattern there will be two (two) tests A and tests B. Tests A consist of questions with 2 answers from each module, being 2 marks for each question. Students should answer all questions. Tests B consists of 2 questions from each module of which students should answer any one. Total student can have maximum 12 marks and can get marks.

Course level Assessment Questions

Course Outcome 1 (CO1): Solve systems of linear equations, diagonalize matrices and characterize such functions

1. If a real matrix of size 2×2 denoted $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$. What can you say about the solution of $AX = 0$?

(A) number of soln 1 or 2 or 3 or 4

2. If $\det(A) = \begin{bmatrix} 1 & 0 & 2 \\ 2 & 1 & 0 \\ -2 & 0 & 0 \end{bmatrix}$. Find an orthogonal matrix P that diagonalizes A.

3. Find all other sets of values for a in the following equation form a system

$$17x_1 + 20x_2 + 17x_3 = 110$$

4. The matrix $A = \begin{bmatrix} -2 & 1 & -6 \\ 2 & 1 & -6 \\ -1 & -7 & 0 \end{bmatrix}$ has an eigen value with corresponding Eigen vector $\begin{bmatrix} 1 \\ 2 \\ -1 \end{bmatrix}$.

Course Outcome 2 (CO2): Compute the partial and total derivatives and maxima and minima of multivariable functions.

1. Find the slope of the surface $z = x^2y + 2x^2$ at the point $(1, 2)$.

- Given the function $y = \ln(1-x)$, use integration to find the instantaneous rate of change of y with respect to x at $x = 0.25$, $y = \ln(0.75) \approx -0.29$.
- Determine the dimensions of rectangular tiles needed to tile. Having a volume is cubic ft and knowing the total amount of material for tiling is rectangular.

Course Outcome 2000B: compare multiple integrals and apply them to find areas and volumes of geometric shapes, mass and centers of gravity of plane laminae.

- Evaluate $\int_0^1 \int_{x^2}^{x+2} dy dx$ where Z is the region bounded by the parabola $y = 1-x^2$ and $x = 1-x^2$.
- Explain how you would find the volume under the surface $z = f(x,y)$ and over a specific region Z in the xy -plane using $2D$ visualized integral ($2D$ visualized integral).
- Find the mass and center of gravity of a triangular laminae with vertices $(0,0), (0,2), (2,0)$ if the density function is $\rho(x,y) = x+y$.
- Use cylindrical coordinates to evaluate $\int_0^{\pi} \int_0^1 \int_0^{r^2} dz dr d\theta$ where R is the unit ball centered at $\theta = \frac{\pi}{4}$ (so $r^2 = x^2 + y^2 + z^2 \leq 1$).

Course Outcome 3 (C3): perform various tests to determine whether a given series is convergent, absolutely convergent or conditionally convergent.

- What are the differences between a conditionally convergent and an absolutely convergent?
- Determine whether the series $\sum_{n=1}^{\infty} \frac{(-1)^n}{n^2}$ converges or diverges.
- What series $\sum_{n=1}^{\infty} \frac{(-1)^n}{n^2}$ is absolutely convergent? Conditionally convergent? Conditionally convergent?

Course Outcome 3 (C3): determine the Taylor and Maclaurin series expansion of functions and their applications.

- Assuming the possibility of expansion, find the Taylor series expansion of $f(x) = (1+x)^{-1}$ for $x < 0$ in terms of rational numbers. What happens if we do another integral?
- Let t be a real number, if $t \neq 0, -1$ and t is neither an integer nor a half-integer, then find the Taylor series of the function $f(t) = t^2 - 1 \leq t \leq 1, f(t+1) = f(t)$, using Bernoulli's identity $\sin(\pi t) = 1 - \frac{t^2}{1!} + \frac{t^4}{3!} - \dots = \sum_{n=0}^{\infty} (-1)^n \frac{t^{2n}}{(2n)!}$
- Repeat the function $f(x) = x$ for $x \in [-1,0]$ with a 10 term series. Do you notice some issues?

Q1 (Q3)

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Regd No. _____

Name: _____

**ANNUAL EXAM TECHNOLOGICAL UNIVERSITY MARCH 2018 DEGREE EXAMINATION
MARCH & APRIL**

Degree Order: 1001102

Date: March 2018

Duration: 3 hours

COURSE: MATHEMATICS

(2000 Scheme)

(Common to all branches)

2017 A

(Answer all questions, each question carries 2 marks)

1. Determine the rank of the matrix $A = \begin{bmatrix} 1 & 2 & -1 \\ -1 & -1 & 1 \\ 1 & 4 & -2 \end{bmatrix}$.
2. Write down the eigen values of $A = \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$ and the eigen values of $P^{-1}AP$, where $P = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$.
3. Define $\Delta(1,2)$ and $\Delta(1,3)$ for the function $f(x,y) = 2x^2y^2 + 3xy + 4x$.
4. Show that the function $v(x,y)$ is an $(n+1)$ solution of the equation $\frac{\partial v}{\partial x} = x^n \frac{\partial v}{\partial y}$.
5. Use double integration to find the area of the region enclosed between the parabolas $y = x^2$ and $y = 2x$.
6. Use polar coordinates to evaluate the area of the region bounded by $x^2 + y^2 = 4\sin \theta$, $0 \leq \theta \leq \pi$ and the y -axis in the first quadrant.
7. Find the convergence of the series: $T_0 = \frac{1}{2!}, T_1 = \frac{1}{4!}, T_2 = \frac{1}{6!}, \dots$
8. Find the convergence of the alternating series: $T_{2n} = (-1)^{n+1} \frac{1}{n!}$ for $n \in \mathbb{N}$.
9. Find the radius and center of convergence of $\sum_{n=1}^{\infty} \frac{x^n}{n}$.
10. Define the sequence which the Cauchy sequence

$$f(x) = 20 - x, 0 < x < 20 \text{ with } f(x+2\epsilon) = f(x) \text{ denotes}$$

Excess

[Answered full question from each module and question carries 10 marks]

Module - I

11. (a) Solve the following system of equations.

$$\begin{aligned}x + y - 2z &= 0 \\3x - 2y + 8z &= 2 \\4x + 3y - 7z &= 6\end{aligned}$$

(b) Find the eigenvalues and eigenvectors of the matrix $\begin{bmatrix} -1 & 1 & -2 \\ 1 & 1 & -1 \\ -1 & -1 & 0 \end{bmatrix}$

12. (a) Diagonalise the matrix
- $\begin{bmatrix} -1 & 2 & -2 \\ 1 & 4 & 1 \\ 1 & 2 & 0 \end{bmatrix}$

(b) What are the conditions the quadratic form $f(x) = 12x_1^2 + 5x_2^2 + 2x_3^2$ must satisfy to be positive definite?

Module - II

13. (a) Determine the linear approximation to
- $f(x,y) = \sqrt{x^2+y^2}$
- at the point
- $(3,1)$
- , use this approximation to find
- $\sqrt{10.2}$
- .

(b) If $y = e^{-x}(1+x^2)^{-1/2}$, calculate $y''(0)$ using the first two terms of the Taylor series expansion of y about $x = 0$.

14. If
- $z(t) = f(t,x)$
- , where
- $x = \cos t + i \sin t$
- , calculate

$$\left(\frac{dz}{dt}\right)^2 = \left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2$$

(c) Consider the mapping, rotation mapping and scaling process

$$f(x,y) = mx + ny + p \quad (m,n,p \in \mathbb{R})$$

Module - III

15. (a) Evaluate
- $\int_{\gamma} (x^2y + xy^2) dx$
- where
- γ
- is the upper arc from
- $(0,0) \rightarrow (1,0)$
- along the curve
- $y = x^2$
- .

(b) Evaluate $\int_{\gamma} (x^2 + y^2) dx$ changing the order of integration.

16. (a) Find the volume of the solid bounded by the surface
- $x^2 + y^2 = z$
- over the plane
- $z = 0$
- and
- $z = 1$
- ,
- $x, y \geq 0$
- .

(b) Evaluate $\int_{\gamma} (1 + x^2 + y^2)^{-1/2} dx$, where γ is the curve of revolution of the parabola $x^2 + y^2 = 1$, by transforming to polar coordinates.

Module - IV

17. (a) Test the convergence of the series

$$\text{(i)} \sum_{n=1}^{\infty} \frac{1}{n^2} \quad \text{(ii)} \sum_{n=1}^{\infty} \frac{(-1)^n}{\ln(n)}$$

(b) Determine the convergence or divergence of the series $\sum_{n=1}^{\infty} (-1)^n \frac{\ln(n)}{n^2}$.

18. (a) Check whether the series
- $\sum_{n=1}^{\infty} (-1)^n \frac{2^n}{(n+1)^2}$
- is absolutely convergent, conditionally convergent or divergent.

$$(ii) \text{ Test for convergence of the series } 2 + \frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + \dots$$

Module - V

(i) Define the Fourier series of $f(x) = e^x$ in the interval $0 < x < \pi$. Sketch $f(x) = e^x$ vs x and calculate the value of $\int_0^\pi e^x dx$.

$$(ii) \text{ Evaluate half range expansion of } f(x) = \begin{cases} 0 & 0 \leq x \leq \pi \\ \frac{\sin x}{x} & 0 < x < \pi \end{cases}$$

(iii) Define $|z| = \sqrt{x^2 + y^2}$ and Taylor series about $z = 0$ to show the regional convergence of the series.

(iv) Find the required sum of $f(x) = e^x$ using Leibniz formula with $n = 10$

$$\text{with } f(x+2\Delta) = f(x), \text{ where } \Delta = \frac{\pi}{20} = \frac{\pi}{40} = 0.07854$$

(see Q-10)

Module - VI

Module 1: Linear algebra

Class 1: Relevant topics from sections 1.2, 7.1, 7.2, 8.1, 8.2, 8.3

Systems of linear equations, solution by Gaussian elimination, row reduced form and rank of a matrix, homogeneous systems for linear equations, homogeneous and non-homogeneous, without pivot, eigenvalues and eigen-vectors, diagonalization of matrices, orthogonal transformation, quadratic forms and their properties.

Module 2: Multi-variable calculus (Revision of)

Class 2: Relevant topics from sections 10.1, 10.4, 11.1, 11.3

Concept of limit and continuity of functions of one variable, partial derivatives, directional derivatives, total linear approximations, chain rule, total derivative, Relative maxima and minima, Absolute maxima and minima on closed and bounded sets.

Module 3: Multi-variable calculus (Integration)

Class 3: Relevant topics from sections 14.1, 14.3, 14.4, 14.5, 14.6, 14.8

Double integrals (Cartesian), changing the order of integration, change of variables (parametric polar). Finding area and volume using double integrals, mass and centre of gravity of homogeneous laminae using double integrals, triple integrals, volume calculated as triple integral, triple integral in cylindrical and spherical coordinate transformations involving surface, volumes.

Module 6 (sequences and series)

Text 2: Relevant topics From sections 2.1, 2.3, 2.4, 3.2, 3.3

Convergence of sequences and series, convergence of geometric series and partial sum of a series, test of convergence (comparison, ratio and root tests, absolute, conditional), alternating series and absolute convergence.

Module 7 (series representation of functions)

Text 2: Relevant topics From sections 2.5, 2.6, Text 3: Relevant topics From sections 2.2, 2.3, 2.4, 2.5

Taylor series (absolute proof), assuming the possibility of power series expansion in appropriate domains, Fourier series and series representation of trigonometric, hyperbolic, logarithmic, functions (without proofs of convergence). Converges, Euler formula, Convergence of Fourier series (without a proof). Application of infinite series: Taylor's theorem (without proof).

Text Books

1. T. Apelian, *Elementary Calculus*, Wiley, 2010, 2nd edn.
2. G.E. Thomas and R.L. Finney, *Calculus and Analytic geometry*, 2nd edition, Pearson, Prentice, 2001.

Reference Books

1. J. Stewart, *Essential Calculus*, Cengage, 2nd edition, 2017.
2. G.E. Thomas and R.L. Finney, *Calculus and Analytic geometry*, 2nd edition, Pearson, Prentice, 2001.
3. James R. M. Bird, *Advanced Engineering Mathematics*, Cengage, 7th edition, 2011.
4. <http://math.mit.edu/classes/18.02/www/notes.html>.
5. D.S. Jones, *Higher Engineering Mathematics*, Pearson Publishing, 2nd edition, 2012.

Course Contents and Lecture Schedule

No	Title	No. of lectures
1	Linear Algebra (24 hours)	
1.1	Solutions of linear equations, solution by Gauss elimination	2
1.2	Geometric interpretation, finding rank from row echelon form, consistency, non-homogeneous linear system	3
1.3	Eigenvalues and eigenvectors	2
1.4	Diagonalization of matrices, orthogonal transformations, quadratic forms	4

and their associated terms		
2	Multi-variable calculus (Differentiation & Integrals)	
2.1	Difference of functions and continuity of functions of two variables, partial derivatives	3
2.2	Differentiable function, total derivative	2
2.3	Chain rule, total derivative	2
2.4	Extrema and minima	2
3	Multi-variable calculus (Integration) (2 hours)	
3.1	Double integrals - Definition - Evaluation	2
3.2	Change of variable in integrals - Double integrals, change of variables, Change of polar	2
3.3	Triple integrals	2
4	Sequences and series (8 hours)	
4.1	Convergence of sequences and series, geometric and p-series	2
4.2	Test for convergence (Comparison, ratio and root)	4
4.3	Alternating series and absolute and conditional convergence, test for divergence	2
5	Series representation of functions (8 hours)	
5.1	Taylor series, binomial series and representations of exponential, trigonometric, hyperbolic, logarithmic functions	3
5.2	Fourier series, Fourier integral, Convergence of Fourier series, Dirichlet's condition	2
5.3	Half range cosine and sine series, Parseval's theorem	2

ID	Programme Title Physics (Electromagnetism)	Category	1	2	3	4	5	Year of Introduction
			ELO	ELO	ELO	ELO	ELO	2020

Preamble: The aim of the Engineering Physics program is to offer students a solid background of the fundamentals of Physics and to impart that knowledge in engineering disciplines. The program is designed to develop students' attitudes and enable the students to understand the concepts of Physics in the core programme.

Prerequisites: Higher secondary level Physics, Mathematics, science or related subjects, optional courses and/or lab work.

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

CO1	compute the quantitative aspects of wave and oscillation in mechanics and acoustics
CO2	work the problem of light with matter through interference, diffraction and identify these phenomena in different media using various instruments
CO3	analyze the behavior of matter in the atomic and subatomic level through the principle of quantum mechanics to predict the microscopic processes in elements and atoms
CO4	apply the knowledge of Chemistry in the atomic level using the principles of quantum mechanics to predict the results and characteristics of atomic properties to provide a safe and healthy environment
CO5	apply the knowledge and concepts about wave and light propagation to explain the various engineering applications

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2				2	2		10	10	10
CO2	2	2				2	2			10	
CO3	2	2				2	2			10	
CO4	2					2	2			10	
CO5	2	2				2	2			10	

Assessment Scheme

Student Category	Continuous Assessment Tasks		Cumulative Continuous Internal
	Test 1: Partial	Test 2: Partial	
Enrolled	20	20	20
Unenrolled	20	20	20

ASSESSMENT	90	85	80
Exams			
Practicals			
Coursework			

Mark Distribution:

Total marks	Q1 Answers	Q2 Answers	Q3 & Question
200	20	20	20

Continuous Internal Evaluation Pattern:

Midterms = 22 marks

Continuous Assessment Total (2 numbers) = 22 marks

Assignment/Quiz/Case/practical = 22 marks

Final Examination: Examination Pattern: There will be four papers (Part A and Part B). Part A consists of 22 questions with 2 questions from each module, having 2 marks for each question. Questions should answer all questions. Part B consists of 2 questions from each module of which students should answer any one. Part C consists of two half maximum 2 questions and carry 22 marks.

Course Level Assessment Questions:

Course Outcome 1 (CO1):

1. Explain the effect of passing light through a prism.
2. Distinguish between converging and diverging lenses.
3. (a) Define an expression for the fundamental frequency of transverse vibration in a spherical mirror.
4. Calculate the fundamental frequency of a string of length 2 m weighing 8 g fastened to a load of 800 N.

Course Outcome 2 (CO2):

1. Explain refraction in thin lenses.
2. Distinguish between converging and diverging thin lenses.
3. (a) Explain the formation of images in a lens and state the expression for radii of images and focal lengths in refraction systems. Also explain how it is used to determine the wavelength of a monochromatic source of light.
- (b) If focal length of a concave lens is introduced between the lens and glass plate, what happens to the image formed by the concave lens?

Course Outcome 3 (CO3):

1. Give the physical significance of wave function?

3. (i) What are moments?
3. (ii) Calculate the change in gauge factor for a piezoelectric in a one-dimensional box and strain to change
gauge factor and normalized wave functions.
3. (iii) Calculate the Poisson's ratio and value of a diode in a one-dimensional box of width
 $3.47 \times 10^{-2} \text{ cm}^2$ with $\mu = 1000 \text{ eV}$.

Course Outcome 4 (CO4):

3. Explain how a system and its acceleration time:
3. How ultrasonic waves are used in non-destructive testing.
3. (i) With a neat diagram explain how ultrasonic waves are produced by a piezoelectric
accelerator.
3. (ii) Calculate frequency of ultrasonic waves that can be produced by a fixed rod of length 1.5
mm (Young's modulus $E = 227 \times 10^9 \text{ Nm}$, Density $= 1000 \text{ kg/m}^3$)

Course Outcome 5 (CO5):

3. Distinguish between systematic error and cumulative error.
3. Explain optical microscopy.
3. (i) Explain the construction and working of a telescope.
3. (ii) Calculate the numerical aperture and acceptance angle of a lens with a focal length
value of 1.24 and a working distance value of 0.20 when the lens has a numerical
aperture value 1.22.



Model Question paper

ST 0200

PH0202

Reg No. _____

Name: _____

JAYA KALYAN TECHNICAL COLLEGE, UNIVERSITY AVENUE, MARATHON & TICHOORAH EXAMINATIONS,
MARCH 2019 & MAY

Course Code: PTM 128

Course Name: Engineering Physics

Max Marks: 100

Duration: 3 hours

PART A

Answer all Questions. Each question carries 2 Marks.

1. Define normal and non-harmonic oscillations.
2. Distinguish longitudinal and transverse waves.
3. Write a short note on wave diffraction using Rayleigh's theory.
4. Define dispersion. Explain dispersion in terms of wave velocity. Give reason.
5. State and explain Rayleigh's Univerality principle. With the help of a system related diagram.
6. Explain surface tension and role of surfactants.
7. Define sound intensity level. Give the value of threshold of hearing and threshold of pain.
8. Describe the method of non-destructive testing using ultrasonic waves.
9. Define the condition of resonance in vibration.
10. Distinguish between real and general index of refraction.

(100-40)

PART B

Answer any one full question from each module. Each question carries 10 Marks

Module I

11. (a) State the differential equation of simple harmonic motion and discuss its solution. Discuss the cases of over damped, critically damped and under damped motion.

(10)

- (b) The frequency of a tuning fork is 512 Hz and its Q factor is 100. Find the resonance ratio. Also calculate the time after which the output becomes 1% of its initial amplitude. (4)
12. (a) Derive an expression for the velocity of propagation of a transverse wave in a string. (Assume linear mass density.) (2)
- (b) The equation of transverse vibration of a stretched string is given by $y = 0.02 \sin(2\pi ft) \text{ m}$, in which the numerical constants are in SI units. Calculate (i) Amplitude (ii) Wavelength (iii) Frequency and (iv) Velocity of the wave. (6)
- Module 3**
13. (a) Explain the formation of Vortex rings and show that the radius of the ring is proportional to the square root of natural numbers. (you can use Hooke's law) (4)
- (b) A student observes the motion of a piece of paper between two 45 cm long sticks. Find the angle of the sticks in seconds if the stick is rotated with a non-uniform speed of wavelength 4500 nm. Given $\mu = 0.0222 \text{ N}$. (4)
14. (a) Define the reflection due to a plane interface or grating. Derive the grating equation. (2)
- (b) A grating has 6000 lines per mm. What is the angular separation of the two adjacent elements of a primary interference pattern if the wavelength of light used is 570 nm? (2)
- Module 4**
15. (a) Write two dissociation and recombination half-life equations. (2)
- (b) An electron is subjected to one dimensional potential box of length 20. Calculate the energies corresponding to the first and second quantum states. (2)
16. (a) Classify semiconductors based on dimensionality of quantum confinement and explain the following terminologies (i) wide band (ii) narrow (iii) quantum dots. (3)
- (b) Calculate the binding energy of hydrogen atom when kinetic energy is 1.6 eV. (3)
- Module 5**
17. (a) Define insulation and insulation-loss. What is the significance of insulation-loss, insulation-res. factors affecting the accuracy of a building and their remedial measures? (3)
- (b) If the volume of a hall is 2000 m^3 , it has a total reservoir of 10000 litres. If the hall is filled with audience who add another 20 m^3 of air, then find the difference in insulation-loss. (3)
18. (a) With a neat diagram explain how ultraviolet waves are produced by photoelectric oscillator. Also discuss the photoelectric method of detection of ultraviolet waves. (3)

- (b) An ultrasonic source of 0.06 MHz emits three 4 pulse bursts. The first burst which occurs after 200 sec, the velocity of sound in the water is 1500 m/s. Calculate the depth of the sea and the wavelength of the pulse. [4]

Module 3

- (c) (i) Define the construction and working of Ruby laser. [3]
- (ii) What is the principle of holography? How is it done practically? [3]
- (iii) (a) Define numerical aperture of an eye lens and derive an expression for the NA of a ray incident on it. [3]
- (b) An optical fibre made with core of refractive index 1.5 and cladding with a fractional index difference of 0.0008. Give refractive index of cladding and numerical aperture. [4]

(1403450)



ENHANCED PHYSICS (FOR NON-ELECTRICAL)**Module 1:****Harmonic oscillations**

Harmonic oscillations, Damped Harmonic motion-Derivation of differential equation and its solution, Over damped, Critically damped and Under damped Case, Quality factor/Eigenvalue, Forced oscillations-Differential Equation-Derivation of expressions for amplitude and phase of forced oscillations, Resonance Frequency, Resonance frequency, Damping of Resonance, Electrical analogy of mechanical oscillators.

Wave motion, Derivation of wave dimensional wave equation and its solution, Three dimensional wave equation and its solution, the propagation, reflection, refraction methods and longitudinal waves, Transverse vibration in a stretched string, Dispersion of light in a prism.

Module 2:**Wave Optics**

Interference of light waves, Interference of waves, Theory of thin film - Coatings (Reflection, refraction), Derivation of the conditions of constructive and destructive interference, Interference due to wedge shaped films-Determination of thickness and wavelength phenomena, Newton's rings-Determination of wavelength and refractive index, Antinodes and anti-nodes.

Diffraction of light, Central and Diffraction pattern of diffraction, Diffraction grating-Deriving equation, Rayleigh criterion for limit of resolution, Resolving and Dispersive power of a grating with expression for dispersion.

Module 3:**Quantum mechanics & Nanoelectronics**

Introduction for the need of quantum mechanics, basic result of particle, wave-particle duality, Application of quantum theory to nucleus and atomic nuclei, Heisenberg Uncertainty principle, formulation of time dependent and time-independent Schrödinger wave equations-Practical application of wave function, Particle in a one-dimensional box-Determination for normalized wave function and energy eigen values, Quantum mechanical tunneling (tunneling)

Introduction to nanoscience and technology, Nanoscale surfaces to reduce costs for nanomaterials, Quantum confinement in one dimension, two dimension and three dimension-Nano physics, Nano wires and Quantum wire, Properties of nanomaterials-nanomaterials, electrical and optical, Applications of nanotechnology (quantum dot)

Module 4:**Micros & Ultrasonics**

Micros, classification of biomedical sono-therapeutic applications of medical ultrasound- $c = \sqrt{\rho \times \sigma}$, Resonance, effect of intensity-modulation of intensity (bio-molecules) on sono, Resonant cavitation, Resonance-Resonation, piezoelectric- behind the acoustic waves (bio-sensors), Micro-affecting architectural structures and their resonance

Ultrasound-therapeutic- hyperthermia effect, hyperthermia-therapeutic and Resonance heating-Warming, Detection of ultrasound waves - Thermal and Piezoelectric

waves, Ultrasonic instruments, Doppler for the velocity of ultrasonic waves in a liquid, Application of ultrasonic waves - SONAR and medical.

Module 2

Laser and Fibre optics

Properties of laser, Hologram and emission of radiation, Spontaneous and stimulated emission, Einstein's coefficients (absorption), Population inversion, Maltese cross, basic components of laser, Laser medium, Pumping mechanism, Optical resonator, cavity, working principle, Construction and working of Ruby laser and Helium neon laser, Generation and working of semiconductor laser, Applications of laser, Holography, Ultrasonics, Sonar, Sonogram and photograph, Recording of hologram and representation of image, Applications

Persepective of : propagation of light, Laws of reflection, refraction and lenses, Interference, Numerical aperture, Diffraction, Fiber optic communication system, Beam splitter, coupler, Modulator and photodiode applications, WDM, optical communication, modulated and phase modulated images

Text Books

1. D.J. Gossard, P.M. Veltkamp and M.A. Strobl "A textbook of engineering physics", Oxford Univ. Press, 2nd edition, 2008.
2. R.K. Pathria, A.C. Beale "Engineering Physics", Tata McGraw Hill Education, 2nd edition, 2007.

Reference Books

1. Arthur Beiser, "Concepts of modern Physics", Tata McGraw Hill Publications, New Delhi, 2003.
2. Eric Madelung, Roman Brandstetter, "Engineering Physics", Springer Universitext Press, 2008.
3. M.L. Manocha & K. Ganguly "Concepts of Engineering Physics", IITK Press, 2008.
4. Anubha S., "Engineering Physics", PHI Publ., 2002.
5. Jayant Chaturvedi, "Digital", Utkarsh KJ Publication, 2nd edition, 2007.
6. T. Venkateswaran, "Name The Essentials", Anupam K. Mehta, 2007.
7. S. K. Jain, "Lasers and their Applications", Pearson Education/Outstanding, 2nd edition, 2004.
8. P. K. Rao, "Advanced engineering physics", Phasor books, 2nd edition, 2001.
9. C. Venkateswara and A. Natarajan, "A textbook of engineering physics", CMC publications, 2nd edition, 2008.

Course Contents and Lecture Schedule

LC	Topic	No of hours
Objectives and Meets (1 hour)		
1.1	Harmonic oscillations, central forces; superposition of differentiable functions and its solution, linear algebra, linear algebra and linear differential theory, Fourier expansion.	2 hrs
1.2	Waves oscillations-differentiation/integration of functions for amplitude and phase of linear oscillations, analysis, Fourier transform for transient signals, quality factor and theorems of Parseval, Discrete and ergodic random oscillations	2.5 hrs
1.3	Wave motion-Dimension of one-dimensional wave equation and its solution, three-dimensional wave equation and its solution by separation	2 hrs
1.4	Distinguish between transverse and longitudinal waves, Transverse vibrations in stretched string, dimension of laws of vibration	2 hrs
Wave Optics (3 hours)		
2.1	Interference of light (principle of superposition of waves, Theory of thin film, Double slit, Diffraction grating), Dimension of interference and diffraction interference	1 hrs
2.2	Interference due to image stepped film, Dimension of thinness and size for optical phenomena, Sommer's rings, Measurements of wavelength and refractive index, Interference fringes	1 hrs
2.3	Diffraction of light, Fraunhofer and Rayleigh classes of diffraction, Diffraction grating-Diffraction grating	2 hrs
2.4	Diffraction minima for law of resolution, Beating and Interference process of a grating with successive interferences	1 hr
Quantum Mechanics (Electron Optics) (1 hour)		
3.1	Introduction for the need of Quantum mechanics, Wave nature of particles, De Broglie's postulate, Application/Useage of electron microscope in surface film broadening measurements	2 hrs
3.2	Formulation of time dependent and independent Schrödinger wave equations/Physics, Meaning of wave function, States in 1, 2, 3 dimensional box, correction for normalised wave function and orthogonality, Quantum Mechanical tunneling effect	4 hrs
3.3	Introduction to transmission and reflection models in surface to volume ratio for semimetallic quantum confinement in two dimension, two dimensional and three dimensional free space, free electron and quantum size	2 hrs
3.4	Properties of semiconductors-homogeneous, isotropic and cubic approximation of band structure (band filling)	1 hr
Assessment & Activities (3 hrs)		
4.1	Answers Classification of semimetallic band-structures, Characteristics	2 hrs

	• Noise reduction of Acousto-optic or intensity Measurement of noise (Gardasil) or 2002. Absorption coefficient, extinction-coefficient, absorption coefficient, beam's profile investigation	
4.2	Noise filtering methods and their concepts.	2 hr
4.3	Unabsorbed-light transmission effect and noiseless effect, measurement method and noiseless method - Working principle of Unsharp mask - Normal and Fuzzylogic methods	2 hr
4.4	Unsharp filter method: Derivation for the velocity of unsharp mask in a fixed Applications of unsharp mask (Sobel, PCT, and Median)	2 hr
B. Laser and Fibre optics / Beam		
5.1	Principle of laser, Application and example of laser, Semiconductor and Stimulus emission, Stimulus conditions for emission, Degradation process, Unstable state, basic components of laser, Gain medium, Pumping mechanism, Optical resonant cavity, working principle	2 hrs
5.2	Generation and control of laser beam and Pulse wave beam Generation and control of stimulated beam (Q-switch), Application of laser	2 hrs
5.3	Holography, Different between hologram and photograph, Recording of hologram and reconstruction of image, Applications	1 hr
5.4	Light Wave Division of, propagation of light, Types of Modulation and broad band filters, numerical aperture, resolution, Aberration, communication system (Basic diagram), Industrial, Medical and technological applications, Fiber optics, optical fiber modulated and Phase modulator sources	3 hrs

PH1 108	DISCRETE MATHEMATICS (Discrete Mathematics)	CATEGORY	I	II	III	CREDIT	TYPE OF ASSESSMENT
		MC	9	1	2	2	2024

Preamble: The aim of the Engineering Physics Program is to offer students a solid background in the fundamentals of Physics and its important knowledge in engineering disciplines. The program is designed to develop scientific attitudes and enable the students to correlate the concepts of Physics with the same in Engineering.

Prerequisite: Higher Secondary/Junior Physics, Mathematics (with vector analysis), differential equations and linear algebra.

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

CO1	Compute the quantitative measure of mass and oscillations in engineering systems.
CO2	Apply the interaction of light with matter through interference, diffraction and wavelet theory phenomena in different natural optical processes and optical instruments.
CO3	Analyze the behavior of matter in the particle and subatomic scale through the principles of quantum mechanics to analyze the energy changes in electronic devices.
CO4	Classify the properties of magnetic materials and apply vector calculus to solve magnetic field problems involving steady state current carrying conductors.
CO5	Apply the principles behind various communication techniques, explain the working of wireless lighting fixtures and their applications in society.

Mapping of learning outcomes with competencies

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

Assessment Pattern

Student's Category	Continuous Assessment Tasks			End Semester Examination (Marks)
	Test 1 (Marks)	Test 2 (Marks)	End Semester Examination (Marks)	
Competent	20	20	20	20
Unacademically	20	20	20	20
Not	20	20	20	20

Analysis			
Evaluation			
Design			

Work Distribution

Total marks	1st marks	2nd marks	Mid Session
20	10	10	5 marks

Continuous Internal Evaluation Pattern:

Assessments	10 marks
Continuous Assessment Test (2 numbers)	10 marks
Assignment (Quiz/Class test process)	10 marks

Mid Semester Examination Pattern: There will be two parts Part A and Part B. Part A consists 10 questions with 2 questions from each module. Having 5 marks for each question. Outcome should answer all questions. Part B consists 5 questions from each module of which student should answer 4. Total system will have maximum 2 sub-sections and total 40 marks.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Explain the effect of varying force on oscillations.
2. Distinguish between resonance and longitudinal waves.
3. (a) Derive an expression for the fundamental frequency of resonance classifier in a stretched string.
4. Calculate the fundamental frequency of a string of length 6 m weighing 6 g if it is attached to a load of 600 g.

Course Outcome 2 (CO2):

1. Explain various wave forms.
2. Distinguish between fixed and free modes of vibration.
3. (a) Explain the formation of standing waves and obtain the expression for ratio of length and standing waves in different systems. Also explain how it is useful to determine the wavelength of a monochromatic source of light.
- (b) Effect of refraction index on reflection between the lens and glass sheet.

What happens to the energy spectrum? Justify your answer.

Course Outcome 5 (CO5):

1. State the physical significance of wave function?
2. What are oscillators?
3. (a) Define Schrödinger's equation for particle in a one-dimensional box and derive its energy eigen values and normalized wave functions.
(b) Calculate the first three energy values of hydrogen in a one-dimensional box of width 1.17×10^{-10} m.

Course Outcome 6 (CO6):

1. Compare dielectric constant and conductivity.
2. Illustrate with four properties of ferromagnetic materials.
3. (a) Starting from Maxwell's equations, derive the free space electromagnetic wave equation and show that velocity of electromagnetic wave is $c = (\epsilon_0 \mu_0)^{1/2}$.
(b) An electromagnetic wave is absorbed by $R = 100$ mg Fe ($10^{-11} \text{ kg} = 10^{11} \text{ g}$) / cm. Find the direction of propagation of the wave if the mass and magnetic field density in the wave is

Course Outcome 7 (CO7):

1. Explain the meaning of Afferent cell.
2. Distinguish between Type I and Type II superconductors.
3. (a) Define hysteresis loop and discuss its applications.
(b) Explain the meaning of memory modulated thin film sensor.

Mental Question paper

On Date:

Page No.

Page No. _____

Name: _____

**ANNA UNIVERSITY TECHNOLOGICAL UNIVERSITY RAILWAY & TECH DEPT EXAMINATION
NORTH E. PAPER**

Course Code: PH1008

Course Name: Engineering Physics 4

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all Questions. Each question carries 4 Marks

1. Define critical and marginal velocities.
2. Define diffraction and interference effects.
3. What is photoelectric effect? Explain.
4. Define angle of deviation and dispersive power. What do they indicate?
5. State and explain the meaning of Compton's principle. With the help of a graph, illustrate the meaning.
6. Define surface reflection coefficient.
7. State Huygen's law of diffraction of waves.
8. Compare de Broglie wave and classical wave.
9. List four important applications of superconductors.
10. Give the working principle of LED.

(100x4=40)

Page No.

Answer any one full question from each module. Total question carries 16 Marks

Module I

11. (a) Define the differential equation of simple harmonic motion and measure the solution time for the case of mass-spring system under constant force. (10)
(b) The frequency of a tuning fork is 500 Hz and its Q factor is $10\pi^2$. Find the relaxation time. Also calculate the time after which its energy becomes 1/200 of its initial undamped value. (10)
12. (a) Calculate expression for the velocity of propagation of a transverse wave in a stretched string. Deduce law of transverse vibrations. (10)
(b) The equation of transverse vibration of a stretched string is given by $y = 0.00027 \sin(72\pi t - 2.75\pi y)$, where the numerical constants are in SI units. Calculate (i) amplitude (ii) wavelength (iii) frequency and (iv) velocity of the wave. (10)

Module 2

13. (a) Explain the formation of Newton's rings and show that the radius of dark ring is proportional to the square root of natural numbers. Then calculate the Newton's rings separation distance due to the diffraction of a laser. (10)
(b) Two pieces of plane glass are placed together with a gap of 10^{-3} mm between them and form an angle of 12° at one end. If the $\text{He}-\text{Ne}$ laser is viewed with a monochromatic light of wavelength 632.8 nm . Given $f = 0.00001 \text{ m}$. (10)
14. (a) Explain the diffraction due to a plane transverse grating. Draw the grating equation. (10)
(b) A grating has 6000 lines per cm. What the angular separation of the two yellow lines of incandescence of wavelength 600 nm and 650 nm ? (Assume $\sin \theta = \tan \theta$). (10)

Module 3

15. (a) Define Compton effect and derive Compton Scattering equations. (10)
(b) An electron is confined to one-dimensional potential box of length $2L$. Calculate the energies corresponding to the first three atomic quantum states in eV. (10)
(c) Classify fermions and bosons by dimensionality of quantum confinement and explain the following terminologies. (i) mesophase (ii) mesocones (iii) quantum dots. (10)
(d) Find the de-Broglie wavelength of electron whose kinetic energy is 10 eV . (10)

Module 4

16. (a) State Rayleigh's Theorem. Calculate the value of Rayleigh losses at the surface of the sun if the power radiated by the sun is $3.3 \times 10^{26} \text{ W}$ and its radius is $7 \times 10^8 \text{ m}$. (10)

- (b) Distinguish between paramagnetic, diamagnetic and ferromagnetic materials. [5]
- (c) Starting from Meissner-Ochsenfeld, derive diamagnetic levitation in terms of [10]
- (d) An inductor of $10 \mu\text{H}$ carries a current of 10A . The magnetic field is 10G . [4]

Module 3

- (e) Show that superconductors persist diamagnetic. Distinguish between Type I and Type II superconductors with suitable examples. [10]
- (f) Write a short note on high-conductance superconductors. [4]
- (g) Define natural aspiration of an insulating fibre and define an insulation factor of a fibre with a mean diameter. [2]
- (h) Calculate the numerical aperture and acceptance angle of a fibre with a core refractive index of 1.33 and a cladding refractive index of 1.20 when the fibre is made under a relative index 1.25. [4] (Total: 40)



**2nd Year Undergrad
2004-2005 Academic Year**

Module 1: **Oscillations and Waves**

Harmonic oscillators, Complex harmonic motion, Derivation of differential equations and its solution, Over-damped, Critically damped and under-damped cases, Quality factor, Damping ratio, Forced oscillations, Differential Equation, Derivation of expressions for amplitude and phase of forced oscillations, Amplitude resonance, Resonance for constant frequency, Quality factor and Q-factor of resonance, Resonant analogy of resistance oscillators.

Wave motion, Definition of one dimensional wave equation and its solution, Three dimensional wave equation and its solution, One dimensional, longitudinal, transverse and longitudinal waves, Transverse vibration of a stretched string, Treatment of laws of vibration.

Module 2:**Wave Optics**

Interference of light, Principle of superposition of waves, Theory of thin lens - Gaussian law / Rayleigh criterion, Conditions of the conditions of constructive and destructive interference, Interference due to Young's double slit, Determination of thickness and size of optical elements, Fresnel's zone, Measurements of wavelength and refractive index, Interference fringes

Diffraction of light, Fresnel and Fraunhofer theory of diffraction, Diffraction going along Rayleigh equation, Rayleigh criterion for limit of resolution, Resolving and Diffraction power of a grating with expression (no derivation)

Module 3:**Quantum Mechanics & Nanotechnology**

Introduction to the need of quantum mechanics, basic idea of symbols, uncertainty principle, Applications - States of electron - orbit & orbital and - recoil free bremsstrahlung mechanism, Formulation of Schrödinger and Heisenberg Schrödinger wave equations - Physical meaning of wave function, Hydro in a two dimensional box derivation for normalized wave function and energy eigen values, Quantum Mechanical Tunneling (Quantum)

Introduction to nanoscience and technology, Relation in surface to volume ratio for nanotechnology, Quantum confinement in one dimension, Two dimensional and three dimensional band theory, Fermi energy and Quantum size, Properties of nanomaterials - mechanical, electrical and optical, Applications of nanotechnology (sufficient area).

Module 4:**Magnetics & Electro Magnetic Theory**

Magnetic field and magnetic flux density, Gauss's law for magnetic flux density, Ampere's Circuital law, Faraday's law in terms of EDD produced by changing magnetic flux, Magnetic permeability and susceptibility, Classification of magnetic materials - air and ferromagnetic materials.

Fundamentals of vector calculus, concept of divergence, gradient and curl along with physical significance, line, surface and volume integrals, Green theorem, Stokes theorem & Divergence theorem, Evaluation of contours, evaluation of Green's theorem in vector, comparison of displacement contours with circulation-current, electrostatics vector, velocity of discontinuities waves in PDE, Role of divergence, Faraday's law (derived).

Module 3:

Superconductors & Photonics

Superconducting phenomena, Meissner effect and surface diamagnetism, Types of superconductors - Type-I and Type-II, BCS Theory (Qualitative), High temperature superconductors-Legislations of superconductivity.

Introduction to photonics-Principle of wave optics, Optic fiber, Light, Principle of propagation of light, Types of fibers-optical and coaxial fiber, Fiber, reflection, optical resonance, Fiber optic communication system (Block diagram), Materials, Optical and Technological applications of optical fiber, Fiber optic sensors-sensors Uniqueness and Fiber mediated sensors.

Text Books

1. A.K. Pandey, "Electromagnetic Field and Waves" (A Text book of Electromagnetic Waves", 2nd Edn., Revised Edition 2010)
2. R.L. Boyle, A.C. Pipkin, "Engineering Physics" (McGraw-Hill Education, India Edition 2017)

Reference Books

1. Gaurav Kumar, "Concepts of Classical Physics", Tata McGraw-Hill Publications, 2nd Edition, 2003.
2. G.J. Thethathiva, Venkateswaran, "Fundamentals of Physics", Oxford University Press, 2015.
3. M.S. Bhattacharya & S. Bhattacharya, "Principles of Electromagnetic Waves (Vol-I)", Cambridge University Press, 2012.
4. Avinash K. "Engineering Physics", PHI Ltd., 2012.
5. Ajay Ghosh, "Concepts of Physics", McGraw-Hill Education, 2nd Edition, 2017.
6. T. Prasanna, "Name the Associate", McGraw-Hill India, 2007.
7. Anthony Zeeves, Walker, "Fundamentals of Optics", John Wiley & Sons Inc., 2008.
8. Gautham Dharmaraj, "Introduction to Electromechanics", Springer-Verlag publishing, 1st Edition, 1999.
9. Renuka B., "Advanced Engineering Physics", Phoebus Books, Collected.
10. J. Deonia and A. Salter, "A Text Book of Engineering physics", Civil Books Publishers, Revised edition 2016.

Course Contents and Lecture Schedule

No.	Topic	in minutes
1	Introduction and Review (3 hours)	
2.1	Harmatt oscillations, Damped harmonic motion/oscillation of differential equation and its solution, Over damped, Critically damped and Under damped cases, Quality Factor/Q-factor	2 hrs
2.2	Normal oscillations (Differential Equation)-definition of resonance for analysis and types of forced oscillations, Resonance mechanism for Acoustic frequency, Quality factor and the types of Resonance, Divergence theory of mechanical oscillations	2 hrs
2.3	Mass-spring connection of one dimensional mass connected to spring, Three dimensional mass connected to three dimension spring	2 hrs
2.4	Dimensionless variables and Frequency ratio, Transformation of variables and visualization, Statement of laws of vibration	2 hrs
2	Free Oscillations (3 hours)	
2.5	Mechanics of Spherical waves, superposition of waves, Theory of standing waves in (Infinite column), Derivation of the conditions of superposition and standing waves	2 hrs
2.6	Superposition due to moving source, Time-Derivative of displacement and time for typical parameters, Doppler's effect - Measurement of wave amplitude and frequency due to interference methods	2 hrs
2.7	Diffraction of light, Fraunhofer and Fresnel diffraction of diffraction, Diffraction grating, Grating equation	2 hrs
2.8	Rayleigh criterion for (max. of intensity, Resolving and Diffraction power of a grating with respect to wavelength)	2 hrs
3	Quantum Mechanics & Nanotechnology (3 hours)	
3.1	Introduction for the need of Quantum mechanics, Wave nature of particles, Uncertainty principle, Applications/uses of quantum mechanics and unusual fine broadening phenomena	2 hrs
3.2	Commutation of some operators and commutation Schrödinger wave equation-Physical meaning of wave function, Relation in 1-D, 2-D, 3-Dimensional free. Derivation for normalized wave function and energy eigen values, Quantum mechanical tunneling localized	2 hrs
3.3	Introduction to nanoscale and nanotechnology, Relation of surface to volume ratio for nanoparticles, Quantum confinement in two dimensions, two dimension and three dimension-wave packets, Nano wires and quantum dots	2 hrs
3.4	Principles of nanoelectro-mechanical, electrical and optical applications of nanotechnology (bioactive, biofuel)	2 hrs
4	Magnets & Electromagnetic Theory (3 hours)	
4.1	Magnetic field and magnetic flux density, Gauss law for magnetostatics	2 hrs

	Wenckebach, Debye's, Onsager's law, Debye-Hückel law, law of Raoult, produced by changing magnetic field.	
4.1	Explanation for magnetic permeability and susceptibility (Classification of magnetic materials, para, dia and ferromagnetic materials)	1 hr
4.2	fundamentals of molecular current of charge carriers, motion and spin along with charge separation, net surface and volume magnet, second harmonic theory & optical magnet.	1 hr
4.3	Explain of complete induction of magnetic charges in circuit, comparison of displacement current with conduction current, electromagnetic waves, source of electromagnetic waves in free space, flow of electric field through loop in connection	4 hrs
5	Superconductivity (Bose-Einstein theory)	
5.1	Super conducting properties, Meissner effect and surface diamagnetic type of superconductivity mechanism	1 hr
5.2	BCS theory (Bardeen, Cooper, Schrieffer), mechanism of superconductivity	1 hr
5.3	Introduction of phonon-Phonon co-existence binding model, Hess-Pauli wave function and Fermi-Dirac distribution, calculation of thermal field	1 hr
5.4	qualitative analysis of temperature effect, types of superconductors and their role, flux, magnetic excess, magnetic field cancellation system, Meissner effect, induced, Meissner, thermological analysis of super fluid, flux quantization, magnetic fluxoid and flux quantized current	1 hr



CIT 300	Induced Disorders	SEMESTER	1	2	3	CREDIT	CRITERIA OF ASSESSMENT
			002	0	0		

Prerequisite: To enable the students to acquire knowledge in the concepts of chemistry for engineering applications and to familiarise the students with different application related topics like thermodynamics, stoichiometry, volumetric methods etc. It familiarises the students with topics like: materials of corrosion, corrosion prevention methods, basic considerations, polymers, crystallisation etc., which results the basic design abilities and skills that are relevant to the study and practice of chemistry.

Prerequisite courses of chapters included in the syllabus (both in addition)

Course outcomes: After the completion of the course the students will be able to:

- CO1 Acquire the basic concepts of stoichiometry and corrosion to explore its possible applications in various engineering fields.
- CO2 Understand various corrosion control techniques available in nature and its applications.
- CO3 Acquire the knowledge of various method for characterising a chemical structure of a compound. Understand the basic concept of Zeta for surface characterization of nanomaterials.
- CO4 Learn about the basic of thermodynamics and its application. Apply the knowledge of evaluating polymers and advanced polymers in engineering.
- CO5 Identify various types of colour indicators methods to develop skills for testing processes.

Mapping of learning outcomes with program outcomes

	POL	POL2	POL3	POL4	POL5	POL6	POL7	POL8	POL9	POL10	POL11	POL12
CO1	0	2	1									
CO2	0	2		1	2							
CO3	0	2		1	2							
CO4	0	2										
CO5	0			1			1					

Assessment Outline

Student's Category	Continuous Assessment Tasks	Total Semester Examination
Attendance	1	1
Understanding	18	18
Apply	12	12
Analyze		
Evaluate		
Create		

Total Semester Examination weightage: There will be two parts- Part A and Part B. Part A contains 28 questions (3 questions from each module), having 2 marks for each question. Student should answer all questions. Part B contains 8 questions from each module, of which student should answer any 6, each question carrying maximum 1 mark each and carries 12 marks.

Course Level Assessment Questions**Source Outcome 1 (SO 1)**

- Q. 1) Write a balanced chemical equation for reduction reaction
[2 Marks]
 Q. 2) List three important advantages of environmental reaction
[3 Marks]
 Q. 3) Write four chemical reactions during photosynthesis and respiration.
[3 Marks]
 Q. 4) Calculate the % of the following salt at 20°C, $C_6H_{10}O_6 \text{ (200)} / \text{Na}^+ \text{ (23)}$.
 $\text{Given } K_f^{20^\circ\text{C}} \text{ of } \text{Na}^+ = 0.79 \text{ V, } F = 96500 \text{ C}$.
[3 Marks]

Source Outcome 2 (SO 2)

- Q. 1) Name four common acids
[3 Marks]
 Q. 2) List the important applications of C compounds
[3 Marks]
 Q. 3) What is Chromic(VI) salt? What are their uses? Chromic acid reacts with 1 mol of iron(II) sulphate to form red colour using the concept of chemical shift.
[3 Marks]
 Q. 4) Calculate the total content of Na in sodium trifluoro-methanesulfonate $\text{NaO}_2\text{S}(=\text{O})_2\text{CF}_3$, when the atomic masses of hydrogen and fluorine are 1 and 19 u respectively.
[3 Marks]

Source Outcome 3 (SO 3)

- Q. 1) Distinguish between TGA and DTG
[2 Marks]
 Q. 2) Give four differences between GPC and SPC
[3 Marks]

1. (a) Explain the principle, components and processes of HCL.	[2 Marks]
(b) molecular formula of $\text{C}_2\text{H}_5\text{OH}$.	[4 marks]
Outcome Outcome # 800-16	
2. Define the functional isomers in acids/bases.	[2 marks]
3. When are functional groups 10% ionised?	[2 marks]
4. (a) If HCl is dissociating completely how it is depicted? Give the structure of polyacrylic acid.	[2 Marks]
(b) Draw the structure of a possible for $\text{C}_2\text{H}_5\text{OH}_2\text{O}_2$.	[4 marks]
Outcome Outcome # 800-17	
1. What is degree of freedom?	[2 marks]
2. Define 1000 and 2000.	[2 marks]
3. (a) Explain the IUPAC nomenclature of ketones.	[2 Marks]
(b) Standard heat water contains 22 g of CaCO_3 per litre. If we require 100 ml of 87.5% solution, form of which water required form of 100% solution form, which water after boiling required 14 ml 87.5% solution. Calculate the necessary percentage of the given amount of water in terms of ppm.	[4 Marks]

Wastewater Management

Final Page

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Page No. _____

AMRITSAR JAGJIT SINGH TECHNOLOGICAL UNIVERSITY
WATER 2013-2014 CLASSIFICATION QUESTION PAPER

Course Code: ENM101

Course Name: ENVIRONMENTAL CHEMISTRY

Max. Marks: 120

Duration: 2 hours

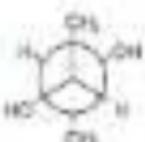
PART A

Answer all questions, each carries 2 marks

1.	What is polarisability (dielectric) ? How this and polarity determine solubility?	2
2.	What is Cahn-Ingold-Prelog's rule? It differentiates between enantiomeric forms?	2
3.	Which of the following molecules can give 3 isomerism? Give reason?	2
(a) C_2H_6	(b) H_2O	(c) CH_3OH
4.	Which of the following molecules shows UV visible absorption? Give reason.	2
(a) Ethene	(b) Butane	(c) Benzene

1. Differentiate the visualisation techniques used in TGA
2. State the three important applications of chromatography.
3. Draw the Coates propagation formula and find $k_{\text{A}}^{\text{obs}}$ given $k_{\text{P}} = 10^{-4} \text{ L} \cdot \text{mol}^{-1} \cdot \text{min}^{-1}$, $k_{\text{I}} = 10^{-3} \text{ min}^{-1}$, $k_{\text{d}} = 10^{-2} \text{ min}^{-1}$, $[M]_0 = 10^{-2} \text{ mol L}^{-1}$, $[A]_0 = 10^{-3} \text{ mol L}^{-1}$, $T = 400 \text{ K}$.

20
16
16



4. Write the structures of all polyacrylates formed
when $\text{CH}_2=\text{CHCOOCH}_3$ reacts with
a) $\text{CH}_2=\text{CHCOOCH}_3$
b) $\text{CH}_2=\text{CHCOOCH}_2\text{CH}_3$

8
8
8

PARTS

Answer any one full question from each module, and question carries 20 marks

Module 1

11. a) Describe the construction of a dry cell. Give the reactions that take place in the electrodes during charging and discharging. What happens to anode material when the cell is 100% charged?
b) Calculate the standard electrode potential of Cu_2 if its reduction potential at -28°C is -0.238 V and the concentration of Cu^{+2} is 0.010 M .
12. a) Explain the mechanism of photochemical conversion of benzene to benzene-1-oxide in acidic wet bath environment.
b) Calculate the evolution percentage of zinc acetate.



use the above data to calculate whether the excess of H_2O_2 and ZnO_2 series used to prepare acidic medium in water bath are involving ZnO_2 .

Module 2

13. a) What is spin-spin splitting? Given the IR spectrum of $(1\text{-DPA})_2\text{Cu}(\text{ClO}_4)_2$ explain how NMR communication used to identify the two systems.
b) A dilute solution of concentration-based fluorescence of Co^{+2} at 400 nm , which is concentration of the photoabsorbance of a dye under same conditions, find the concentration of the dye solution.
- Or
14. a) Explain the basic principle of UV-VIS spectrometry. What are the possible electronic transitions? Explain with examples.
b) Show the chemical reaction of Co^{+2} and H_2O_2 . Which of them are bleached?

20
20
20

Module 1		
15.	a) Define the concepts, terminology and mechanism involved in gas chromatography. b) Define the term of $\text{CaCO}_3/\text{Na}_2\text{CO}_3$ with its uses.	10 Or
16.	a) Define the various chemical methods used for the synthesis of nanoparticles. b) Name five widely used scandium (III) compounds of polymers?	10 Or
Module 2		
17.	a) What are environmental clean sheets and decomposition of 2, 4-dimethylphenoxanes. b) What is conformational form? Is it more stable in molecules? c) Where is IEDC/Cu properties and applications.	10 Or
18.	a) Explain the nucleophilic addition with suitable examples. b) Define DADT. Draw a detailed diagram.	10 Or
Module 3		
19.	a) What are ion exchange resins? Explain the exchange process for removal of hardness of water from industrial wastewater applications? b) In a certain reactor effluent to 1000 ml with diameter 10 cm, the initial reaction time was 10 min, the dissolved oxygen lost after 2 days of incubation was 2.4 ppm. Find the rate of the reaction.	10 Or
20.	a) What is a colloidal system? Explain its various treatment? Give the flow diagram, bubble etc., involving of breaking lines. b) Calculate the temperature and conductivity readings of a water sample which contains $[\text{Ca}^{2+}] = 180 \text{ mg/L}$, $[\text{Na}^{+}] = 122 \text{ mg/L}$ and $[\text{Cl}^{-}] = 122 \text{ mg/L}$.	10 Or

Topics

Module 1:

Electrochemistry and Corrosion:

Corrosion - Difference between corrosion and electrochemical cells - Corrosion cell - half reactions - self conserving - different types of corrosion - Hg/Hg_2 electrode - Zn/ZnO - General corrosion - **Soda Ashness** - Construction and Working - Single electrode potential - **potentiometer** - Potentiometric titration - Determination of F^- using colored electrodes - Determination of pH using glass electrode - Electrochemical series and its applications - Free energy and ESR - Nernst Equation - Oxidation - single electrode area cell (Thermodynamics) - Application - Variation of heat with temperature - Thermodynamics - Titration - Titration - Oxide reduction - Lithium ion cell - ammonium and working Conductivity - Measurement of conductivity of a solution (numericals).

Corrosion, Passivation and de-passivation - anodization, Galvanic series, Redox potential - difference plating - resistor and mixed plating

Module 3

Spectroscopic techniques and Applications

Introduction - types of spectrum - Electromagnetic spectrum - Molecular energy levels - Boltzmann's law (Boltzmann's Distribution) - Principle - Types of electronic transitions - Energy level diagram of atoms, molecules, lattices and proteins; Preparation of UV-visible spectrometer and applications of UV-visible - Principle - Number of vibrational modes - Vibrational energy states of a diatomic molecule and Determination of force constant of diatomic molecule (Harmosita) - Applications of IR spectroscopy - Principle - Relation between field strength and frequency - chemical shift, spin-spin splitting (hyperfine splitting) - coupling constant (paramagnetic), applications of NMR, including ESR (brief).

Module 4

Instrumental Methods and Nanomaterials

Thermal analysis (TGA) - Principle, instrumentation (Block diagram and applications) - role of TGA, TGA and columns, DTG-Principle, Instrumentation (Block diagram and applications) - role of DTG, TGA, DTG, Differential methods - basic principle and applications of atomic- and NLO-Raman based, DC and microwave, transverse (Block diagram) - oscillator line and applications.

Nanomaterials - Definition - Classification - Chemical methods of preparation - Hydrolysis and Solvation - Applications of nanomaterials - Surface characterization (SRI) - Principle and Instrumentation (Block diagram).

Module 5

Stereochemistry and Polymer Chemistry

Isotachroisomeric chain rotation, Functional, polycrystalline and metacrylam - zwitter ion with stereochemistry - Preparation of ZE stereoregular polymer, Stereoregularity and Molar volume of substituted methacrylate ester monomers - Isotactic, syndiotactic & heterotactic bonds and syndiotactic lamellae and ZE lamellae, PZ lamellae - Rules and examples - Optical isomerism, Chirality, Chirahomers and Chirahomers with chiralities, Conformational analysis of ethers, isomers, substituents, monomers and di-mers, substituted substituents.

Polymer - Definition - Types - Random, Alternating, Block and Graft copolymers - ABS - preparation, properties and applications. Crystalline polymers, preparation, properties and applications (Conducting polymers - Doping, Redox and Polyelectrolytes - preparation, properties and applications, CLE, Strength, permeation and advantages).

Module 6

Water Chemistry and Sewage Water Treatment

Water characteristics - hardness - Types of hardness Temporary and Permanent - Dissociation of hard water - units of hardness ppm and mg/L - analysis of hardness (hardness) - definition of

Kumar, 2021, revised (Volume 1). Water-solvent molecular exchange process, methods, mechanism and advantages. *Advanced materials - principle, process and advantages*. Mysore: Vaidika Publications (pp. 1-26). Methods, mechanism, scope and U mechanism.

Balaji, 2019. (2019). *Water-solvent ionic IED processes/mechanisms, method, scope and applications, optimization (only prof. procedure and significance)*. Mysore: Vaidika Publications (pp. 1-26). Methods, mechanism and significance - Two diagram - Trailing line and LADD analysis.

Text Books

1. E. L. Tamm, Samelson, N. S. Krasner, "Engineering Chemistry" (2019, 4th edition), 2002.
2. P. W. Atkins, "General Chemistry", Oxford University Press, 12th edn., 2011.

Reference Books

1. C. H. Bamford, "Fundamentals of molecular association", molecular-47th edn., 2002.
2. Donald J. Neely, "Introduction to solubility", Congress Learning Publishers, vol. 2003.
3. R. S. Muller & R. Baum, M. S. Bernstein, "Principles of Physical Chemistry", Wiley Publishing Co., 4th Edition, 2007.
4. A. R. Wilson, J. J. Morris, "Encyclopedia of Analytical Chemistry", Chichester, 2nd Edition, 2008.
5. Michael J. S. Dewar, James A. Pritchard, "Computational Chemistry of Organic Compounds", Wiley, 2009.
6. Raymond E. Scovell, Charles C. Canfield, "Volmer-Chapman vs. transition", Wiley Online WL-400 Reference Edition, 2002.
7. Venkateswaran, Venkata Venkateswara Rayudu & Rao, "Engineering Chemistry", OUP, 2012, 2013.
8. Kaval, "Engineering Chemistry", 4th Publication, 2002.
9. Rev. C. Nagappa, "Engineering Chemistry", Dr. Ganguly Publishers, 2011.
10. Somas C. George, Arunachalam, "Text Book of Engineering Chemistry", L. Chand & Company, 11th edn., 2011.

Course Contents and Lecture Schedule

No.	Topic	No. of lectures Per Week
1.	Electrochemistry and Conductance	3
2.	Conductivity - difference between ohm and molar electrical conductivity - self resistances - self representation - different types of conductors (ionic) - molecular conductors and derived conductors - metal conductors - conduction and working.	3
3.	Digital voltmeters - definition - half-wave diode - double layer - 2. Determination of E° using several methods - Determination of pH using glass electrode - Electrochemical series and its applications - Free energy and EMF - Nernst Equation - Determination using electrodes and cell (Nernstian) Application - Variation of cell voltage with temperature.	3
4.	Determination of current - resistances (Zero resistance and DC ammeter) - introduction and working - conductors - measurement of conductance of a solution (Dissociation)	3
5.	Concentration of electrochemical reactions - molality, molarity, molality ratio method - dilution - electrode placing - Concentration related placing	3
6.	Selective sensors, techniques and Applications	3
7.	Microanalysis - Theory of spectrum - absorption and emission - Microscope design tools - color selection for microscopes	3
8.	UV-visible spectrometry - Principles - Theory of absorbing molecules - Design, functional groups of solvents, solubility, ionization and dissociation, measurement of UV-visible absorption and absorption	3
9.	P-D spectrometry - Principles - Number of vibrational modes (Vibration, Group, states of a diatomic molecule and - Determination of force constant of diatomic molecule [Lennard-Jones] - Applications	3
10.	NMR spectroscopy - Principles - Relation between field strength and frequency - chemical shift - spin-spin coupling (second problem) - coupling constants (definition) - applications of NMR, including 13C-NMR	3
11.	Instrumental Methods and Interferences	3
12.	Flame analysis - TGA - Atomic, Potentiometric, Block diagram and Applications - Use of CALCDAT and programs (TGA) - Block diagram and applications - use of calcudat, no.	3

3.3	Chromatographic methods - Basic principles and applications of column and TLC - Detector Types -	3
3.3	el. and radioisotope, Instrumentation block diagram - detection limit and resolution	3
3.4	Isomerism - Definition - Classification - Chemical methods of separation - nucleic acid isolation - Applications of isomerism - surface chromatography-OCW - Principles and Instrumentation block diagram.	3
4	Stereochemistry and Isomer Derivatives	3
4.1	Isomers and isomerism, their physical, functional, isomeric and resonance - Definition with examples - Representation of OCW resonance form, Werner Debye model and Fischer projection of substituted molecules and stereo-Isomerism - Common isomers in stable forms and isomers like trans and cis isomers.	3
4.2	OCW Isomer - Enantiomers and enantiomeric pairs - Optical isomerism, Optical, Chirality, Chiroptical and Chiroisomerism, Difference with enantiomers.	3
4.3	Differentiation analysis of enanti, diastere, epimers, meso and chiral substances and isomerism.	3
4.4	columns - column - HPLC - HPLC, HPLC block and its components - ABS - procedure, chromatography separation, Polycapillary, pre-column and post-column, column packings - glass - Polyvinylid and Polymethyl - procedure procedure with applications, GC - Microcolumn and extraction.	4
5	Water Chemistry and Sewage Water Treatment	3
5.1	Water chemistry basic - Hardness - Types of hardness Turbidity and Potassium - Characteristics of Hard water - units of hardness, ppm and mg/L, causes of hardness (Numerical) - Formation of hardness EDTA method (Numerical) - Water softening mechanism exchange, precipitation, procedures and advantages. Reverse osmosis principle, process and advantages.	3
5.2	Drinking water treatment (soft) - Chemical methods - chlorination, water and effluent treatment.	3
5.3	Statistical test (t-test) Assumption, zero hypothesis, null hypothesis, t-test, one tailed test, estimator, p-value level, p-values and significance (Numerical).	3
5.4	Simple linear regression - Factors, according and terms - Non linear - Fitting linear and non linear.	3

EN	PHYSICS Mechanics	CAT000249	1	T, P	2006/07	Date of introduction:
001		001	1	1	1	2006

Possible uses of the course is to expose the students to the fundamental concepts of mechanics and enhance their problem-solving skills. It introduces students to the influence of applied force on motion and the operational processes of the rigid bodies while stationary or in motion. After this course, students will be able to recognize similar problems in real-world situations and respond accordingly.

Prerequisite(s)

Course Outcomes: The outcomes of this course that you will be able to:

001	Identify principles and theories related to the study of mechanics
002	Identify various variables that contribute to the motion of objects
003	Apply the principle of equilibrium to solve practical problems involving different force systems
004	Demonstrate appropriate reasoning, principles or formulas to solve problems of mechanics
005	Solve problems involving rigid bodies, applying the principles of concurrent resultant forces

Mapping of course outcomes with program outcomes (Worth in assessment)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12
001	+	+	-	-	-	-	-	-	-	-	-	-
002	+	+	-	-	-	-	-	-	-	-	-	-
003	+	+	+	-	-	-	-	-	-	-	-	-
004	+	+	+	+	-	-	-	-	-	-	-	-
005	+	+	-	-	-	-	-	-	-	-	-	-

Assessment Matrix

Blooms Category	Continuous Assessment Test		End Semester Examination Marks
	Test 1 Marks	Test 2 Marks	
Remember	10	10	10
Understand	10	10	10
Analyse	10	10	10
Evaluate			
Create			

mark distribution

Total marks	Oral marks	Written marks	Discussion
120	20	100	10 marks

Continuous Internal Evaluation Pattern:

Attendance	20 marks
Continuous Assessment Test (2 numbers)	20 marks
Assignments (Quiz/Quizzes) project	20 marks

Test, Semester, Examination Details: There will be two parts Part A and Part B. Part A consists 20 questions with 2 questions from each module, having 5 marks for each question. Students should answer all questions. Part B consists 2 questions from each module which students should answer within 30 minutes. Total duration can have a maximum 2 hours duration and carry 64 marks.

Course Level Assessment Questions

Part A

Course Outcome 1 (CO1): One question from each module to meet the course objective 1. To recall principles and theories related to rigid body mechanics.

1. Explain D'Alembert's principle

2. Distinguish between statics and dynamics

3. Define and explain perpendicular axis theorem

Course Outcome 2 (CO2): One question from each module to meet the course objective 2. To recall, recollect the components of work and kinetic energy of rigid body

1. A string suspended from All of your 2 m is carrying point loads 2 kg, 2 kg and 2 kg at 2m, 2m and 2m respectively from support A. Calculate the support reaction at A.

2. A person holding one end of a suspended massless string. The bar is suspended by two ropes that attach to the ceiling. Diagram the forces acting on the combination of person and bar.

3. While you are riding your bike, you turn a corner following a circular path. Illustrate the forces that affect your bike in turning along the circular path?

Part B

All the questions under this section shall assess the learning levels corresponding to the course outcomes listed below.

G03	To apply the conditions of equilibrium to various general problems involving stiffened-based systems.
G04	To choose Newton-Raphson, gradient or formulae to solve problems of mechanics.
G05	To solve problems involving rigid bodies, applying the principles of distributed loads and moments.

2. Two rollers each of weight 100 N are suspended by an inclined plane and a vertical wall, find the reaction at the points of contact A, B, C. Assume all the surfaces to be smooth.

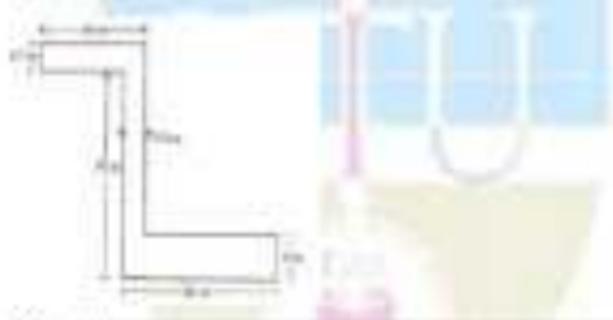


Course outcome identifier	Description of outcome statement	Learning level assessed	Marks allocated
G03	To apply the conditions of equilibrium to various general problems involving stiffened-based systems.	Applying – (Solve any three tests (Diagram that represents equilibrium state where every))	4
G04	To choose Newton-Raphson, gradient or formulae to solve problems of mechanics.	Applying (Prove the equations and formulae required for calculation)	4
G05	To solve problems involving rigid bodies, applying the principles of distributed loads and moments.	Applying (Solve this problem based on the description given in G03 and G04)	2
Total:			10

2. If cylindrical disc, 50 mm diameter and 10 mm thickness, is increased with a horizontal velocity by turning at uniform speed of 2 rad/s. Assuming there is no slip at points of contact determine (i) angular velocity of disc (ii) angular acceleration of disc if velocity of contact changes to 5 m/s. Also compute the moment acting about the axis of rotation in both cases.

Course outcome identifier	Description of course outcome	Learning level assessed	Marks allocated
CO3	To apply the conditions of equilibrium to various practical problems involving different force systems.	Applying – (Determine free body diagram that represent state of the body.)	4
CO4	To assess appropriate theories, principles or formulae to solve problems of mechanics.	Applying – choose the equations and formulae required for calculation	4
CO5	To solve problems involving rigid bodies applying the properties of distributed areas and masses	Applying – solve the problem based on the description given in CO2 and CO4	6
	Total		14

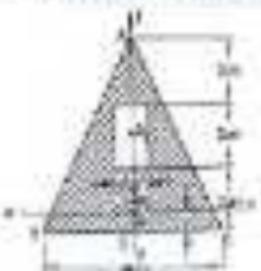
E. Determine the reaction of the given system:



Course outcome identifier	Description of course outcome	Learning level assessed	Marks allocated
CO3	To apply the conditions of equilibrium to various practical problems involving different force systems.	Applying – (Determine the condition of equilibrium for the given geometrical shape)	4
CO4	To assess appropriate theories, principles or formulae to solve problems of mechanics.	Applying – choose the equations and formulae required for calculation	4
CO5	To solve problems involving rigid bodies, applying the properties of distributed areas and masses	Applying Solve the problem based on the description	6

	student name	given in Class 11	
Topic			14

4. A regular tetrahedron rests in a triangular container shown. Find moment of inertia about the vertical axis passing through the base of the container about 10 cm.



Learning outcome identifier	Description of student outcomes	Learning level assessed	Skills assessed
CO3	To apply the conditions of equilibrium to solve problems involving different temperatures	Assessing (Solve the application of moment of inertia for the given geometrical shape)	b
CO4	To choose appropriate physical formulas to solve problems of mechanics	Assessing (Choose the equations and formulae required for calculation)	b
CO5	To solve problems involving light waves applying the properties of diffracted waves and waves	Assessing (Solve the problem based on the concepts given in the question)	b
Total:			14

Q1 (cont.)

Page no. _____

Date _____

MECHANICAL ENGINEERING TECHNOLOGICAL KNOWLEDGE FROM LEARNERS' TECHNIQUE COMMUNICATIONS
ASSESSMENT & TEST

Course Grade: B7/138

ENGINEERING MECHANICS

May Marks: 00

Supplementary: 00/00

Part A

ANSWER ONE QUESTION EACH FROM EACH OF THE FIVE

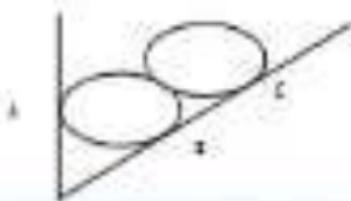
1. Explain D'Alembert's principle.
2. Distinguish between a system & a system boundary.
3. State any three principles of equilibrium.
4. A simple suspension train of mass 40 t is carrying 2000 passengers of 60 kg, 70 kg and 20 kg at 1 m, 5 m and 10 m respectively from the center. Calculate the tension in each of the cables.
5. A girder having a circular bar, 60 mm diameter, is hinged at mid-span. The bar is supported by two rollers that roll on the ground. Compute the total working load combination of girder and bar.
6. While you are riding your bike, you hear a siren following a circular arc. If the siren has a fixed frequency, will you hear it louder as you follow the circular path?
7. Define damping and undamped free vibrations.
8. State the equation of motion of a rotating rigid body, reading about its fixed axis.
9. Summarise the significance of instantaneous centre in the analysis of rigid bodies undergoing rotational motion.
10. Explain the principle of mechanics applied in the evaluation of classic collision of rigid bodies.

TOTAL

(Answers one full question from each module, each question carries 10 marks)

Module 4

- (i) Two identical rollers each of weight 100 N are supported by an inclined plane, making an angle of 30° with the vertical, and a horizontal wall. Give the reaction at the points of contact 1, 2, 3. Assume all the surfaces to be smooth. (14 marks)



12. A string tied to a wall is made to pass over a pulley placed an even from it. A weight m is attached to the string such that the string makes an angle of θ with the support on the wall as the function of maximum of weight. Determine the force F required to maintain 200 kg heavy in position for $\theta = 30^\circ$. The diameter of pulley is negligible. [4 marks]

Module - 2

13. Two blocks A, B, C are resting against a wall and the floor as shown in figure below. Use the concept of resultant force if applied to the lower block than will make the system in equilibrium. Coefficients of friction are 0.20 at the floor, 0.3 at the wall and 0.1 between the blocks.

[4 marks]



14. A block is being pushed with a constant velocity of 1 m/s along a horizontal surface as shown below. Find the frictional force f .

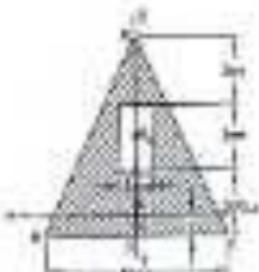
[4 marks]



Module - 3

15. A rectangular block of mass m is at triangle surface as shown. Find moment of inertia about the axis of rotation through the base of the rectangle before it rotates.

[4 marks]



11. Question 11 has left and right-hand sections. Waller supports at 2 pressure meter in the m^{-1} dimension. Gravity g is fixed to 9.81 m/s 2 . The weight is negligible. Determine the unknown force components using all 1, 2, and 3.

[4 marks]



Module 1.4

12. A cricket ball is thrown with a初 velocity of 30 m/s at an angle of 60° to the horizontal, with an initial velocity of 30 m/s. Integrate to determine a height of 10 m from the ground. Show the solution from the working.

[4 marks]

13. An engine of weight 200 kN pulls a train weighing 1200 kN up an incline of 1 in 200. The train starts from rest and moves with constant acceleration against a resistance of 5 kN. At a maximum speed of 20 km/h in 1 km distance. Determine the tension in the coupling between train and engine and the traction forces developed by the engine.

[4 marks]

Module 1.5

14. A cylindrical pipe, 20 cm diameter and 20 cm thickness having mass of 12 kg, is connected with a horizontal conveyor belt running at uniform speeds of 2 m/s. Assuming there is no slip at points of contact determine (i) angular velocity of pipe (ii) angular acceleration of pipe if velocity of conveyor changes to 3 m/s in 20 seconds. Also compute the moment acting about the axis of the pipe in both cases.

[4 marks]

15. A wheel rotating about its axis at 22 rpm is uniformly accelerated for 20 seconds during which time it rotates 60 revolutions. Calculate (i) angular velocity at the end of this interval and (ii) time required for the velocity to reach 120 rpm during this rotation.

[4 marks]

MODULES

Module 1

Introduction to engineering mechanics-Static analysis of structures - free body diagram, free body diagram, law of equilibrium, principle of superposition and transmissibility, law of action and reaction, choice of force diagrams.

Concurrent coplanar force system and resolution of forces-Resultant of concurrent and collinear forces - methods of resolution - methods of moment - polygon of moments - polygon of forces.

Module 2

Free body diagram - Coulomb's law of friction - analysis of single bodies - wedge, ladder, analysis of connected bodies.

Parallel coplanar forces - couple - resultant of parallel forces - series of parallel forces - equilibrium of parallel forces - Google search subject on concentric force systems - General coplanar force system - resultant and equilibrium equations.

Module 3

Concept of concurrent axes - moment of inertia about axis and moment of inertia about axis of symmetry, radius of gyration, moment of inertia of rectangular frame and disc.

Method of moments, substitution method.

Moment of inertia - moment of inertia of forces, moments and couples - free body and equilibrium equations - unsolved forces in pairs (couple + distance only).

Module 4

Dimension - coordinate conversion - coordinate transformation matrix.

Kinetics - equation of motion - D'Alembert's principle - forces on fixed and free bodies, method of successive bodies, impulse momentum equation and work energy equation (principle only).

Concurrent translation - equations of kinematics - projectile motion (only) - kinetics - equation of motion, linear motion and work energy equation (principle only).

Module 5

Discrete - examples 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 (Centroidal axis).

Simple harmonic motion - free vibration - degree of freedom - undamped free vibration of spring mass system (of damped motion - only)

Text Books

1. Timoshenko and Young, Engineering Mechanics, McGraw-Hill Publications.
2. Bhansali, I. R., Engineering Mechanics- Statics and Dynamics, Pustak Mahal of India.
3. R. C. Hibbeler and Ashok Sarpaga, Engineering Mechanics, Vol. 1_Statics, Vol. 2_Dynamics, Pearson Education.

References

1. Horner, J. und Ingraham, G.: *Managing Networks - mit, Laut und Lassen*. Berlin: Springer.
2. Tavel, A.C.: *Managing Networks - Tools and Dynamics*. New York: McGraw-Hill.
3. Shankland, S.: *Managing Networks*. New York: International Publishers.
4. K. R. Cross und R. L. Johnson: *Networks: Models and Methods for Engineers*. New Jersey: Wiley-Interscience.
5. M. E. J. Newman: *Networks: An Introduction*. Oxford: Oxford University Press.

Course Contents and Lecture Schedule

Module	Type	Course outcomes addressed	No. of hours
1	Module 1		Total 1
1.1	Introduction to managing networks - introduction of nodes and streams - Data principles of nodes - Developing the equilibrium law - Supervision and traceability, law of nodes and reaction (reaction law)	CO1, CO4 CO2	1
1.2	cont'd from 1.1: principle of homogeneity of sources and results of reactions - concepts for flow node stream interaction - composition and evaluation of flows, reactions and equilibrium sequences (within the source) - numerical example for illustration.	CO1, CO4 CO2	1
1.3	Consistent sequence laws - analysis of sequential flows - analysis of reactions - Illustrative numerical example - reaction oriented problem solving	CO1, CO4 CO2	1
1.4	analysis of consistent laws - analysis of reaction diagram's theorem of reactions - Illustrative numerical example - reaction oriented problem solving	CO1, CO4 CO2	1
1.5	Analysis of consistent laws systems - consistent problem solving (lesson 1)	CO1, CO4 and CO8	1
1.6	Analysis of inconsistent laws systems - consistent problem solving - lesson 1 - Inconsistency principle	CO1, CO4 and CO8	1
1.7	Analysis of inconsistent laws systems - consistent problem solving - lesson 1.	CO1, CO4 and CO8	1
2	Module 2		Total 2
2.1	vector - using vector - Coulomb's law of Action - analysis of single lines - illustrative examples for origin and distance vector	CO1, CO4 and CO8	1

	<u>assess problem solving techniques using problems from weights and levers</u>		
3.3	Friction on Inclines - analysis of component forces - determine numerical answers - repeat assess problem solving	C03, C04 and C05	1
3.4	Friction on Inclines - repeated problem solving	C06,C04 and C05	1
3.5	Resultant forces - touch - resultant of parallel forces - centre of parallel forces - equilibrium of parallel forces - simple linear systems in one dimension	C03, and C05	1
3.6	Resultant forces - touch - resultant and equilibrium equations - illustrate example - touch - assess problem solving	C03	1
3.7	Resultant forces - touch - resultant and equilibrium equations - illustrate example - touch - assess problem solving	C03, C04 and C05	1
3.8	Resultant forces - touch - resultant and equilibrium equations - illustrate example	C03, C04 and C05	1
3.9	Resultant forces - touch - resultant and equilibrium equations - touch - touch - learning tool	C03, C04 and C05	1
3	Module 3		Task 7
3.10	Centres of gravity and regular gravitational fields - analysis of figures in combination - composite centre examples for Newtonian - problems for practice to be done by self	C03, and C05	1
3.11	Centres of gravity - parallel axis theorem - examples for illustration - problems for practice to be done by self	C03	1
3.12	Centres of gravity - perpendicular axis theorem - example for illustration to be given as handout and discussion on the related example	C03	1
3.13	Introduce to passive problems - problems related to moments and moments of inertia - problems for practice to be done by self	C03, C04 and C05	1
3.14	Polar moment of inertia, Radius of gyration, Mass moment of inertia of ring, cylinder and uniform disc. <u>Theorem of Pappus-Guldinus - demonstration</u>	C03, and C05	1
3.15	Introduction to forces in space - resultant, representation of forces, moments and couples - simple problems to illustrate vector representations of forces, moments and couples to be done in class	C03, and C05	1
3.16	Introduce to passive problems - resultant and equilibrium equations for concurrent forces in space - equilibrium forces in space - 3 simple problems to illustrate the application of resultant and equilibrium equations for concurrent forces in space	C03,C04 and C05	1
3	Module 4		Task 7

4.1	Introduction to dynamics - mass of continuous bodies - equations of dynamics - problems to reduce the entropy - additional problems involving extended application of entropy	CCC, and CCD	1
4.2	Solutions for exercises with necessary expansions given as hints and - introduction to kinetics - equation of motion - D'Alembert's principle - illustration of the concepts using one numerical exercise from mechanics having rigid multibody systems.	CCC, and CCD	1
4.3	Motion of continuous bodies / example for D'Alembert's principle to be given as hint and discussion in the solved example - problems for practice to determine by self	CCC, CCC and CCD	1
4.4	Classification of mechanical systems problem solving	CCC, CCC & CCD	1
4.5	Curvilinear translation - factors of dynamics - properties matter - simple problems to reduce the entropy - introduction to kinetics - equation of motion - illustration of the concepts using numerical examples	CCC, CCC and CCD	1
4.6	Kinetics another solving - nonlinear and curvilinear translation	CCC, CCC and CCD	1
4.7	constant resistive momentum coupled with work energy equation translation translation - discussions to bring out different version classification of mechanical systems. Concepts on change of momentum and mass energy equation (curvilinear translation).	CCC, and CCD	1
Module 2			Topic 2
5.1	Introduction to kinetics - motion of rigid bodies - motion of a rigid body relative to a fixed axis - simple problems for illustration	CCC, and CCD	1
5.2	Rotation under a constant moment - rotation around problem solving	CCC, CCC and CCD	1
5.3	Rotation under a variable moment - rotation around problem solving	CCC, CCC and CCD	1
5.4	Planar motion of rigid bodies - instantaneous centre of rotation concept notes	CCC, and CCD	1
5.5	resolution of forces - instantaneous centre of rotation concept notes	CCC, and CCD	1
5.6	rigid body rotation - analysis of single degrees of freedom beam systems - classification of mechanical systems as rigid mass systems (summary with)	CCC, and CCD	1

6.6	EOOD spring mass system frequency of motion = unbalance free vibration frequency - concept of natural frequency Free vibration frequency due to initial conditions Damped oscillations or dissipation of residual stresses and free vibration frequencies for the undamaging load	EOO, EOU	1
6.7	Free vibration analysis of EOED spring mass system - Problem solving effect of damping on free vibration frequencies (20100212090)	EOO and EOU	1



NET	Industries & Business	CATEGORY	1	7	3	CRD01	Date of introduction
NET	Business	NET	2	2	2	1	2012

Possibility: To enable the students to effectively perform technical communication through practical representation on the global standards.

Transpiration (T2)

Course Outcome: After the completion of this module the student will be able to

CO1	Identify the problem of cost reduction based on different standards.
CO2	Import multiple engineering properties of steels by visualizing them in different positions.
CO3	Draw contour lines and circles in terms of major circle.
CO4	Import profile drawing along the principle of axonometric perspective projections to calculate slopes in three dimensions.
CO5	Convert 2D views to orthographic views.
CO6	Draw multi-view projections and section views of structures using various tools.

Mapping of course outcomes with program outcomes

	P0	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
CO1	2												
CO2	3												
CO3	2												
CO4	2												1
CO5	2												1
CO6	2												1

Assessment details

Assessment Details	Continuous Assessment Test		End Semester Examination (100 marks)
	Test 1 75 Marks	Test 2 25 Marks	
Numerical			
Understanding	2		20
Ability	20	20	20
Total			
CGPA			

Mark distribution

Total Marks	CA (Marks)	ELI (Marks)	RA (Marks)
160	40	60	60

Continuous Internal Evaluation pattern:

Round-ups – 10 marks

One round-up session 10 marks (2 marks for L1 and class work 10 marks)

Other sessions 2 sessions 10 marks (2 marks for L1 and Class work 12 marks)

End Semester Examination Pattern:

CBSE will be of 2 hour duration or 100 marks answer booklet and will be for 100 marks. The question paper shall contain two questions from each module of Section A only. Student has to answer one question from each module. Each question carries 20 marks.

Course Level Assessment Questions:

Question may be framed based on the syllabus given under performance assessment.

Course Outcome I (CO1)

- Identify points in different quadrants of a coordinate system.
- Plot points in three dimensions from plans.
- Draw front, top and side views of solids.

Course Outcome 2 (CO2)

- Draw orthographic views of solids and combination solids.
- Determine views of solids enclosed in any two reference planes.
- Determine views enclosed in both reference planes.

Course Outcome 3 (CO3)

- Draw views of solids contained by a cutting plane.
- Find true size and true shape of cutting plane from 2D views of the section.
- Draw development of frontal surface of solid and its related views.

Course Outcome 4 (CO4)

- Determine visual relations of solids.
- Determine visual relations of combination of solids.
- Draw orthographic views of solids.

Course Outcome 5 (CO5)

- Draw Orthographic views of solids from given three dimensional view.

Course Outcome 6 (CO6):

1. Draw the given figures including dimensions using 3D software.
2. Create 3D model using existing software from the given orthographic views or 3D figures for framed IC boards.

Model Question Paper

Ex-Date:

14/05/17

Fig No. _____

Name: _____

**AN ABDUL KALAM TECHNOLOGIES UNIVERSITY TRUST UNIVERSITY LEVEL DEGREE EXAMINATION,
MARCH 2017**

Course Code: MCT128

Unit Code: MCA/ME/128

Mathematics-128

Time: 3 hours

PART A

Answer all Questions. Each question carries 2 Marks.

Indications: Before necessary Computation lines

- Draw necessary dimensions.
- Indicate any 0.50 mm dimension from each module.
- Each question carries 20 mgms.

QUESTION 1

1. The end point A of line A is 10 mm above XY and 20 mm in front of YZ. The other end of the line is 20 mm above XY and 40 mm behind YZ. The distance between the end points is 10mm. Draw the projections of the line AB in first angle and true inclination of the line with the principal plane. Also locate the mid-point of the line.
2. One end of a line A lies 10 mm from base line principal plane of projection. The other end of the line is 20 mm above XY and 40 mm in front of YZ. The true length of the line is 10mm. Draw the projections of the line AB in second angle. Also indicate dimensions, direction length and plan length. Also locate mid-point.

QUESTION 2

2. A rectangular prism of base side 22 mm and height 40 mm, is resting on the ground on one of its triangular faces. The base edge of that face is inclined 30° to XY. Draw the projections of the solid.

4. A hexagonal prism has side 20mm and height 40mm. It has a corner at its base on the ground and the long edge containing that corner inclined at 60° to the vertical. Give three descriptions of the solid.

METHODS

5. A rectangular prism of base 20 mm and height 30mm is resting with its base on the ground and having an edge of the base at an angle of 14° to the vertical. The top edge of the prism is a translation of parallel edges 10mm and 20mm. Show the positions showing the two edges. Find the inclination of the cutting plane with the ground plane.
6. Draw the development of a frustum of a pyramid of base side 20mm and height 20mm. • centre a circle from a corner of the base, draw the periphery and back to the same point through the other two diameters. Show the position of the cutting in the development plan.

METHODS

7. The bottom of a cone has base diameter 10mm and its slant height 10mm has a height of 8mm. It is placed centrally on one of a rectangular slab of base 20mm and of thickness 20mm. Give the construction of the combination.
8. A hexagonal prism has base side 20mm and height 30mm. A section of diameter 40mm is placed centrally on one of its faces. Show the construction of the combination.

METHODS

9. Show the perspective view of a pentagonal prism 20mm side and 40mm long lying on one of its rectangular faces on the ground and having its axis perpendicular to ground plane. One of its horizontal faces touches the ground plane and the major corner distance from it is 40 mm above the ground plane and lies in the central plane, which is parallel to the left of the centre of the front.
10. Draw three orthographic views with dimensions of the object shown in figure below.



Section D: Calculus

1. solving the problems involving the applications of the first derivative
 - finding true length by any method = 5 marks
 - finding true inclination with 2 digits = 2 marks
 - finding true inclination with 1 or 2 marks = 2 marks
 - solving horizontal slope = 2 marks
 - solving vertical slope = 2 marks
 - differentiating and integrating = 2 marks

Total = 12 marks

2. solving the problems involving true length of the line = 5 marks
 - finding projections by any method = 5 marks
 - finding length of elevation and depression = 2 marks
 - finding distance = 2 marks
 - solving horizontal slope = 2 marks
 - solving vertical slope = 2 marks
 - differentiating and integrating = 2 marks

Total = 12 marks

3. solving initial position plan and elevation = 4 marks
 - first inclination = 2 marks
 - second inclination = 2 marks
 - solving initial position = 2 marks
 - differentiating and integrating = 2 marks

Total = 12 marks

(Any one method or combination of methods for solving can be used)

(If initial position is wrong, then maximum 20% marks may be allotted for the answer)

4. solving initial position plan and elevation = 4 marks
 - first inclination = 2 marks
 - second inclination = 2 marks
 - solving initial position = 2 marks
 - differentiating and integrating = 2 marks

Total = 12 marks

(Any one method or combination of methods for solving can be used)

(If initial position is wrong, then maximum 20% marks may be allotted for the answer)

5. solving initial position plan and elevation = 4 marks
 - solving position change by given condition = 2 marks
 - drawing true shape = 2 marks
 - finding inclination w/ solving plans = 2 marks
 - differentiating and integrating = 2 marks

Total = 12 marks

6. solving initial position plan and elevation = 4 marks
 - development of the pyramid = 2 marks

	measuring string in development - 2 marks measuring string in direction - 1 mark measuring string in plan - 2 marks dimensioning and notation - 1 mark	Total = 10 marks
1.	Measuring initial positions - 4 marks dimensions of 360° - 4 marks dimensions of Plan of Prism - 2 marks Dimensioning and notation - 1 marks	Total = 10 marks
	(+ Deviation is optional, dimension of hole is needed Radius 4 marks / normal thickness or 10 mm)	
2.	Measuring final positions - 2 marks dimensions of 90° - 2 marks dimensions of prism - 3 marks dimensions of bottom - 3 marks Dimensioning and notation - 1 marks	Total = 10 marks
	(+ deviation is optional, thickness of base 2 marks)	
3.	Measuring the plan and locating the corner point - 4 marks measuring elevation of point - 2 marks measuring plan points - 2 marks Drawing the perspective view - 10 marks Dimensioning and notation - 1 marks	Total = 10 marks
4.	Drawing the elevation - 5 marks Drawing the plan - 3 marks Drawing the side view - 3 marks Captioning model in right - 2 marks Dimensioning and notation - 1 marks	Total = 10 marks

EVALUATION

Social Function:

- All rights processes to be followed.
- Student A presents solutions to his problems at an effective level.
- Student B clearly to be conducted in English.

STRUCTURE

Module 1:

Introduction: Definition of technical drawing in engineering field. Types of lines, Dimensioning, 3D solids of revolution for technical drawing.

Dimetric projection of Triangles and Lines: Dimensional process in different quadrants. Dimension of straight lines defined as one plane and inclined to both planes. Types of lines. Indication of lines with common planes. True length of line indicated on each of the reference planes.

Module 2:

Orthographic projection of solids: Projection of simple solids such as triangular, rectangular, square, Pentagonal and hexagonal plates, pyramids, cones and cylinders. Indication of solids in orthographic projection including profile view. Position of edges with axis referred to one of the reference planes and with axis inclined to both reference planes.

Module 3:

Isometric Drawing: Isometry of Triangles, Pyramids, Cones, Cylinders with axis in vertical position and axis for different section planes. True shape of the system. True Section true section plane when the true shape of the section is given.

Development of Surfaces: Development of surfaces of the above solids and solids having different section planes. Dimensioning the projected points between two points on the surface.

Module 4:

Assembly Drawing: Isometry of Triangles, Pyramids, Cones, Cylinders, Development of Pyramids, Indication of cones, Spheres, Hemispheres and their combinations.

Module 5:

Perspective Projection: Isometric projection of Triangles and Polygons with axis perpendicular to the ground plane, axis perpendicular to section plane.

Construction of Isoplot (one combination of observer view) in three reference planes.

STRUCTURE

(To be completed in 20.2.2018)

Introduction to Computer-Aided Drawing: Role of CAD in usage and development of new products. Advantages of CAD. Creating two dimensional drawing with dimension using suitable software (Minimum 2 exercises mandatory).

Introduction to Solid Modeling: Drawing 3D models of various components using suitable modeling software. (Minimum 2 exercises mandatory).

Text Books

1. BISHOP, D., Engineering Drawing, Charter Publishing House Ltd.
2. JUNE, G.G. Engineering Graphics, Pearson-Hall India Publishers.

Reference Books

1. ANGULANI, S., Engineering Graphics, Achuthanayagam Publishers.
2. AGARWAL, R. and AGARWAL, C.M., Engineering Drawing, Tata McGraw Hill Publishers.
3. BURGESS, L., Engineering Drawing, Pearson Publishers, 2nd edition, 2007.
4. DUFF, J. M. and KEE, M.A., Engineering Design and Visualization, Cambridge University Press.
5. HOBSON, G.H., HOBSON, A.P. and LEADER, A.L., Engineering Graphics with AutoCAD, PH.
6. LUCAS, H., WILLIAMS, J. and DUFF, J.M., Fundamentals of Engineering Drawing, PH.
7. LUGONES, J., Engineering Graphics, I.I.T. Publications.
8. VENKATESH, V., Engineering Drawing and Graphics, Prentice-Hall International Publishers.

Course Contents and Lecture Schedule

Sl.	CONTENTS	No. of Hours
MODULE I		
1.1	Introduction to graphical tools of engineering	3
1.2	Conversion of given statements of problems, different elements involved in drawing	3
1.3	Selection of lines, indicators and others, types of lines to be drawn, measured method of solving problems on lines	3
1.4	Problems on lines using measured method	3
1.5	Use of ratios in method of solving problems on line measured method	3
MODULE II		
2.1	Introduction of different solids, Simple position plan and elevation of solids	3
2.2	Problems on various solids formed by two planes	3
2.3	Problems on various solids formed by three planes	3
2.4	Relative positions of solids formed by four planes	3

	MODULE 9	
9.1	Introduction to scatter plots, Q-Q plot and LSC. Analysis of learning outcome points and finding out effects.	3
9.2	Problems on scatter of different variables	3
9.3	Problems on the Tukey's Biplot	3
9.4	Methods of decomposition of effects, seasonal effects	3
	MODULE 10	
10.1	Methods of forecasting linear and Polynomial, seasonal effects, Problems on growth rates	3
10.2	Forecasting problems on Trendline problems, Cyclical and Seasonal	3
10.3	Problems on combination of different series	3
	DISCUSSION	
11.1	Introduction to progressive projection, different plans, future projections Progressive problems on pyramid	3
11.2	Progressive problems on pyramid	3
11.3	Problems on representation of a general curve into segments problems	3
	EXCERPT 4 (De-revised total = 112 hrs)	
1.	Introduction to GCD and its effect, Familiarizing frequency of GCD values, Practice on making combinations	3
2.	Procedure on classifying	3
3.	Introduction to sole-modelling and others	3
4.	Procedure on sole-modelling	3

ID	NAME OF THE SUBJECT AND SUBDIVISION AND SEMESTER	CATEGORY	0	1	2	SEMESTER	YEAR OF IMPLEMENTATION
			ES	ES	ES		

Principle:

Objectives of this course is to provide an insight and includes the essentials of civil engineering design, to the students of all branches of technology and to provide the students an illustration of the significance of the Civil Engineering Profession in solving the societal needs.

To inculcate the students to the basic principles of mechanical engineering

Prerequisite (s):

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

CO1	Analyse the role of civil engineer in society and to relate the various disciplines of Civil Engineering
CO2	Identify different types of building, building components, building materials and building construction
CO3	Explain the basic requirements, functions, materials, components and methods of functioning
CO4	Compare the basic infrastructure services (WATER, WASTE, WIND, SOLAR) and explain its range
CO5	Discuss the NEEDS, Analysis, synthesis, design, management and implementation for green buildings
CO6	Analyze the environmental policies and calculate its efficiency
CO7	Evaluate the economy and resources of IC Engine
CO8	Explain the basic principles of Refrigeration and Air Conditioning
CO9	Describe the working of hydraulic machines
CO10	Explain the working of power transmission elements
CO11	Describe the basic manufacturing, welding and forming processes

Mapping of course outcomes with program-outcomes

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CO1	2	1	*	*	-	3	5	4	-	-	-	-
CO2	5	3	*	1	5	*	*	5	-	-	*	*
CO3	5	3	*	*	3	-	-	-	3	-	*	*

CSE	8	1	-	1	8	-	-	12	-	12	-
CSE	8	1	-	1	8	3	3	-	12	-	12
CSE	8	1	-	-	-	-	-	-	-	-	-
CSE	8	1	-	-	-	-	-	-	-	-	-
CSE	8	1	-	-	-	-	-	-	-	-	-
CSE	8	1	-	-	-	-	-	-	-	-	-
CSE	8	1	-	-	-	-	-	-	-	-	-

Assessment Report

Sloane's Category	Basic Civil Engineering			Basic Mechanical Engineering		
	Continuous Assessment		Semester Examination (marks)	Continuous Assessment		Semester Examination (marks)
	Test 1 marks	Test 2 marks		Test 1 marks	Test 2 marks	
Competence	8	8	32	18	78	18
Commitment	32	32	32	12.8	12.8	12
Habits				8	8	12
Attitudes						
Behaviors						
Character						

Mark distribution

Total Marks	CB Marks	SAC Marks	SEM Question
100	60	60	8 hours

Continuous strand evaluation pattern

Attendance	22 marks
Continuous Assessment Test (2 marks)	22 marks
Assignment/Class/Online project	22 marks

Semester Examination Pattern

There will be two parts, Part I – Basic Civil Engineering and Part II – Basic Mechanical Engineering. Part I and Part II carries 60 marks each. For the one semester examination, part I carries 30 parts.

Part A and Part B. Part C contains 8 questions carrying 4 marks each (not exceeding 2 questions from each module). Part B contains 2 questions from each module half of which are to be answered. Each question carries 20 marks and can have maximum 2 sub-divisions. The pattern for oral examination for part C is same as that of part A. However, student should answer both parts A and part C in separate answer booklets.

Course Level Assessment Questions

Course Outcome CO1: To recall the role of civil engineer in society and to relate the various disciplines of Civil Engineering.

1. Explain the role of Civil engineering in the overall infrastructural development of the country.

Course outcome CO2: (One question from each module and not more than one)

Watch different types of buildings, building components, building materials and building construction

1. Discuss the different basic building elements and components

Course outcome CO3: (One question from each module and not more than one)

Discuss the importance, advantages and disadvantages of recycling

1. Explain the importance of recycling in Civil Engineering

Course outcome CO4: (One question from each module and not more than one)

Examine the basic infrastructure services (SAN, WASH, electricity, irrigation and roads).

1. Explain the civil engineering aspects of these basic services used in buildings

Course outcome CO5: (One question from each module and not more than one)

Discuss the materials, energy and cost, water management and environment in green buildings

1. Discuss the relevance of Green building in modern

Answers to Question paper 2 (5 questions from each module, Part A) (Question papers 10 marks)

Course Outcome CO1: (Five full question from each module and each question can have maximum 2 sub-divisions)

To recall the role of Civil engineer in society and to relate the various disciplines of Civil Engineering
CO2 Questions

1. Explain the types of buildings you encounter. Explain briefly each in about three sentences
a. Discuss the components of a building with a neat figure.

2. What are the major disciplines of civil engineering and explain their role in the infrastructural framework.

3. Explain the role of NBC, BS & CECI norms in building rules and regulations prevailing in our country.

Course Outcome 4 (CO4) & Course Outcome 5 (CO5) Two full question from each module and both questions can have maximum 2 sub-questions

Define the basic of buildings, building components, building materials and building construction & describe the major terms, objectives and processes of surveying.

CO Questions

- a. What are the different kinds of surveys available and discuss their use.
b. Define properties of good building tools. Explain any five.
- a. List and problems faced during construction materials used for construction.
b. Explain the objectives and principles of surveying.

Course outcome 4 (CO4) & Course outcome 5 (CO5) Two full question from each module and both questions can have maximum 2 sub-questions

Examine the basic of buildings across NBC, HVAC, insulation, assembly and terms & discuss the insulation, cooling systems, code management and requirements for green buildings.

CO Questions

- a. Draw the sketch of your plan of one residential unit with legend note.
b. Explain the energy systems and code management in Green building.
- a. Draw the sketch of following numbers (i) adiabatic process having
(ii) constant volume, and (iii) constant heat \rightarrow
b. discuss the dual mode operation of VRF and VAV in a commercial building.

Course Outcome 6 (CO6)

- a. An air standard cycle with the compression ratio is 7 and expansion ratio is 20/7. If the maximum temperature of the cycle is 220°C. Then
 - Heat supplied per kg of air
 - Heat rejected per kg of air
 - Efficiency.

Take $C_p = 1,000 \text{ kJ/kg/K}$ and $C_v = 714 \text{ kJ/kg/K}$.
- A Carnot cycle works with adiabatic compression ratio of 3 and adiabatic expansion ratio of 3. The volume of air at the beginning of isothermal expansion is 0.6 m^3 . If the maximum temperature of the cycle is 1000 K and isotherm is constant, then find the minimum temperature and the cycle wise efficiency of the cycle.
- an idealized cycle, the compression at the beginning and end of compression is soft and 80% respectively. The compression at the beginning and end of expansion is 100% and 200%. Discuss the ideal efficiency of the cycle.

4. Explain the concepts of CFD and FEM in 3D designs.

Course Outcome 1 (CO1)

- With the help of a real sketch explain the working of a windmill design.
- Compare the working of a windmill with a wind turbine.
- Explain the classification of turbines.

Course Outcome 2 (CO2)

- Explain the working of a pump or compressor with its working principle.
- With the help of a real sketch, explain the working of a reciprocating pump.
- Define CFD, specific humidity, relative humidity and dew point temperature.

Course Outcome 3 (CO3)

- Explain the working of a single stage centrifugal pump principle.
- With the help of a real sketch, explain the working of a reciprocating pump.
- A pump with a pump cylinder length of 25 m at 200 rpm. The discharge is $2 \text{ m}^3/\text{s}$. If the overall efficiency of the pump is 100%. Determine the power required by the motor.

Course Outcome 4 (CO4)

- Explain the working of a steam and gear pump with the help of their sketches.
- Sketch a single stage pump.
- Name different parts of gear pump and motor.

Course Outcome 5 (CO5)

- Describe the processes which can be performed using drilling machine.
- Explain the functions of various accessories used in drilling.
- With a real sketch explain the working principle of a drill.

Related Question Paper

by Code No. 20202

page 2

Reg No. _____

Name _____

**AN AUTONOMOUS TECHNOLOGICAL UNIVERSITY FIRST SEMESTER 3RD YEAR DEGREE EXAMINATION
NORTH E. TERM**

Course Code: PGT 100

Course Name: CAD/CAM/CAE AND COMPUTER AIDED DESIGN

Page No. 100

Total No. of Pages

www.tatc.org.in/sem2/examquestion/paper100.pdf

Part I-Basic Civil Engineering

PART A

(Answer all questions. Each question carries 4 marks)

1. Explain relevance of Civil engineering in the overall infrastructural development of the country.
2. Discuss the differences between plain soil and改良 soil.
3. Explain different types of soil with their properties.
4. What are the different kinds of compressibility and what is their use?
5. Define bearing capacity of soil.

[16 x 4 = 64]

PART B

Answer any four questions from each module:

MODULE - I

- Q1. List out the types of buildings by your viewpoint. Explain any one, each in about five sentences. [5]
- Q2. Discuss the components of a building with a neat figure. [5]
- Q3. What are the major disciplines of civil engineering and explain their role in the infrastructural framework. [5]
- Q4. Explain the role of SAC, BIS & ISSI norms in building rules and regulations prevailing in our country. [5]

MODULE - II

- Q1. What are the different kinds of construction materials used in construction. [5]
- Q2. List the uses of good building units. Explain any five. [5]
- Q3. Name any five modern construction materials used for construction. [5]
- Q4. Explain the objectives and processes of surveying. [5]

MODULE - III

- Q1a. Draw the elevation and plan of any building and label with English name. [5]
- Q1b. Explain the energy systems and cost management in Green buildings. [5]
- Q2a. Explain each of the following foundations: (i) Infilled propple footing
(ii) Cantilever footing and (iii) Continuous footing. [5]
- Q2b. Explain the civil engineering aspects of L&T and TATA in a commercial building. [5]

[16 x 4 = 64]

CHAPTER 10: BASIC MECHANICAL ENGINEERING

PART A

Answer all questions. Each question carries 4 marks.

1. Sketch the P-v and T-s diagrams of a Carnot cycle and list the processes.
2. Define the working of an isothermal gear train.
3. Define cutting and deformation-based processes.
4. Differentiate between welding and brazing.
5. Explain the principle of wetting in manufacturing.

5 x 4 = 20 marks

PART B

Answer any full question from each module.

Module A:

- B. In an air-standard Otto cycle the compression ratio is 7 and maximum engine temperature is 227°C.
i) If heat addition is 70 kJ/kg find
a) Isentropic efficiency of the cycle
b) Mean effective pressure
c) Work output

$$T_1 = 227 + 273 = 500 \text{ K}$$

20 marks

10

- C. Explain the working of a 2-stroke Diesel engine with neat sketches.
D. Define the fuel economy of a petrol engine.

2 marks

2 marks

Module B:

- E. a) Explain the working of a two-stage compression process with the help of a flow diagram.
b) Define: base/Churned, rolled, humidity and droplets concentration.

2 marks

2 marks

20

- F. With the help of neat sketch, explain the working of a centrifugal pump.

20 marks

Module C:

- G. Define: R value, high, ultra-high, low/high and cluster cooling rolls with neat sketches.

20 marks

10

- H. a) Describe the two working processes with a neat sketch.
b) Differentiate between up-milling and down-milling operations.

2 marks

2 marks

10

Module 1

General introduction to Civil engineering: Advances of Civil Engineering in the social infrastructure development of the country. Feasibility of an project in involving the safety of built environment. brief introduction to major disciplines of civil engineering like, transportation Engineering, Structural Engineering, Geotechnical Engineering, Water Resources Engineering and Environmental Engineering.

Introduction to buildings: Types of buildings, evolution of buildings, components of a residential building and their functions.

Building rules and regulations: Definitions of NBC, CDL & ZBB norms (brief discussion only).

Building areas: Total area, built up area, floor area, car parking and floor area ratio for a building as per ZBL.

Module 2

Surfacing materials, cohesive and non-cohesive.

Construction materials: conventional construction materials like, stones and soil of building materials (bricks, pipes, concrete, lime and cement).

Common composite construction materials, properties and tests.

Portland cement, asbestos, reinforcement, glass fiber etc.

Modern construction materials: Polymers, glass fibers, Plastics, composite materials, thermal and acoustic insulating materials, adhesives, paints, waterproofing materials. Modern use of gypsum, prefabricated building components (brief discussion only).

Module 3

Building Fundamentals: Foundations, bearing capacity of soil (brief discussion only), locations of foundations, types – shallow and deep (brief discussion only), shear bearing and framed structures (longer project).

Brick masonry: - Basic and strength term, English bond & Flemish bond various units in masonry.

Bricks and Braces: - Dimensions, types, bonding materials (brief discussion only).

Basic Infrastructure services: road, rail, water, electrical, telecommunication and terms like drainage, septic tank, fire safety for buildings.

Green buildings: - materials, energy efficient, waste management and environment for green buildings (brief discussion only).

Module 4

Analysis of thermodynamics cycles: Carnot, Otto, Diesel cycles. Definition of efficiency of these cycles. Need to calculate heat added, heat rejected, net work and efficiency. C Engine, O.I, D-Engine, P-Diesel engines, using the series of different types of IC Engines. Efficiency of IC Engines (Definitions only); (ii) Dual working and Liquefying systems in V and C Engines, CCG, UNI. Concept of hybrid engines.

Module 5

Properties, units of measurement, converted factors, hydrostatic, buoyant, compression, safe load, shear stress, shear force and its problems, definitions of dry, wet & due point, hygrometry, specific humidity and relative humidity, cooling and dehumidification, causes of unsed conditions.

Description about working with sketches of: Actioning pump, centrifugal pump, Action turbine, Francis turbine and Kaplan turbine. Overall efficiency. Equations on calculation of input and output power of pumps and turbines (both steady state).

Description about working with sketches of: Box and Open tanks. Single phase turbines.

Module 6

Manufacturing Process: Basic description of the manufacturing processes – Sheet Cutting, Drilling, Boring, Milling, Forming and their applications.

Sheet cutting Processes: Use types of cutting. Description with sketches of: Line cutting, Scribing and Stripping and their applications.

Basic machining operations: Turning, Drilling, Milling and Boring.

Description about working with block diagram of: Lathe, drilling machine, milling machine, the lathe. Elements of NC/CNC. Recent and future developments.

Text books:

1. Langford, J. C., *Introduction to Civil Engineering*, Chesser Publishing House
2. Vithal, A. K. and Prabhu, J. C., *Building Construction*, volumes 1 to 4, Pearson India Education Services

Reference books:

1. Chorlton and Davies (Eds), *The Civil Engineering Handbook*, Blackie Academic and Professional
2. Charles, Peter (Eds) *BSI Building construction handbook*, National Physical Laboratory, London, England
3. Charles, P., *Construction Technology*, Vol. 1 to 8, Longman group, England Chesser Press
4. Jenkins, D. L., *Elements of Civil Engineering*, Chesser Publishing house
5. Venkatesh, M. S., and Samanta, J. P., *Handbook for Civil and Construction Engineering*, Pearson Education
6. Langford, J. C. and Chorlton, D., *Building Construction*, Chesser Publishing house
7. Bhavani, S., Chittenden, R. and Shrivastava, A., *An Introduction to Structural Engineering Part 1*, E&E Davis
8. Atsu and Chaudhury, *Principles of material engineering*, CRC Press/CSIR Publications Pvt. Ltd, New Delhi
9. Jenkins, D. L., *Fundamentals of material engineering*, Prentice
10. S. Sathyanarayana, M. T. Venkateswaran, *Basic Civil and Maritime Structures*, Prentice-Hall Education, New Jersey, 2002
11. S. Sathyanarayana, *Material Engineering Principles*, 2002
12. Sathyanarayana, *Basic Material Engineering*, Prentice Hall Books

Course Contents and Lecture Schedule

No.	Topic	Course outcomes addressed	No. of Lectures
1	module 1		10/10/1
1.1	General introduction to civil engineering, objectives of civil Engineering & its social significance, development of the country, Possibility of an engineer in creating the future of India environment.	CO1	1
1.2	Brief introduction to major disciplines of Civil Engineering like Transportation Engineering, Structural Engineering, Geotechnical Engineering, Water Resources Engineering and Environmental Engineering.	CO2	1
1.3	Introduction to buildings: Types of buildings, selection of site for buildings, requirements of a residential building and their functions.	CO3	1
1.4	Building codes and regulations: Categories of IS:456 & IS:4037 (Structural Concrete).	CO4	1
1.5	Building area: Dimensions, floor plans, dimensions, requirements and limitations for a building project.	CO5	1
2	module 2		10/10/1
2.1	Cement: main types, classification and formulas	CO6	1
2.2	Bricks - classification, properties of good bricks and types of brick	CO7	1
2.3	Stones - Qualities of good stones, types of stones and their uses Common : Good qualities of stones, types of stones and their uses	CO8	1
2.4	Sand - Classification, qualities of good sand and their analysis Properties Hinbar - Characteristics, occurrences and uses	CO9	1
2.5	Common cements : Classification, materials, properties and types Steel : Steel components and their uses, types and uses	CO10	1

2.8	Use of non-combustion materials - Asbestos-free glass, ceramic tiles, composite materials, thermal and acoustic insulating materials, decorative panels, waterproofing materials, modern use of gypsum, prefabricated building components (with discussion only)	100	3
9	Module 5		
2.1	Foundations - Bearing capacity of soil (saturation only), function of foundations, types - shallow and deep, brief discussion only.	100	3
2.2	Brick masonry - Header and stretcher bond, English bond & Dimple bond- dimension and plan (one 2 mm and a half brick wall plus Random rubble masonry).	100	3
2.3	Basic Functions, basic teaching materials (brief discussion only) - Three Functions, Applications - teaching materials (brief discussion only)	100	3
2.4	Heat Distribution pattern (HDP), HVAC, firewalls, load factors and range (Cost Engineering aspects only) fire safety for buildings	100	3
2.5	From Building - Materials, construction, heat transmission and dimensions for typical buildings, brief discussion only	100	3
MODULE 4			
4.1	Analysis of thermodynamic cycles (Rankine, Otto, and Diesel) - behaviour of efficiency of these cycles. Problems in selecting best suited thermodynamic cycle and efficiency	100	3
4.2	Co-Generation, Co-Optical, +ve side energy, using the parts of off-grid house for co-generation, off-grid off-grid/economic grid	100	3
4.3	No, fuel, sealing and isolating systems in 2D and 3D drawings, CFD, term, calculus of fluid dynamics	100	3
2	MODULE 3		
3.1	Refrigeration units of refrigerators, reversed Carnot cycle, CO ₂ , vapour compression cycle (brief description and no problems)	100	3
3.2	Definitions of dry, mean & dew point temperatures, specific humidity and relative humidity, Cooling and dehumidification, latent & sensible air constituents	100	3

8.2	Description about working with concrete : Describing pump centrifugal pump, Vibrator, cutting,震動, cutting and replace system. Overall efficiency, Performance requirements of input and output power of pumps and turbines. (no velocity limitation)	2
8.3	Description about working with woodchips, soil and other materials and structures. Single piece cutters	2
9	Method 6	
8.2	Description about working with wood - basic description of the manufacturing processes - Sand Casting, Forging, Rolling, Drawing and their applications.	2
8.2	Basic Joining Processes and types of joining. Description with examples of Riveting, Soldering and Braze and their applications	2
8.2	Basic Manufacturing operations: Turning, Drilling, Milling and Drilling Description about working with basic degrees of Justice, Drilling machine, Milling machine, CNC Machine	2
8.2	Principle of CAD/CAM, Rapid and Additive manufacturing	1



ART 136	NAME OF ELECTRONIC MEDIUM ELECTRONIC'S INFORMATION	CATEGORY	FORMAT			SUBJECT	NAME OF INFORMATION
			1	2	3		
			1	2	3		

REFERENCES

This course aims to (i) equip the students with an understanding of the fundamental principles of structural engineering to prepare an engineer of tomorrow; and (ii) introduce the working principle and examples of fundamental structures. It also (iii) provides an overview of concepts of sustainability, resilience and circularity as three elements in today's construction.

Francesca Tassan and Silvana Paganini / *Journal of Aging Studies* 27 (2013) 93–103

From this point, the names of the most prominent physicians who have practiced in this city

III-1	Apply fundamental concepts and various laws to solve simple DC networks.
III-2	Distinguish and solve problems of magnetic circuits.
III-3	Apply the fundamental laws of electrical engineering to solve simple AC circuits in steady state.
III-4	Understand the meaning of a voltage source.
III-5	Understand the principle of an inductor, resistor and capacitor.
III-6	Understand the principle of transformer and its applications.

Review of some software with memory features

第十一章

Semester Category	Basic Structures Engineering			Basic Electromechanical Engineering		
	Continuous Assessment Tasks		Examination Duration (Weeks)	Continuous Assessment Tasks		Examination Duration (Weeks)
	Test 1 (Weeks)	Test 2 (Weeks)		Test 3 (Weeks)	Test 4 (Weeks)	
Summative	2	2	22	22	22	22
Formative	11.5	12.5	22	22	22	22
Avg.	22.2	22.2	22			
Grade						
Total						
Course						

Mark distribution

Test Grade	CH marks	80% marks	80% Question
80	80	80	8 hours

Continuous Internal Evaluation Pattern

Attendance	22 marks
Continuous Assessment Test (2 numbers)	22 marks
Assignments/Quizzes/Class projects	22 marks

Final Semester Examination Pattern: There will be two parts, Part I – Basic Electrical Engineering and Part II – Basic Electronic Engineering. Part I and II will have 12 marks each. Part I and semester examination, part I consists of 3 parts - Part I-Apart I and II. Part II contains 8 questions carrying 1 mark each (one question from each module). Part II consists 2 questions from each module out of which one is to be answered. Each question carries 1.5 mark and can have maximum 3 sub-questions. The pattern for the semester examination for part I is same as that of part II. However, students should answer both part I and part II in respective exam books.

Course level Assessment Questions

Course Outcome 1 (CO01)

1. Solve problems based on current division rule.
2. Solve problems with Ohm's law analysis.
3. Solve problems on Kirchhoff's transformation.

Course Outcome 2 (CO02)

1. Problems on series magnetic circuits.
2. Problems on parallel magnetic circuit.
3. Problems on complex magnetic circuit.

4. Course Outcome 2 (CO02)

1. problems on self-inductance, mutual inductance and coefficient of coupling.
2. problems on reactance and average value of alternating currents.
3. problems on series circuits.

4. Distortion free and Class C biased 2 phase AC amplifier.

Course Outcome 4 (CO04): Explain working of a voltage amplifier

1. What is the need of voltage divider biasing in an IC coupled amplifier?

- Define operating point in the context of a BJT amplifier.
- Why is it required to provide voltage and/or current feedback?

Course Outcome 5 (CO5): Explain the principle of an ohmmeter measurement system.

- Draw the block diagram of an ohmmeter measurement system.
- What is a rheostat?

- Explain the working principle of operation of digital multimeter.

Course Outcome 6 (CO6): Explain the concepts of radio and cellular communication.

- What is the working principle of what waveforms used in a radio transmitter?
- What is the role of two carrier waves, RF carrier and AF carrier in a radio transmitter?
- What is meant by call in cellular communication?

Model Question Paper

Up to date

Page 4

Page No. _____

Name _____

ANNUAL EXAMINEE FORMULATION UNITS IN INSTITUTE OF COMPUTER & INFORMATION TECHNOLOGY,
MORNING TIME

Course Code: EEE111

Course Name: ANALOG ELECTRONICS AND ELECTRONIC ENGINEERING

Date: _____

Duration: 3 hours

Answer both part I and part II in separate answer books

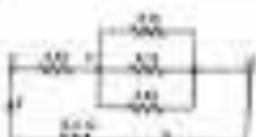
Part I:

ANALOG ELECTRONICS ENGINEERING

PART A

Answer all questions, each question carries 4 marks.

- Calculate the output voltage for the CCW connection in the circuit shown, applying Kirchhoff's current rule.



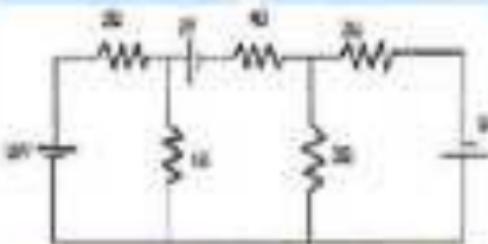
2. Calculate the total and average values of a partly sinusoidal current having peak value 1.0 A.
3. An increasing voltage of $(10+0.01t)$ V is applied to an RLC circuit and the current flowing through the circuit is $(4-0.01t)$ A. Calculate the impedance of the circuit in ohms per radian. Also determine if it is resistive or inductive.
4. Define the voltage frequency, low and high values of voltage in a linear graph for alternating currents.
5. Compare primary and secondary currents. (1 mark)

PART B

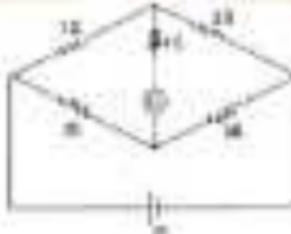
Answer any question from each module, each question carries 10 marks.

Module 2

- B. Calculate the total voltage in the circuit shown, applying node analysis.



- C. (a) Answer and explain Kirchhoff's laws. (1 mark)
- (b) Calculate the current through the galvanometer (G) in the circuit shown. (1 mark)



(1 mark)

Module 2

2. (a) State and explain Faraday's law of electromagnetic induction with examples. (4 marks)
- (b) Distinguish between statically and dynamically induced voltages. A conductor of length 8.2m moves in a uniform magnetic field of flux density 1.7 T at a velocity of 30m/s. Calculate the coefficient in the expression if the direction of motion of the conductor is indicated as 10° to the direction of field. (6 marks)
3. (a) Derive the amplitude, form and frequency of a purely sinusoidal waveform. (3 marks)
- (b) A current wave is made up of two components. An ac component and a 200mA dc component, which is a sinusoidal wave with a peak value of 2A. Sketch the resulting waveform and determine its RMS and average values. (5 marks)

Module 3

10. Draw the power triangle and define active, reactive and apparent power in ac circuits. Two coils A and B are connected in series across a 240V, 50Hz supply. The resistance of A is 1Ω and the reactance of B is 0.812Ω. If the input from the supply is 50W and 12Vrms, find the total value of A and the resistance of B. Also calculate the voltage across each coil.
11. A balanced three phase load consists of three coils each having resistances of 1Ω and inductances 0.025H. It is connected to a 415V, 50Hz, 3-phase ac supply. Determine the phase voltage, phase current, power factor and active power when the loads are connected in (i) star (ii) delta.

(10 marks)

Part 2

Basic Electronics Measurements

Part 3

Answer all questions with another (total 4 marks)

1. Give the specifications of a resistor. This value is determined on a resistor test fixture. Why? (a) 10Ω and 2Ω. What are the minimum and maximum resistance values accepted from this resistance?
2. What is meant by load impedance?
3. Explain the working of a full bridge bridge rectifier.
4. Discuss the role of coupling and bypass capacitors in a single stage CC coupled amplifier.
5. Define voltage, AC and DC communication systems.

(10 marks)

QUESTION

Answer one question from each module, each question counts 20 marks.

Module 4

- Q. a) Explain with diagram the principle of operation of an ICF converter. [10]
 b) Sketch and explain the typical input-output characteristics of a GTO drive connected in common-emitter configuration. [10]
- [20]
- Q. a) Explain the formation of a potential barrier in a JFET junction diode. [10]
 b) What do you understand by Hall-effect measurement? Draw and explain the IV characteristic of a Hall-measuring device. [10]

Module 5

- Q. a) With the help of circuit diagram, explain the working of an LC coupled amplifier. [10]
 b) Draw the frequency response characteristics of an LC coupled amplifier and state the reasons for the reduction of gain at lower and higher frequencies. [10]
- [20]
- Q. a) With the help of block diagram, explain how an electronic instrumentation system. [10]
 b) Explain the principle of an oscilloscope. [10]

Module 6

- Q. a) With the help of a block diagram, explain the working of Super-heterodyne receiver.
 b) Explain the necessity of antenna in a communication system.
- [20]
- Q. a) With neat sketches explain a cellular communication system.
 b) Perform radio communication with the help of a block diagram.

[20+20=40]



MODULE 1: Elementary Concepts of electric Circuits

Elementary concepts of DC electric circuits: basic circuit topologies including voltage, current, power, resistance, and inductance in series and parallel. Current and voltage Division rules; Dependent & independent voltage and current sources. Ohm law and Kirchhoff's laws; resistors, variable resistors in passive microwave communication components and problems.

Analysis of DC electric circuits: Mesh current method - Matrix representation - Solution of mesh equations, loop voltage methods, node representation and use of current equations by matrix methods. Numerical problems.

MODULE 2: Elementary Concepts of Magnetic circuits, Electromagnetic induction and AC Fundamentals

Magnetic Circuits: basic terminologies like flux, flux strength, flux density, reluctance - comparison between electric and magnetic circuits, series and parallel magnetic circuits with comparison between linear and non-linear relations.

Electromagnetic induction: Faraday's law, problem, Lenz's law, self-induced and mutually induced EMFs, Self-inductances and mutual inductances, coefficient of coupling.

Alternating Current Fundamentals: Generation of alternating voltages, Representation of sinusoidal waveforms, Frequency, period, Average, RMS values and form factor of AC voltages, numerical problems.

MODULE 3: AC Circuits

AC Circuits: Effect of combination of sinusoidal currents, impediment, Potentiometer, resistor, inductor and capacitor, form. Analysis of simple AC circuits, Parallel networks, inductive & capacitive circuits, resistive and capacitive reactance, concept of impedance, Average Power, Power factor, Analysis of RL, RC and RLC series combinations, maximum and minimum power, Z-parameters, numerical problems.

Three phase AC systems: Generation of three phase voltage, advantages of three phase systems, parallel AC connections (balanced and unbalanced), relation between line and phase voltages, line and phase currents, Numerical problems.

MODULE 4:

Introduction to Semiconductor Devices: Evolution of electronics - vacuum tubes to semi-conductors. Diodes, Capacitors and Insulators (conventional) Materials and required properties, specifications, forward voltage, rated rating, PN junction diode: Principle of operation, I-V characteristics, principle of zener diode breakdown, Zener current, Zener voltage, P-N and N-P structures, Principle of operation, Relation between current gains in CE, CB and CC, Input and output characteristics of common-emitter configuration.

MODULE 4

Basic electronic circuits and instrumentation: Oscilloscope and power supplies. Basic design discussion of a DC power supply, working of a full wave bridge rectifier, inductor filter (in analysis), working of single stage voltage regulator. Amplifiers: Block diagram of Pulse Ammeter system, Circuit diagram and working of common emitter (IC coupled) amplifier with its frequency response, Design of voltage divider biasing. Electronic measurement: Block diagram of an electronic measurement system.

MODULE 5

Introduction to Communication Systems: Radiation of communication systems - Telegraphy to FDDI. Basic communication: principle of AM & FM, Frequency bands used for various communication systems, Block diagram of super heterodyne receiver, Principle of antenna - relation from polarized charge. Mobile communication: basic principles of cellular communications, principle and block diagram of GPRS.

Text Books

1. D. C. Jaitly and V. Jagadish, "Basic Electrical Engineering", Tata McGraw Hill, 2002.
2. D. C. Gauravendra, "Basic Electrical Engineering", Tata McGraw Hill, 2002.
3. Chittaranjan, Aruneshwar Ray and Devesh Garg, "Basic Electronics - Principles and Applications", Cambridge University Press, 2003.
4. D. C. Jaitly and T. S. Jagadish, "Basic Electrical and Electronic Engineering", Oxford University Press, 2002.
5. Wayne Thomas and Neil Davies, A Textbook Of Basic Communication and Information Engineering, Pearson, 2001.

Reference Books

1. Dr. Tom W. "Electrical Engineering Fundamentals", Prentice-Hall.
2. T. S. Jagadish, D. C. Jaitly, "Basic Electrical Engineering", Oxford Higher Education.
3. Hayt & Kemmerly, K. and Soniat E. L., "Engineering Circuit Analysis", Tata McGraw Hill.
4. Hayes, "Electrical and Electronic Technology", Pearson Education.
5. N. S. H. Alvi and Syed Ali, "Basic Electronics Engineering", Pearson Education, United States.
6. Danen and Dohr, "Principles of Electrical Engineering", CBS Publishers and Distributors.
7. S. R. Lal Nitineni and Venkata Basava, "Fundamentals of Electrical Engineering", Cambridge University Press.
8. Arun Agarwal, "Practical Projects of Analog and Mixed Electronics Circuits", Morgan Kaufmann Publishers, 1995.
9. Goran Gajic, "Basic Electronics", McGraw Hill.
10. A. Bhagat Singh, Paul S. Driscoll, "Communication Systems: An Introduction to Signals and Noise in Communication", Tata McGraw Hill, 2nd edition.

CURRICULUM AND LECTURE SCHEDULE

No.	Topic	No. of Lectures
1	Elementary Concepts of Electric Circuits	
1.1	Elementary concepts of DC electric circuits Basic Terminology involving voltage, current, circuit, resistance, cell, Kirchhoff's laws and ohm's law; current and voltage division rules; capacitors & resistors (parallel and series). Circuit analysis methods (meshes).	3
1.2	Series circuit (resistor, capacitor and inductor) non-resonant problems.	1
1.3	Example of DC electric circuits (Kirchhoff's method + Ohm's law representation), solution of network equations. RC-RC circuit methods (series connection/parallel connection of resistors, capacitors); mesh methods. Numerical problems.	3
2	Elementary Concepts of Magnetic Circuits, Electromagnetic induction and AC Fundamentals	
2.1	Magnetic Circuits Basic Terminology (flux, flux density, reluctance, inductance, comparison between electric and magnetic circuits) Series and parallel magnetic circuits with composite methods, numerical problems.	3
2.2	Electromagnetic induction: Faraday's law, problems, and self- mutually induced and互感互感 induced fields - self-inductance and mutual inductance, coefficient of coupling	3
2.3	Alternating Current Fundamentals: Generation of alternating voltages Representation of sinusoidal waveforms: frequency, period, Average, RMS values and form factor of currents/voltages, Numerical Problems.	2
3	AC Circuits	

8.1	AC Single Phase representation of various quantities Harmo neric, Rectangular, Polar and complex form. Analysis of single AC circuit: AC voltage, Inductive & capacitive reactances and admittance, concept of impedance, phasor, power factor.	1
	Analysis of Δ , Y and π connected AC circuits and equivalent circuits.	1
	Simple numerical problems.	1
8.2	Three phase AC system: Character of three phase voltages, advantages of three phase systems, star and delta connections, balanced three phase between line and phase voltages, line and phase currents, numerical problems.	3
9	Introduction to semi-conductor devices	1
10	Diode as an electronic device - basic idea to new positions in conditional conduction path.	1
11	Transistor: Construction and working, types, applications. Transistor driven, collector biasing (DC, compensation), feedback.	2
12	PN junction diode, principle of operation, PN junction diode, principle of operation, applications	2
13	Silicon Junction Transistor: 100 and 1000 picoseconds, Principle of operation, relation between current gains in CE, CB and CC, input and output characteristics of common-emitter configuration.	3
14	Basic electronic circuits and their applications	1
15	Rectifiers and power supplies: Half wave, bridge conversion of a.c. power supply, Working of a full wave bridge rectifier, separator filter (ac analysis), working of Zener diode voltage regulator	3
16	Amplifiers: Block diagram of Fully-Biased system, circuit diagram and working of common emitter (DC coupled) amplifier, mid-tube frequency response, concept of voltage division biasing	4
17	Electronics instrumentation: Block diagram of an electronic instrumentation system	1
18	Introduction to Communication Systems	1
19	Evaluation of communication systems - Telegraphy to DS	2

8.C	Radio communication: principle of AM & DM, Frequency bands used for various communication systems, Block diagram of super heterodyne receiver. Principle of antenna - variation form ambient charge.	3
8.D	Mobile communication: basic principles of cellular communication, principle and block diagram of 2G.	2

Suggested Simulation Requirements for Basic Electronics Engineering

1. Plot V/I characteristics of Diode & Zener diode on a simulator
2. Plot input and Output characteristics of BT on a simulator
3. Implementation of logic sequence on full logic module
4. Simulation of DC coupled amplifier with sine wave supplied
5. Generation of audio signal

Note: The simulations can be done on commercially available softwares like Multisim or similar software to enhance the understanding.



Module	Learning Outcomes	Category	1	2	3	Credit	Year	SF
			W&L	1	2			
03.6	L14.201.01	W&L	1	1	1	—	2018	80%

Principles: LFC skills are those competencies that provide the means for an individual to be successful and productive while taking on their responsibilities. Development of this contributes to being aware of the self, connecting with others, reflecting on the effects and the context, leading and guiding change, and staying focused in times of stress and pressure. It is being assessed at this module to enhance the understand and harness the potential of the students by introducing them to the principles that underpin personal and professional success and help them acquire the skills needed to begin these principles in their lives and careers.

Prerequisite Skills

General Competence: Upon the completion of this module the student will be able to:

03.1	Identify and justify differences in different cultures in presentation and professional life
03.2	Develop an awareness of the self and apply self-learnt techniques to cope with challenges and setbacks
03.3	Highlight the basic importance of effective communication and communicate these through presentations
03.4	Take part in group discussions
03.5	Use appropriate planning and problem solving techniques to solve inter-personal problems
03.6	Understand the concept of leadership and leadership

Mapping of learning outcomes with programme outcomes

	PO1	PO2 – PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
03.1					1			1	1	1	1
03.2								1			1
03.3					1			1	1		
03.4									1		1
03.5	1	1	1								
03.6					1			1			

Work distribution

Total weeks	01	02	03 duration
20	20	20	2 hours

Continuous Internal Evaluation

Total marks: 10

Assessments

Regular assessments	12 marks
Self-assess (including self-assessment of practical modules)	1.5 marks

Final assessment

Part A: Group Discussion (Marks 12)

Create groups of about 8 students to teach and engage them on a CD on a selected topic for about 10 minutes. Parameters to be used for evaluation are as follows:

- Communication skills 3 marks
- Subject depth 2 marks
- Visuals/presentation 2 marks
- Interaction & engagement 1.5 marks

Part B: Presentation Skills (Marks 12)

Select a suitable topic and ask the students to prepare a presentation (preferably a power point presentation) for about 10 minutes. Parameters to be used for evaluation are as follows:

- communication skills 2 marks
- platform skills 1 marks
- audience engagement 1 marks

Final Semester Examination

Total marks: 20

Time: 2 hrs

Part A: Short answer questions (12 marks)

There will be one question from each module. One question is read. Five marks each. Short answers should be written in about maximum of 40 words. Parameters to be used for evaluation are as follows:

- (i) content clarity (2 marks)
- (ii) presentation skills
- (iii) Organisation of content.

Part B: Case Study (12 marks)

The students will be given a case study with questions on the unit. The students have to analyse the case and answer the questions on the unit. Parameters to be used for evaluation are as follows:

- (i) Analysis of the case (3 marks)
- (ii) Identification of the problem (3 marks)
- (iii) Root cause (3 marks)
- (iv) Analysis of alternatives against the condition
- (v) Choose the best alternative
- (vi) Requirements gathering
- (vii) Conclusion

[e] Answer the questions at the end of the notes.

Course level Assessment Questions

Course Outcome 1 (CO1)

1. Define the skills required by firms:
2. What do you mean by effective communication?
3. What are the essential skills required by a professional?

Course Outcome 2 (CO2)

1. Identify an effective means to deal with conflict situations.
2. Identify a leadership style relating to stress management.
3. What are the methods of conflict resolution when the method can be used effectively.

Course Outcome 3 (CO3)

1. Identify the communication methods or systems that can be observed in the given situations.
Description:
 - (a) A group discussion on development.
 - (b) An address made by Dr. Bhargav regarding community.
 - (c) A lecture introduction to marketing.
 - (d) Discussing the issues of access with a group of friends.
2. Illustrate the importance of non-verbal communication by giving examples.
3. Differences between males, females, and homosexuals with examples.

Course Outcome 4 (CO4)

1. How can a participant contribute to group discussion effectively?
2. Learning skills are required for effective participating in a group discussion - Do you agree? Substantiate your answer.

Course Outcome 5 (CO5)

1. Illustrate the creative thinking process with the help of a suitable example.
2. Translate the following problem from verbal to graphical form and find the solution : If Alan has 22 pencils more than Ema, Chenny has 20 pencils less than Smith, and Dharm has 22 pencils less of Chenny. What is the difference in pencils between Ema and Dharm?

- b) Given their findings in which the problem "How to increase profits?" can be addressed

Course Outcome 9 (CO9)

1. A group of engineers started to implement a design team on a new product. Since it was decided to change with the same members, how would you use learning theory to see what different solutions would you suggest to avoid the "groupthink" before the presentation.
2. "A group focuses on individual contribution, while a team must focus on synergy." Explain.
3. Identify the type of group norms, summarized in each of the given situations:
 - a) A POCO manager with subordinates reporting to him.
 - b) An engineer committed to maintaining specifications.
 - c) The accounts department of a company.
 - d) A group of health issues after medical school class reading.

Skills

Module 1:

Structure of life skills. Meaning and significance of life skills, life skills related to time, self, emotional, empathetic, critical thinking, creative thinking, decision making, problem solving, effective communication, interaction with others, cognitive processing with information.

Life skills for professionals, problem solving, life skills, decision making, having the big picture, learning skills, research skills, problem solving, setting goals and achieving them, helping others, learning motivation, self-motivation, and maintaining actions, personal life enrichment, GQ, Level CO.

Module 2:

Relationships, self-esteem, need for self-acceptance, Dealing with stress and tensions, human values, tools and techniques of life-coachments, counseling, reflective listening, motivation, influences, psychological terms, feedback.

Team management: Stress, reasons and effects, identifying stress, stress theory, the four A's of stress management - techniques, motivational, action-oriented, creation-oriented, accomplishment, cognitive, feedback training.

Dealing with emotions: Identifying and managing emotions, harmful ways of dealing with emotions, POCO mediated and relaxation techniques.

Moral, Values and Ethics; Integrity, Due Diligence, Respect for Others, Young Creativity, Caring, Sharing, Honesty, Fairness, Helping others, Time management, Innovation, Commitment, Integrity, Self-Confidence, Charisma, Optimism, Curiosity, Imagination, Sense of Beginning, Risk.

Module 1:

21st century skills: Creativity, Critical Thinking, Collaboration, Problem Solving, Decision Making, Need for Creativity in the 21st century, imagination, intuition, experience, Source of Creativity, Lateral Thinking, Styles of Creativity, Critical Thinking vs Creative Thinking, Functions of Left Brain & Right Brain, Convergent & Divergent Thinking, Critical thinking & Multiple intelligences.

Steps in problem solving: Problem Solving Techniques, Six Thinking hats, Mind Mapping, Central Connections, Analysing Thinking, Summarising, and graphic recording, Systems thinking and Critical thinking.

Module 2:

Group and Team Dynamics: Introduction to Groups, Interactions, Networks, Social Shaping, Identifying stakeholders, Problem solving, Consensus, Dynamic processes, Roles in team, Team Dynamics, Virtual Teams, Managing team performance and managing conflicts, Interpersonal skills.

Module 3:

Leadership: Leadership framework, entrepreneurial and more, coaching, vision, cultural dimensions, Driving as a leader, continuous learning, managing diverse stakeholders, crisis management, Types of leadership, Traits, Hersey, House, Vroom, Leadership, Levels of leadership, Transformational vs Transactional leaders, Leader, Leading Child, Effective leaders.

Self Activities:

Topic 1:

Effective communication and Presentations skills.

Different kinds of communication: Oral or written, written, Communicator networks, Types of barriers, Miscommunication.

resolution of presentation emerging issues.

Learning styles: visual, oral, reading, listening, logical, visual, auditory, Processing, Oral, audio, visual, reading, RBLP model.

Speaking skills: talking, nonlinear speaking methods, conflict rocks, three column meeting.

Non-verbal communication: Association, feedback, Personal, audience, Space, Distance and Timing, Spoken presentation.

Time management: setting, identifying time wasters, managing priorities, planners and schedules, Planning - Goal setting, SMART goals, Productivity tools and apps, Prioritisation techniques.

Topic 2:

Non-verbal Communication and Body language: Forms of nonverbal communication integrating Non-verbal skills, Non-verbal characteristics, Plastic art of body language, Communication in a multi-cultural environment.

Reference Books

1. Gokhale, Venkatesh, *Myself & Skills*, Surya Books, 2003.
2. Narve E. Ulma, "Teamwork Development & Soft Skills", Oxford Publishing, Third Impression, 2001.
3. CT Academy of India, "Life Skills for Engineers", Indusprint Publishers, Madras Institute, 2005.
4. Savitri S. R. and Savitri C, "The Emotional Intelligence Manager: How to Develop and Use the Four Key Skills to Succeed", John Wiley & Sons, 2004.
5. Miyake, "Soft Skill For Managers", Prentice-Hall, New Delhi, 2002.
6. Lain-Jones, "The Plus Book" 25 Skills", Plus Edition, Penguin Books, 2002.
7. Shashi Verma, "Development of Life Skills and Personal Progress", Five Star, Zulm, Shashi G.U.P Company, 2004.
8. Daniel Goleman, "Emotional Intelligence", Random, 2004.
9. Nirmala E., Nalini K.D., "Life Skills for Engineers", Pearson Publications, New Jersey, 2004.
10. successforlife, "Soft skills for managers", eGangotri Learning India Pvt Ltd, 2009/2010, 2011.
11. Training in Interpersonal Skills: Tips for Managing People at Work, Pearson Education, India, 8 edition, 2008.
12. The Art of Soft Skills, Motivational, Communication and Etiquette for Success, Pearson Education, 1 edition, 2010.



ID 109	Engineering Materials	CATEGORY	L	T	P	CREDIT	DATE OF INTRODUCTION
			100	1	0		

Aim: The aim of this course is to make the students gain practical knowledge in connection with the theoretical studies and to provide practical applications of engineering materials and use the principles in the right way to implement the modern technology.

Prerequisite: Higher secondary level Physics.

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

PO1	Observe and recall from external sources important parameters required for engineering applications.
PO2	Understand the need for precise measurement processes for base learning.
PO3	Understand the synthesis, analysis, working and evaluations of various techniques and conversion of materials with different attributes.
PO4	Analyze the structures and their association with various elements like atom and molecules.
PO5	Develop basic communication skills through working in teams in performing the laboratory assignments by implementing the module.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EO1	1				1		1	1			1	
EO2	1				1		1	1			1	
EO3	1				1		1	1			1	
EO4	1				1		1	1			1	
EO5	1				1		1	1			1	

Mark distribution

Total Marks	CG		SG Score/marks	SG Score/marks
	Marks	Weight		
100	60	1	100	

Demonstrations/Practical Patterns:

Waves	10 minutes
Electrostatics	10 minutes
Thermal conduction (through a wall)	10 minutes

End Semester Examination Between Under Graduate Semester of one year

QUESTION

(SET OF EXPERIMENTS)

Set of experiments should be completed

1. DCO-Measurement of frequency and wavelength of wave form.
2. Measurement of strain using strain gauge and ultrasonic bridge.
3. LCR Bridge-Demand and supply harmonic oscillations.
4. ABS/Calorimeter-Measurement of Temperature in the bath water and long water rods.
5. Wavelength measurement of a monochromatic source of light using Newton's Ring method.
6. Determination of diameter of a thin wire or thickness of a thin wire of paper using air gauge method.
7. To measure the wavelength using a millimetre scale as a grating.
8. Measurements of wavelength of source of light using grating.
9. Determination of dispersion power and refracting power of a glass by normal grating.
10. Determination of the particle size of barium sulphate powder.
11. Determination of the wavelength of Hg-violet light by standard KBr ultra filter from 2000.
12. Calculate the numerical aperture and cause the losses that occur in optical fibers.
13. H characteristics of solar cell.
14. Q Characteristics.
15. Uv-Vis spectrometer-Measuring band velocity measurements of absorption maxima in a liquid.
16. Deflection magnetooptical elements of a magnetic field A position.

Reference Books

1. S. L. Gupta and D. K. Kumar, "Practical Physics with Visa-vista", Prentice Hall India Publishers, Revised Edition, 2008.
2. M. N. Josephson, J. L. Jain and V. V. Ravi, "Experiments in Engineering Physics", A. Chandrasekhar, 2008.
3. K. K. Raja, "Engineering optics in practice", McGraw-Hill Education Pvt. Ltd., 2012.
4. P. K. Pathaner "Practical Physics", PHI Ltd., 2002.

CR. 129	BIOASSAYO CHEMISTRY LAB	CREDIT 302	CATEGORY				CREDIT 3
			1	2	3	4	

possible to gain scientific approach and to familiarize with the common organic compounds for research process in higher education.

Prerequisite: Basic knowledge in chemistry, mathematics and physics taught in schools.

Course outcomes: After the completion of the course the students will be able to

CO-1	Understand and practice different techniques of quantitative chemical analysis to gain basic experimental skills and apply those skills to various analysis
CO-2	Develop skills required to separate organic substances and acquire the practical skill to use TLC for the identification of drugs
CO-3	Develop the ability to understand and explain the use of modern spectroscopic techniques for analysing and determining the IR spectra and NMR spectra of some organic compounds
CO-4	Acquire the ability to understand, explain and use instrumental techniques for chemical analysis
CO-5	Learn to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments
CO-6	Function as a member of a team, communicate effectively and work in higher learning, Non-discriminatory, non-stereotypical, social, community and environmental problems and help it to an integral part of curriculum

Mapping of course outcomes with program outcomes

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12
CO-1	2				2							2
CO-2	2				2							2
CO-3	2				2							2
CO-4	2				2							2
CO-5	2				2							2
CO-6	2				2							2

Mark distribution

Total marks	Oral marks	Written marks	CB Duration/intervall
200	200	+	2 hours

Continuous Internal Evaluation Pattern:

Attendance	20 marks
Discipline/Adherence/Neatness	10 marks
Total Internal Assessment (Experiments) by college	20 marks
Total Semester Total mark on basis of primary objective (out of 100)	100 marks

RESULTS

LIST OF EXPERIMENTS (ASSESSMENT AND CREDITS)

1. Determination of total hardness of water (EDTA method)
2. Determination of copper.
3. Determination of oil content and colourimetric estimation.
4. Estimation of pH meter and determination of pH of a solution.
5. Estimation of chlorine in water.
6. Determination of titration of NaOH with HCl.
7. Determination of wavelength of absorption maximum and determine concentration of Cr^{+3} in solution.
8. Determination of molar absorptivity of a compound (KIO_3 , or any other soluble redox salt).
9. Preparation of polymer gel (Crosslinked polyacrylate) (A) Polymer formation and (B) Polymer formation rate.
10. Estimation of iron in ore.
11. Estimation of copper in brass.
12. Estimation of dissolved oxygen by Winkler's method.
13. (A) Analysis of I₂ system (minimum 3 experiments), (B) Analysis of NaClO₂ system (minimum 2 experiments).
14. Color photometric estimation of Cu^{+2} in first two the salinity in sea.
15. Determination of viscosity of a organic oil.
16. Determination of concentration of a organic oil.

Reference Books

1. D. Gupta & S. Bhattacharya, "Topics in Qualitative Inorganic Analysis", Pearson, 2012.
2. R. K. Mukherjee, "Engineering Chemistry Lab Manual", TM Publications, 2017.
3. V. Venkatesh, "Engineering Chemistry Lab Manual", Oxy publications, 2020.
4. Shanti, "Engineering Chemistry Lab Manual", Oxy Publications, 2010.
5. Rev. D. Ganguly, "Engineering Chemistry Lab Manual", Dr. Ganguly Publishers, 2012.
6. James P. O'Neil, David Lyle Jones, "Text Manual of Engineering Chemistry", L. L. Shirey, Company Inc. ed. New Delhi, 2018.

Possible: The student is assigned to train the students to identify and manage the risks, resources and methods required to execute an ongoing project. Students will be introduced to a team working environment where they develop the necessary skills for planning, directing and monitoring an organization's goals.

To enable the solution of Schrödinger's variational tasks, numerical analysis and efficient methods of calculating derivatives are used in the solution of boundary problems.

Page 10 of 10

[202] However, after the same year of the peace the situation will be quite

Course Outcome	Learning Outcomes Description
CO-1	Identify common concepts and tools used for civil engineering measurements.
CO-2	Explain the use of various tools and devices for various field measurements.
CO-3	Demonstrate the steps involved in basic building reading activities like floor measurements, setting out operation, calculating the natural profile, efficient plumbing and undertaking simple construction work.
CO-4	Choose materials and methods required for basic civil engineering activities like floor measurements, measurement and plumbing.
CO-5	Compare different instruments and devices used in civil engineering measurements.
CO-6	Identify basic mechanical workshop operations in accordance with the material and norms.
CO-7	Apply standard terms and instruments with reference to the mechanical workshop.
CO-8	Apply standardised safety measures with respect to the mechanical workshop tools.

Winnipeg Free Press, February 19, 1990

EO 1	2							
EO 3	2							

Mark Distribution

Total Marks	CB	CE	CE Revision
100	50	50	Year

Assessment Procedure: Total time allocated for the course is 200 hours, of which is conducted for 120 hours and 80 for 20 marks. EO3 should be done for the mark allocated by the students and also the time taken for the work done in each practical session. EO2 will be evaluated by written examination of one hour duration conducted internally by the Institute.

Continuous Internal Evaluation Pattern:

Attendance	20 marks
Class work/ assignments/ quizzes	40 marks
Mid semester examination (externally by college)	20 marks

Final Semester Examination Pattern: Written Objective Examination of one hour

Objectives

PART I

LEVEL ACHIEVEMENT

- Scenario 1:** Calculate the area of a building space and a small garden of land. Use standard measuring tools and stated dimensions. Measuring devices
- Scenario 2:** (a) Use vernier caliper and mm scale to measure the diameter of a metal rod and thickness of a feather
 (b) Measure the total floor area of a room by a meter board
 (c) Draw a section view of a building from a given plan and measuring tape
- Scenario 3:** Give three levels differences between any four points using plumb line
- Scenario 4:** (a) Construct a $1\frac{1}{2}$ cubic brick with a height of 20 cm, height and 20 cm length, using English bricks. Using this brick to construct the walls
 (b) Determine the number of different bricks of following size that can construct a wall

- Outcome 6:**
- (i) introduce students to building tools, different types of tools, type of connections, tools, values, norms and safety fittings.
 - (ii) recall a small structure featuring materials in the campus.

Reference Books:

1. Ghosh P.D, "Indian Practical Civil Engineering Handbook", Agripram Publications.
2. Shukla S, "Surveying and levelling (Volume 2)", Laxmi International Publishing House.
3. Airee D.P and Soni D.P, "Building Construction", Chander Lal Publications.
4. R.C. Bhargava, "Engineering Materials", Charotra Publishing house.

PART II

Mechanical Workshop

UNIT 01:

UNIT 01.01 - Introduction and Preparation Unit 01 & Material

UNIT 01- General : Introduction to working tools, tools available at the shop, tool classification.

Study of mechanical tools, components and their applications in Transmission system, generators, alternators, cutting planes etc and processes [X], storage, tools, O-rings, wrenches, hammers.

UNIT 01.02 - Capacity : Understanding of capacity tools

Minimum and maximum:

1. T-Hex joint 2. Cross lag joint 3. Channel joint 4. Flange joint

UNIT 01.03 - Foundry : Understanding of foundry tools

Minimum and maximum:

1. Box Joint 2. Core holding 3. Core-making 4. Casting-making

UNIT 01.04 - Sheet Metal : Understanding of sheet metal working tools

Minimum and maximum:

1. Circular shear
2. Rectangular shear
3. Hydraulic sheet metal shear machine

UNIT 01.05 - Metal : Understanding of tools used for tools

Minimum and maximum:

1. Square file
2. V-groove
3. Hand and bench filing

UNIT 01.06 - Plumbing : Understanding of plumbing tools, instruments

With emphasis on points of concern like use of minimum thickness of sections

UNIT 01.07 - Safety : Understanding of tools used for safety.

Demonstrating the fragility of different materials (H.C., C, Alucore and steel) in cold and hot states.

Discussing the qualities of different materials in terms of their suitability

Minimum and maximum sizes

1. Squat stem
2. Tapered pedestal
3. Tapered stem
4. Dished stem

UNIT 10 - Making: Understanding of making operations

Minimum and maximum working position

Making joints using screws per working base template is horizontal, vertical and cross head positions

UNIT 11 - Assembly (Interpretation only)

Describing and understanding of:

1. Components and part assembly
2. Self-assembly
3. Tools
4. Manufacturing methods

UNIT 12 - Technical comprehension and application of the following machines

Shaving and Reaming machine, Milling machine, Drilling machine, Mill, Drilling machine.

UNIT 13 - Modern manufacturing machines: Power tools, CNC machine tools, 3D printing, Glass cutting

Course Content and Lecture Schedule

No	Topic	No of lectures
INTRODUCTION		
1.0	Workshop practice, shop floor procedures, codes and rules and knowledge.	1
Components		
2.0	Analysis of material costs, conventions and their applications (i) Trivis, wave plates, spacers, filter bars, cutting plots etc and accessories (ii) bearings, seals O-rings, gaskets, keys etc.	1
Operations		
3.0	Understanding of assembly tasks and making minimum and major	1

S	KNOWLEDGE	
9.1	Understanding of machinery tools and making minimum one model	1
10	SKILL	
10.1	Understanding of essential working tools and making minimum one model	1
11	Process	
11.1	Understanding of three essential working minimum one model	1
12	PLANNING	
12.1	Understanding of job tasks are planning task and making minimum one model	1
13	WORK	
13.1	Understanding of quality, techniques making minimum one model	1
14	QUALITY	
14.1	Understanding of working equipments and making minimum one model	1
15	SKILL	
15.1	Demonstration of essential and alternating of multiple parts	1
16	TECHNIQUE	
16.1	Demonstration of various methods	1
17	WORKING METHODS	
17.1	Demonstration of various tools, tools techniques, tools working	1
18.1	Demonstration of some tools, tools techniques, tools working, tool working	1

EEU.200	ELECTRICAL & ELECTRONIC PRINCIPLES	CATEGORY	I	T	P	EMERG	TEACH OF	INDIVIDUALS
			800	2	2	1		200

Principle: Electrical circuitology is essential to implement safe and carry out design of electrical wiring. It is essential for the practicing engineer to identify the basic practices and safety measures in electrical wiring.

Prerequisite (P):

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

EO-1	Demonstrate safety measures against electric shock.
EO-2	Identify the tools used for electrical wiring, electrical accessories, wires, cables, terminals and certified symbols.
EO-3	Draw the connection diagram, identify the suitable measures and materials necessary for using single lighting circuitry for domestic buildings.
EO-4	Identify various types of insulation components.
EO-5	Distinguish between live and neutral wires.
EO-6	Understand different connection methods for lighting.
EO-7	Working with safe electrical wiring.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
EO-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
EO-2	2	-	1	-	-	-	-	-	-	-	2	-	-	-	-
EO-3	2	-	1	-	2	-	2	-	2	2	2	-	-	-	2
EO-4	2	-	1	-	-	-	-	-	-	-	-	-	-	-	2
EO-5	2	-	1	-	-	2	-	-	-	-	-	-	-	-	2
EO-6	2	-	1	-	-	2	-	-	-	-	-	-	-	-	1
EO-7	-	-	1	-	-	-	-	-	-	2	2	-	-	-	2

Mark distribution

Total marks	Ex	Pr	Pr Continuous
200	+	+	+

Continuous material evaluation criteria:

Attendance	20 marks
Class work / Assessment / Worksheets	20 marks
Discontinuous assessment (internally or college)	20 marks

End Semester Examination Pattern: Written Objective Examination of one hour

Subject

Maths

Electrical

Lab experiments / Experiments

1. To determine the preliminary mechanical design of Electrical switch
absolutely different types of switch (voltage, resistance, timer, bus switch, micro, touch and PLC) and settings.
2. Writing of simple logic circuit for controlling light for particular time interval.
3. Writing of logic function using three variable OR gate using
4. Writing of Current source and logic source. OR writing power circuit for controlling power device (IGBT switch).
5. Writing of power distribution arrangement using single phase AC/DC converter based on
BUCK, boost and buck-boost.
6. Identify all components of Inverter with their specifications.
Identify the Type and Rate Setting Selection using Chakrabarti VLSI

Maths

Electrical

Lab experiments / Experiments (Minimum of 4 mandatory)

1. Familiarization with basic of electronic components with application
Microcontroller, logic, Relays, logic reading, oscillator, switch, resistor, Diode, Resistor, Electrical, Electronics, Electro-mechanical, Wires, Capacitor, Components, Transistor, Diodes, Relays, Optocoupler, Displays, Potentiometers, Resistors etc.)

3. Drawing of electronic circuit diagrams using EWB/ EWB symbols and conversion to PCB mask (such as DIL, SOT23, surface mount devices components and PCB assembly and testing).
4. Specification/Explanation of testing documents and community case tools (e.g., Nios II, Xilinx generation Timer, ADC, DAC and [soldering iron, desoldering pump, fluxes,助剂, solder paste, solder fluxes, solder paste, solder paste, cleaning tool, rework soldering and reworking equipment]).
5. Testing of electronic components (Resistor, Capacitor, Diode, Transistor and JFET) using multimeter.
6. Measurement methods and soldering practice (Smart Iron, Soldering, Cleaning, Soldering types, evaluation of materials and safety procedures, soldering practice in common and general purpose PCBs, cleaning).
7. Printed circuit boards (PCB) Trace length, width, height, size, APG, Accounting members, Design and manufacture of a single-sided PCB from a single mask with manual drilling (drill/diamond) and drilling.
8. Assembly of electronic circuits using MELCO Fast Mount Technology (any two).
9. Assembly of electronic circuit system on general purpose PCB, test and show the functioning (Any two circuits).
10. High voltage construction with transformer (transformer design, resistor, filter, current limiter).
11. Transformer generation using EWB/ EWB in Class.
12. Transformer generation using EWB/ EWB in Class.
13. Microcontroller with transistor logic.

SEMESTER II

MAT1 501	VECTOR CALCULUS, DIFFERENTIAL EQUATIONS AND TRANSFORMS	CATEGORIE	I	II	III	GRADUAT	Year	W
		AU	5	1	11	4	2009	

Principle: This course introduces the concepts and applications of differentiation and integration of vector-valued functions, differential equations, Laplace and Fourier transforms. The objective of this course is to familiarize the prospective engineers with some advanced concepts and methods in Mathematics which include the calculus of vector-valued functions, various differential equations and basic transforms such as Laplace and Fourier Transforms which are invaluable for any engineer's mathematical tool box. The topics treated in this course have applications in all branches of engineering.

Prerequisite: Calculus of single and multi-variable functions.

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

CO-1	Compute the derivatives and the integrals of vector functions and learn their applications
CO-2	Evaluate surface and volume integrals and learn about their applications
CO-3	Solve homogeneous and non-homogeneous linear differential equations with constant coefficients
CO-4	Compute Laplace transforms and apply them to solve ODEs arising in engineering
CO-5	Compute the Fourier transforms of functions and apply them to solve problems arising in signal processing

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
	0	0	0	0	0	0	0	0	0	0	0	0
CO-1	3	3	3	3	2	1		3	3	3	3	3
CO-2	3	3	3	3	2	1		3	3	3	3	3
CO-3	3	3	3	3	3	3		3	3	3	3	3
CO-4	3	3	3	3	2	1		3	3	3	3	3
CO-5	3	3	3	3	2	1		3	3	3	3	3

Assessment Scheme

Learning Category	Continuous Assessment Test Year 1 (Marks)	Year 1 (Marks)	Ex. Semester Examination (Marks)
Remember	22	22	22
Understand	22	22	22
Analyse	22	22	22
Evaluate			
Total			

Syllabus

Mark Distribution

Total marks	Continuous	Midterm	Final Exam
120	20	30	70/50

Continuous Internal Distribution pattern:

Assessments	22 marks
Continuous Assessment Tests (2 numbers)	22 marks
Assignments/Quiz/Online program	23 marks

Assignment assessments should include specific problems highlighting the applications of the concepts introduced in this course in science and engineering.

Final Semester Examination Pattern: There will be two parts, Part A and Part B. Part A contains 10 questions with 2 questions from each module, having 6 marks for each question. Students should answer 4 questions. Part B contains 12 questions from each module of which students should answer 8 marks. Total duration can have maximum 120 minutes and carry 54 marks.

Course Level Assessment Questions

Course Outcome 1 (CO1): Compute the derivatives and the integrals of vector functions and parametric representations.

- How would you calculate the speed, velocity and acceleration at any instant of a particle moving in space whose position vector at time $t = t_0$?
- What are the units used by the first five $F(x) = x^2 + (y^2 - 4)^2$ in a particle that travels around the unit circle centered at origin having radius 1.
- What do you say that a curve Γ is concave up or down the indications $y'' < 0$ or $y'' > 0$ is concave?

Course Outcome 2 (CO2): Evaluate surface and volume integrals and their interpretations and applications.

- From any two applications each of line integral, double integral and surface integral.
- Use the divergence theorem to find the outward flux of the vector field $F(x, y, z) = \langle x^2, y^2, z^2 \rangle$ across the boundary of the unit square $S = \{(x, y) | 0 \leq x \leq 1, 0 \leq y \leq 1\}$.
- Using double integral, use Green's theorem to express the area of a plane region bounded by a smooth closed curve.

Course Outcome 4 (CO4): Solve homogeneous and non-homogeneous linear differential equation with constant coefficients

1. If $y_1(x)$ and $y_2(x)$ are solutions of $y'' + p(x)y' + q(x)y = 0$, then constants show that $c_1y_1(x) + c_2y_2(x)$ is also a solution.
2. Solve the differential equation $y'' - 4y = 0$ using method of undetermined coefficients.
3. Solve the differential equation $y'' - 4y' + 4y = 3e^{2x}$ using method of undetermined coefficients.

Course Outcome 4 (CO4): Compute Laplace transform and anti-laplace transform using convolution

1. After the initial value problem $\frac{dy}{dt} + \frac{y}{t} = \frac{1}{t^2}$, $y(1) = 0$.

2. Compute the inverse of Laplace transform.

3. Solve the differential equation $y'' - 4y' + 4y = 2\left[1 - e^{-2t}\right]$ using convolution.

Course Outcome 4 (CO4): Determine the Cauchy problem of LTI system and apply them to solve problems arising in engineering

1. Define the Cauchy integral representation of function defined by $f(z) = \frac{1}{2\pi i} \int_{\Gamma} \frac{f(\zeta)}{z-\zeta} d\zeta$ where Γ is closed curve and $f(z) = 0$ outside Γ .

2. What are the conditions for the existence of Laurent expansion of a function $f(z)$?

3. Find the Laurent expansion of $f(z) = 0$ for $|z| < 2$ and $f(z) = 0$ otherwise.

Final Question paper

PP CO4:

PP CO5:

Name: _____

Name: _____

APPLIED NUMERICAL TECHNOLOGIES, UNIT-4: LAPLACE TRANSFORMS AND Z-TRANSFORMS

QUESTION 5 (10M)

Course Code: MAT 320

Max. Marks: 10.0

Question 5 Marks:

VECTOR CALCULUS, DIFFERENTIAL EQUATIONS AND TRANSFORMS

QUESTION 6 (10M)

Comments or Remarks:

PART A

(Answer all questions. Each question carries 3 marks)

1. Let $f(x) = ax^2 + bx + c$ where $a \neq 0$ and a, b, c are constants, such that $f(0) = 0$.
2. Show that the function $F(x, y, z) = az^2 + bz + c$ is also an antiderivative.
3. What is the relationship between \mathbf{G} 's components and \mathbf{F} 's components?
4. Solve $y' = 4x^3 + 2xy - 3$.
5. Given the function $y = G(x) = x + C$, determine a solution $G'(x) + y = 2x$ is to the general solution (check your answer).
6. Find the indefinite integral of $\frac{dx}{x^2 + 1}$.
7. Given the function $\mathbf{F}(x, y) = \langle x^2 + y^2, xy \rangle$, find the divergence of \mathbf{F} .
8. Show the circulation theorem for Fourier transform.

PART B

(Answer one full question from each module. Each full question carries 12 marks)

MODULE A

- 1(a) Using only the three field $\mathbf{F} = x\mathbf{i} + y\mathbf{j} + z\mathbf{k}$ prove that \mathbf{F} is conservative in the entire \mathbb{R}^3 .
- 1(b) Use Fourier transform to find the wave equation in the plane $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$.
- 1(c) Use the divergence of the vector field $\mathbf{F} = \frac{1}{\sqrt{x^2+y^2+z^2}}(\mathbf{i} + \mathbf{j} + \mathbf{k})$.
- 1(d) Use the work done to the force field $\mathbf{F}(x, y, z) = (x^2 + y^2)^{1/2}\mathbf{i} + z\mathbf{j}$ along C where C is the curve $\gamma(t) = (t + t^2)\mathbf{i} + t^2\mathbf{k}$.

MODULE B

- 2(a) Use divergence theorem to find the general form of the vector field $\mathbf{F} = (ax + by + cz)\mathbf{i} + (bx + cy + dz)\mathbf{j} + (cx + ay + bz)\mathbf{k}$ where a, b, c are constants.
- 2(b) Find the condition of $\mathbf{F}(x, y, z) = (x - y)\mathbf{i} + (z - x)\mathbf{j} + (y - z)\mathbf{k}$ using Stokes theorem around the triangle with vertices $A(1, 0, 0), B(0, 1, 0)$ and $C(0, 0, 1)$.
- 2(c) Use divergence theorem to find the volume of the cylinder $x^2 + y^2 \leq 16$ bounded by $z^2 + 4x + y^2 = 4$ part $z \geq 0$ given the vector field $\mathbf{F} = x\mathbf{i} + y\mathbf{j} + z\mathbf{k}$ across surface of the cylinder.
- 2(d) Use Stokes theorem to calculate $\int_C \mathbf{F} \cdot d\mathbf{r}$ where $\mathbf{F}(x, y, z) = x^2\mathbf{i} + 2xy\mathbf{j} + y^2\mathbf{k}$ and C is

the value $x^2 + y^2 = 1$ in the plane under consideration is obtained by
down to position 1400.

INTRODUCTION

(1) $\partial \Phi/\partial x = y - 4x = x^2 - 4^2 = 16x$

(2) $\partial \Phi/\partial y = 2y - 2x = y^2 - x^2 = 16y^2 - 16x^2 = 16(1 - x^2)$

Maxima of $\Phi(x, y) = 16x^2 + 16y^2 - 16x^2 - 16y^2 + 16 = 16$

Using method of variation of parameters, $\Phi(x, y) = 16$

INTRODUCTORY

(1) The final transmission function $T(s) = \frac{e^{2\pi f_1 s}}{s^2 + 1}$

(2) Solve the differential equation $s^2 + (s - 4)^2 = 0$ to get $s = 2s_1 = 2s_2 = 0$ using real methods

(3) $\partial \Phi/\partial x = y - 4x = f_1(s) \sin(f_2(s)) = 16s^2 \sin(16s^2) \text{ and } f_2(s) = 16s^2$
in Laplace transform

(4) Approximate the poles to find the Laplace transform of $\Phi(x, y)$

INTRODUCTORY

(1) Find the Fourier series integral representation for $f(x) = e^{-2x}$ for $x > 0$.

$x > 0$ and Fourier series $\sum_{n=0}^{\infty} b_n \cos nx$ function

(2) Given the Fourier sine transform $f(x) = x^2 e^{-x^2}$ consider $0 < a < b$ and sketch roughly your answer

(3) Sketch the polar representation of $f(z) = z^2 \ln|z|$ in $|z| > 0$ and $f(z) = 0$ otherwise

(4) Find the Fourier series transform of $f(x) = x^2 \ln(x^2 + 2)$

Module 1 | Calculus of vector fields (1)**Panel 1 | Relevant topics from sections 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10**

Vector valued function of single variable, evaluation of vector function and geometrical interpretation, motion along a curve, velocity, speed, arc length, unit tangent vector field, Curvature 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).

Module 2 | Line integral phenomena**Panel 1 | Relevant topics from sections 1.11, 1.12, 1.13, 1.14, 1.15, 1.16, 1.17, 1.18, 1.19**

Fundamental theorem for line integrals, conservative vector fields and applications to including flux integrals and probability, surface integrals over surfaces of the form $\mathbf{r}(u, v) = \langle u, v, f(u, v) \rangle$, flux integrals over surfaces of the form $\mathbf{r}(u, v) = \langle u, v, g(u, v) \rangle$, divergence theorem, Stokes' theorem and its applications to finding flux integrals, total flux (without proof) and its applications to finding line integrals of vector fields and curl div.

Module 3 | Ordinary differential equations**Panel 1 | Relevant topics from sections 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 2.10**

Homogeneous linear differential equation of second order, superposition principle, general solution, homogeneous linear ODEs with constant coefficients, general solution of homogeneous equations (second order only), transient and unbounded, transient, non-homogeneous linear differential equations, relation to the inverse of undetermined coefficients (the right hand side of the form $a_0 + a_1 t + a_2 t^2 + \dots + a_n t^n$) involving first linear combinations, methods of variation of parameters, solution of higher order homogeneous and non-homogeneous with constant coefficients using method of undetermined coefficients.

Module 4 | Laplace transforms**Panel 1 | Relevant topics from sections 2.1, 2.2, 2.3, 2.4, 2.5, 2.6**

Laplace Transform and its inverse, (inverse transform), initial value, linear, Laplace transform of basic functions, shifting theorem, Laplace transform of derivatives and integrals, solution of differential equations using Laplace transform, unit step function, Second shifting theorem, Unit step function and its Laplace transform, Solution of ordinary differential equation involving unit step function and their delta functions, convolution theorem (without proof) is applicable to finding inverse Laplace transform of products of functions.

Module 6 (Fourier Transforms)

Field 2: Relevant tools Part sections 12, 13.1, 13.2, 13.3

Fourier integral representation, Fourier series and Fourier integrals, Fourier sine and cosine transforms, Inverse sine and cosine transforms, Fourier transform and inverse Fourier transform, basic properties, The Fourier transform of derivatives, Convolution theorem (without proof).

Text Books

1. H. Anton, I. Rorres & C. Heil, "Calculus", Wiley, 10th edition, 2006.
2. Ruel攀Dreyfus, "Advanced Engineering Mathematics", Wiley, 10th edition, 2011.

Reference Books

1. L. Schwartz, "Primer of Calculus of Variations", 17th edition, 2017.
2. G.B. Thomas and R.L. Finney, "Calculus and Analytic Geometry", 10th edition, Pearson, 2010.
3. Peter D'Antonio, "Advanced Engineering Mathematics", 2nd Edition, Thomson, 2007.
4. Louis E. Shampine, C.W. Gear, "Numerical Methods for Ordinary Differential Equations", 2nd edition, Wiley, 17th edition, 2009.
5. Ivanov, "Engineering Mathematics for Engineers", Text Mc Graw - Hill, 2008.
6. C.S. Arora, "Higher Engineering Mathematics", Manohar Publications, 2010.
7. Srimanta Pal, Sudip K. Mukherjee, "Engineering Mathematics", Oxford University Press, 2009.
8. Ravindra K. Bajaj, "The Fourier Transform and its Applications", Oxford University Press, 2000.

Course Content and Lecture Schedule

No.	Topic	No. of lectures
1	Definition of Fourier Series (1 hour)	
2	Fourier series of a periodic function - derivative of Fourier series Fourier series of odd and even functions	4
3.1	Fourier series of non-periodic function	1
3.2	Fourier and its transforms, convolution theorem, divergence and curl	4
3.3	Unit impulse with respect to arc length, Arc Integrals of vector fields Work done by a charged particle	3
3.4	Convergence test for Fourier series of periodic function	1

2	Vector Integral (Three Variable) (8 hours)	
2.1	Green's theorem and its applications	2
2.2	Ampere's integral, flux integral and flux law	4
2.3	Stokes theorem and applications	2
2.4	Tensor integral and applications	2
3	Ordinary Differential Equations (8 hours)	
3.1	Homogeneous linear equation of second order, Successive product of general solution	2
3.2	Inhomogeneous linear ODE of second order with constant coefficients	2
3.3	Second order Euler-Duhamel's theorem	2
3.4	Non-homogeneous linear differential equations of second order with constant coefficients with variation of coefficients by undetermined coefficients, variation of parameters.	2
3.5	Higher order equations with constant coefficients	2
4	Laplace Transform (10 hours)	
4.1	Inverse Transform, Convolution Theorem, Linearity, Convoluting theorem, expansion of basic functions	2
4.2	Translation of derivatives and integrals	2
4.3	Solution of Differential equations- initial value problems by Laplace transform method	2
4.4	Unit step function - Second shifting theorem	2
4.5	Dirichlet's convergence criterion of ODE involving Dirichlet function	2
4.6	Convolution and related problems	2
5	Fourier Transforms (8 hours)	
5.1	Fourier integral representation	4
5.2	Fourier cosine and sine integrals and transforms	2
5.3	Complex Fourier integral representation, Fourier transform and its inverse problems, Fourier series	2
5.4	Fourier transforms of non-periodic, Convolution theorem	2

PH1 108	DISCRETE MATHEMATICS (Discrete Mathematics)	CATEGORY	I	II	III	CREDIT	TYPE OF ASSESSMENT
		MC	9	1	2	2	TERM TEST

Preamble: The aim of the Engineering Physics Program is to offer students a solid background in the fundamentals of Physics and its important knowledge in engineering disciplines. The program is designed to develop scientific attitudes and enable the students to correlate the concepts of Physics with the same in Engineering.

Prerequisite: Higher Secondary/Junior Physics, Mathematics (with Calculus), Differential Equations and Linear Algebra.

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

CO1	Compute the quantitative analysis of waves and oscillations in engineering systems.
CO2	Apply the interaction of light with matter through interference, diffraction and wavelet theory phenomena in different natural optical processes and optical instruments.
CO3	Analyze the behavior of matter in the particle and waveforms, such through the principles of quantum mechanics to analyze the energy changes in electronic devices.
CO4	Classify the properties of magnetic materials and apply vector calculus to solve magnetic field problems involving steady state current carrying conductors.
CO5	Apply the principles behind various superconductive applications, explain the working of superconductor lighting fixtures and fiber optic communication system.

Mapping of learning outcomes with competencies

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

Assessment Pattern

Student's Category	Continuous Assessment Tasks			End Semester Examination (Marks)
	Test 1 (Marks)	Test 2 (Marks)	End Semester Examination (Marks)	
Competent	20	20	20	
Unacademically	20	20	20	
Not	20	20	20	

Analysis			
Evaluation			
Design			

Work Distribution

Total marks	1st marks	2nd marks	Mid Session
20	10	10	5 marks

Continuous Internal Evaluation Pattern:

Assessments	10 marks
Continuous Assessment Test (2 numbers)	20 marks
Assignment (Quiz/Class test process)	10 marks

Mid Semester Examination Pattern: There will be two parts Part A and Part B. Part A consists 10 questions with 2 questions from each module. Having 5 marks for each question. Outcome should answer all questions. Part B consists 5 questions from each module of which student should answer 4. Total system will have maximum 2 sub-sections and total 40 marks.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Explain the effect of varying force on oscillations.
2. Distinguish between resonance and longitudinal waves.
3. (a) Derive an expression for the fundamental frequency of resonance classifier in a stretched string.
4. Calculate the fundamental frequency of a string of length 6 m weighing 6 g if it is attached to a load of 600 g.

Course Outcome 2 (CO2):

1. Explain various wave forms.
2. Distinguish between fixed and free modes of vibration.
3. (a) Explain the formation of standing waves and obtain the expression for ratio of length and standing waves in different systems. Also explain how it is useful to determine the wavelength of a monochromatic source of light.
- (b) Effect of refraction index on reflection between the lens and glass sheet.

What happens to the energy spectrum? Justify your answer.

Course Outcome 5 (CO5):

1. Give the physical significance of wave function?
2. What are oscillators?
3. (a) Define Schrodinger's equation for particle in a one dimensional box and derive its energy eigen values and normalized wave functions.
(b) Calculate the first three energy values of hydrogen in a one dimensional box of width 1.17×10^{-10} m.

Course Outcome 6 (CO6):

1. Compare dielectric constant and conductivity.
2. Mention any four properties of ferromagnetic materials.
3. (a) Starting from Maxwell's equations, derive the free space electromagnetic wave equation and show that velocity of electromagnetic wave is $c = (\epsilon_0 \mu_0)^{1/2}$.
(b) An electromagnetic wave is absorbed by $R = 100$ mg ferro $(\mu_0)^{-1} \times 10^3$ / m. Find the direction of propagation of the wave if the wave and magnetic field are in the xz -plane.

Course Outcome 7 (CO7):

1. Explain the meaning of Afferent cell.
2. Distinguish between Type I and Type II superconductors.
3. (a) Define hysteresis loop and discuss its applications.
(b) Explain the meaning of intensity modulated fibre opto sensor.

Mental Question paper

On Date:

Page No.

Page No. _____

Name: _____

**ANNA UNIVERSITY TECHNOLOGICAL UNIVERSITY RAILWAY & TECH DEPT EXAMINATION
NORTH E. PAPER**

Course Code: PH1008

Course Name: Engineering Physics 4

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all Questions. Each question carries 4 Marks

1. Define critical and marginal velocities.
2. Define diffraction and interference effects.
3. What is Brewster's angle of reflection?
4. Define angle of acceptance & acceptance angle. (10+10)
5. State and explain the meaning of Fermat's principle. With the help of a graph, illustrate the meaning.
6. Define surface reflection coefficient.
7. State Huygen's law of diffraction of waves.
8. Compare reflection from plane and concave surfaces.
9. List four important applications of superposition principle.
10. Give the working principle of LEC. (10+10)

Page No.

Answer any one full question from each module. Total question carries 16 Marks

Module I

11. (a) Define the differential equation of simple harmonic motion and measure the solution time for the case of mass-spring system under constant force. (10)
(b) The frequency of a tuning fork is 500 Hz and its Q factor is $10\pi^2$. Find the relaxation time. Also calculate the time after which its energy becomes 1/200 of its initial undamped value. (10)
12. (a) Calculate expression for the velocity of propagation of a transverse wave in a stretched string. Deduce law of transverse vibrations. (10)
(b) The equation of transverse vibration of a stretched string is given by $y = 0.00027 \sin(72\pi t - 2.75\pi y)$, where the numerical constants are in SI units. Calculate (i) amplitude (ii) wavelength (iii) frequency and (iv) velocity of the wave. (10)

Module 2

13. (a) Explain the formation of Newton's rings and show that the radius of dark ring is proportional to the square root of natural numbers. Then calculate the Newton's rings separation distance due to the diffraction of a laser. (10)
(b) Two pieces of plane glass are placed together with a gap of 10^{-3} mm between them and form an angle of 12° at one end. If the $\text{He}-\text{Ne}$ laser is viewed with a monochromatic light of wavelength 632.8 nm . Given $f = 0.00001 \text{ m}$. (10)
14. (a) Explain the diffraction due to a plane transverse grating. Draw the grating equation. (10)
(b) A grating has 6000 lines per cm. What the angular separation of the two yellow lines of incandescence of wavelength 600 nm and 650 nm ? (Assume $\sin \theta = \tan \theta$). (10)

Module 3

15. (a) Define Compton effect and derive Compton Scattering equations. (10)
(b) An electron is confined to one-dimensional potential box of length $2L$. Calculate the energies corresponding to the first three atomic quantum states in eV. (10)
(c) Classify fermions and bosons by dimensionality of quantum confinement and explain the following terminologies. (i) mesophase (ii) mesocones (iii) quantum dots. (10)
(d) Find the de-Broglie wavelength of electron whose kinetic energy is 10 eV . (10)

Module 4

16. (a) State Rayleigh's Theorem. Calculate the value of Rayleigh losses at the surface of the sun if the power radiated by the sun is $3.3 \times 10^{26} \text{ W}$ and its radius is $7 \times 10^8 \text{ m}$. (10)

- (b) Distinguish between paramagnetic, diamagnetic and ferromagnetic materials. [5]
- (c) Starting from Meissner-Ochsenfeld, derive diamagnetic levitation in terms of [10]
- (d) An inductor of $10 \mu H$ carries a current. The magnetic field is $10^{-3} T$. Find the current. [4]

Module 3

- (e) Show that superconductors persist diamagnetic. Distinguish Type I and Type II superconductors with suitable examples. [10]
- (f) Write a short note on high temperature superconductors. [4]
- (g) Define natural aspiration of an open pipe and define an orifice of a pipe. If a pipe has diameter 10 cm, calculate the natural aspiration and resistance angle of a pipe with a pipe resistance index of 1.25 and a closing resistance index of 1.60 when the pipe is made under a relative index 1.25. [4] (Total 40)



syllabus

2nd year (VII-VIII semesters)

Module I:

Oscillations and Waves

Harmonic oscillators, Complex harmonic motion, Derivation of differential equations and its solution, Over damped, Critically damped and under damped cases, Quality factor, Damping ratio, Forced oscillations, Differential Equation, Derivation of expressions for amplitude and phase of forced oscillations, Amplitude resonance, Resonance frequency, Quality factor and Q-factor of Resonance, Resonance, Mechanical analogy of resonance oscillations.

Wave motion, Definition of one dimensional wave equation and its solution, Three dimensional wave equation and its solution, One dimensional, longitudinal, transverse and longitudinal waves, Transverse vibration of a stretched string, Treatment of laws of vibration.

Module II:

Wave Optics

Interference of light, Principle of superposition of waves, Theory of thin lens - Gaussian law / Rayleigh criterion, Conditions of the conditions of constructive and destructive interference, Interference due to Young's double slit, Determination of wavelength and use for optical phenomena, Fresnel's zone, Measurements of wavelength and refractive index, Interference fringes.

Diffraction of light, Fresnel and Fraunhofer theory of diffraction, Diffraction grating (Gating equation), Rayleigh criterion for limit of resolution, Resolving and Diffraction power of a grating with expression (no derivation).

Module III:

Quantum Mechanics & Nanotechnology

Introduction to the need of quantum mechanics, basic idea of symbols, uncertainty principle, Applications - States of electron - orbit & orbital and - recoil free bremsstrahlung mechanism, Formulation of Schrödinger and Heisenberg Schrödinger wave equations-Physical meaning of wave function, Hydro in a two dimensional box derivation for normalized wave function and energy eigen values, Quantum Mechanical Tunneling (Quantum)

Introduction to nanoscience and technology, Relation in surface to volume ratio for nanotechnology, Quantum confinement in one dimension, Two dimensional and three dimensional band theory, Fermi energy and Quantum size, Properties of nanomaterials-mechanical, electrical and optical, Applications of nanotechnology (sufficient area).

Module IV:

Magnetics & Electro Magnetic Theory

Magnetic field and magnetic flux density, Gauss's law for magnetic flux density, Ampere's Circuital law, Faraday's law in terms of EMF produced by changing magnetic flux, Magnetic permeability and susceptibility, Classification of magnetic materials-poles, dia and ferromagnetic materials.

Fundamentals of vector calculus, concept of divergence, gradient and curl along with physical significance, line, surface and volume integrals, Green theorem, Stokes theorem & Divergence theorem, Evaluation of contours, evaluation of Maxwell's equations in vacuum, comparison of displacement current with conduction current, dielectric and magnetic media, velocity of electromagnetic waves in free space, form of Ampere's and Faraday's law converted.

Module 3:

Superconductors & Photonics

Superconducting phenomena, Meissner effect and surface diamagnetism, Types of superconductors - Type I and Type II, BCS Theory (Qualitative), High temperature superconductors-Legislations of superconductivity.

Introduction to photonics-Principle of reflection and refraction, Polarization of light and Poynting vector, UV Characteristics, Optic fibre, Principle of propagation of light, Types of fibres, modes and losses, Polarization, optical resonance, Fabry-Perot resonator system (FPR diagram), Resonators, Optical and Technological applications of optical fibre, Polarization analysis-Resonators Unidirectional and Phase modulated systems.

Text Books

1. A.K. Pandey, "Electromagnetic Field and Waves" (A Text Book of Electromagnetic Waves", 2nd Edn., Revised Edition 2010)
2. R.L. Boyle, A.C. Pipkin, "Engineering Physics" (McGraw-Hill Education, India Edition 2017)

Reference Books

1. Gaurav Kumar, "Concepts of Classical Physics", Tata McGraw-Hill Publications, 2nd Edition, 2003.
2. G.J. Thethathiva, Venkateswaran, "Fundamentals of Physics", Oxford University Press, 2015.
3. M.S. Bhattacharya & S. Bhattacharya, "Principles of Electromagnetic Waves (Vol-I)", Cambridge University Press, 2012.
4. Avinash K. "Engineering Physics", PHI Ltd., 2012.
5. Ajay Ghosh, "Concepts of Physics", McGraw-Hill Education, 2nd Edition, 2017.
6. T. Prasanna, "Name the Associate", McGraw-Hill India, 2007.
7. Anthony Zeeves, Walker, "Fundamentals of Physics", John Wiley & Sons Inc., 2008.
8. Gautham Dharmaraj, "Introduction to Electromagnetism", Springer-Verlag publishing, 2nd Edition, 1999.
9. Renuka B., "Advanced Engineering Physics", Phoebus Books, 2017 (copied).
10. J. Deonia and A. Salter, "A Text Book of Engineering Physics", Civil Books Publishers, Revised edition 2016.

Course Contents and Lecture Schedule

No.	Title	No. of hours
1	Introduction and Review (3 hours)	
1.1	Harmatt oscillations, Damped harmonic motion/oscillation of differential equation and its solution, Over damped, Critically damped and Under damped cases, Quality Factor/Q-factor	2 hrs
1.2	Normal oscillations (Differential Equation)-definition of resonance for analysis and types of forced oscillations, Resonance mechanism for Acoustic frequency, Quality factor and the types of Resonance, Divergence theory of mechanical oscillations	2 hrs
1.3	Mass Reson- conversion of one dimensional mass system and its solution, Three dimensional mass system and its solution for damped L	2 hrs
1.4	Resonance, Resonance curves and Frequency versus Frequency characteristics of vibration using Statement of laws of vibration	2 hrs
2	Free Oscillations (3 hours)	
2.1	Mechanics of Spherical waves of superposition of waves, Theory of free linear -damped free (harmonic system), Oscillation of the conditions of conservative and nonconservative mechanics	2 hrs
2.2	Mechanics due to mass-spring system, Oscillation of diatomic and ionic for typical parameters, Damped's ring - Oscillation of conservative and nonconservative mechanics, Interference and beats	2 hrs
2.3	Oscillation of LRC, Transient and Resonance cases of vibration, Damping, gearing, Coupling frequency	2 hrs
2.4	Resonance condition for (resonant frequency, Resonant and Damped) process of a gear and interference (resonance)	2 hrs
3	Quantum Mechanics & Nanotechnology (8 hours)	
3.1	Introduction for the need of Quantum mechanics, Wave nature of particle, Uncertainty principle, Application/Use of electron microscope and tunneling for non-destructive measurement	2 hrs
3.2	Commutation of some operators and commutation Schrödinger wave quantum-Physical Meaning of wave function, Periodic in 1-D, commutation law, Derivation for normalized wave function and energy eigen values, Quantum mechanical tunneling localized	2 hrs
3.3	Introduction to nanoscale and nanotechnology, Relation of surface to volume ratio for nanoparticles, Quantum confinement in two dimensions, two dimension and three dimension-wave packets, Nano wires and Quantum dots	2 hrs
3.4	Properties of nanomaterials-magnetic, electrical and optical Applications of nanotechnology (bioactive load)	2 hrs
4	Magnets & Demagnetization (3 hours)	
4.1	Magnetic field and magnetic moments, Factors for magnetization	2 hrs

	Demystify Superconductors: Current Trends in Science & Applications produced by changing magnetic flux.	
4.1	Explanation for magnetic permeability and susceptibility Classification of magnetic materials, paramagnetic and ferromagnetic materials	1 hr
4.2	fundamentals of superconductors concept of charge carrier, gap function and pair along with phase superlattice, zero surface and volume magnetic susceptibility theory & critical current	1 hr
4.3	Explaination of complete cancellation of magnetic charges in superconductor, comparison of displacement current with conduction current, electromagnetic fields, concept of diamagnetism, fields in free space, flow of electric field from magnetic field conversion	4 hrs
5	Superconductivity Application Models	
5.1	Super conducting filaments, vortices effect and Josephson junctions types of superconducting junctions	1 hr
5.2	BCS theory, Ginzburg, Landau equations, applications of superconductivity	1 hr
5.3	Introduction of phonons-Photo to phonon-carbon tunneling model, Hess-Andreae-Schmid and PR phononloses, supercurrent of the superfluid	1 hr
5.4	superflow model of a magnetohydrodynamic theory of Foucault current and Meissner effect, Meissner effect, iron-copper, Nb-Sr-Y-Ba-Cu-O superconductor system, Meissner effect, induced, Meissner, thermological applications of super fluid, flux quantization models, flux pinning and flux modulation devices	1 hr



ID	Programme Title Physics (Electromagnetism)	Category	1	2	3	4	5	Year of Introduction
			ELO	ELO	ELO	ELO	ELO	2020

Preamble: The aim of the Engineering Physics program is to offer students a solid background of the fundamentals of Physics and to impart that knowledge in engineering disciplines. The program is designed to develop students' attitudes and enable the students to understand the concepts of Physics in the core programme.

Prerequisites: Higher secondary level Physics, Mathematics, science or related subjects,
Additional courses and/or options

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

CO1	compute the quantitative aspects of wave and oscillation in mechanics and acoustics
CO2	work the problem of light with matter through interference, diffraction and identify these phenomena in different media using various instruments
CO3	analyze the behavior of matter in the atomic and subatomic level through the principle of quantum mechanics to predict the microscopic processes in elements and atoms
CO4	apply the knowledge of Chemistry in the atomic level using the principles of quantum mechanics to predict the results and characteristics of atomic properties to provide a safe and healthy environment
CO5	apply the knowledge and concepts about wave and light propagation to explain the various engineering applications

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2				2	2		10	10	10
CO2	2	2				2	2			10	
CO3	2	2				2	2			10	
CO4	2					2	2			10	
CO5	2	2				2	2			10	

Assessment Scheme

Student Category	Continuous Assessment Tasks		Differentiated Evaluation Interval
	Test 1: Partial	Test 2: Partial	
Exempted	20	20	20
Unexempted	20	20	20

ASSESSMENT	90	80	70
Exams			
Practicals			
Coursework			

Mark Distribution:

Total marks	Q1 Answers	Q2 Answers	Q3 & Question
200	20	20	20

Continuous Internal Evaluation Pattern:

Midterms = 22 marks

Continuous Assessment Total (2 numbers) = 22 marks

Assignment/Quiz/Case/practical = 22 marks

Final Examination: Examination Category Three will be four parts (Part A and Part B). Part A consists of 22 questions with 2 questions from each module, having 2 marks for each question. Questions should answer all questions. Part B consists of 2 questions from each module of which students should answer any one. Part C consists of two having maximum 2 questions and carry 20 marks.

Course Level Assessment Questions:

Course Outcome 1 (CO1):

1. Explain the effect of passing light through a prism.
2. Distinguish between converging and diverging lenses.
3. (a) Define an expression for the fundamental frequency of transverse vibration in a spherical mirror.
4. Calculate the fundamental frequency of a string of length 2 m weighing 8 g fastened to a load of 800 N.

Course Outcome 2 (CO2):

1. Explain refraction in thin lenses.
2. Distinguish between converging and diverging thin lenses.
3. (a) Explain the formation of images in a lens and state the expression for radii of images and focal lengths in refraction systems. Also explain how it is used to determine the wavelength of a monochromatic source of light.
- (b) If focal length of a concave lens is introduced between the lens and glass plate, what happens to the propagation path of an arrow?

Course Outcome 3 (CO3):

1. Give the physical significance of wave function?

3. (i) What are moments?
3. (ii) Calculate the change in gauge factor for a piezoelectric in a one-dimensional box and strain to change
gauge factor and normalized wave functions.
3. (iii) Calculate the Poisson's ratio and value of a diode in a one-dimensional box of width
 3.47×10^{-2} nm with $\psi_0 = 0$.

Course Outcome 4 (CO4):

3. (i) Explain how a resonator and its relaxation time.
3. (ii) How ultrasonic waves are used in non-destructive testing.
3. (iii) With a neat diagram explain how ultrasonic waves are produced by a piezoelectric
resonator.
3. (iv) Calculate frequency of a longitudinal wave that can be produced by a rod of length 1.5
mm (Young's modulus $= 127 \times 10^9$ N/m, Density $= 1000 \text{ kg/m}^3$)

Course Outcome 5 (CO5):

3. (i) Distinguish between transmission electron and stimulated emission.
3. (ii) Explain optical microscopy.
3. (iii) Calculate the concentration and working of a laser.
3. (iv) Calculate the numerical aperture and acceptance angle of a lens with a numerical aperture
value of 1.24 and a working distance value of 2.20 when the focal length of lens is
focal length 2.20.



Model Question paper

ST 0200

PH 0202

Reg No. _____

Name: _____

JAYA KALYAN TECHNICAL COLLEGE, UNIVERSITY AVENUE, MARATHON & TOWNSHIP EXAMINATIONS,
MARCH 2019 & MAY

Course Code: PTM 128

Course Name: Engineering Physics

Max Marks: 100

Duration: 3 hours

PART A

Answer all Questions. Each question carries 2 Marks.

1. Define normal and non-harmonic oscillations.
2. Distinguish longitudinal and transverse waves.
3. Write a short note on wave diffraction using Rayleigh's theory.
4. Define dispersion. Why does light travel slower in glass than in air? Give reason.
5. State and explain Rayleigh's Univerality principle. With the help of a system related diagram.
6. Explain surface tension and role of surfactants.
7. Define sound intensity level. Give the values of threshold of hearing and threshold of pain.
8. Describe the method of non-destructive testing using ultrasonic waves.
9. Define the condition of resonance in vibration.
10. Distinguish between real and general index of refraction.

(100-40)

PART B

Answer any one full question from each module. Each question carries 10 Marks

Module I

11. (a) State the differential equation of simple harmonic motion and discuss its solution. Discuss the cases of over damped, critically damped and under damped motion.

(10)

- (b) The frequency of a tuning fork is 512 Hz and its 12th overtone has a frequency 8192 Hz. Also calculate the time after which the original frequency of 512 Hz would reappear. (4)
12. (a) Define an expression for the velocity of propagation of a transverse wave in a string. Define longitudinal waves also. (2)
- (b) The equation of transverse vibration of a stretched string is given by $y = 0.02 \sin(2\pi ft - \frac{\pi}{4}x)$, where the numerical constants are in SI units. Calculate (i) Amplitude (ii) Wavelength (iii) Frequency and (iv) Velocity of the wave. (6)
- Module 3**
13. (a) Explain the formation of Vortex rings and show that the radius of the ring is proportional to the square root of natural numbers. (you can use Hooke's law) (4)
- (b) A student observes a plough moving with a speed of 10 m/s . Find the angle of the plough in seconds if the soil is turned with a transverse speed of wavelength 4000 nm . Given $\lambda = 0.0001 \text{ m}$. (4)
14. (a) Define the reflection due to a plane transverse grating. Derive the grating equation. (4)
- (b) A grating has 6000 lines per mm. Find the angular separation of the two adjacent elements of a primary spectrum 672 nm and 670 nm . (4)
- Module 4**
15. (a) Write two dissociation and recombination half-life equations. (2)
- (b) An electron is subjected to one dimensional potential box of length 2A . Calculate the energies corresponding to the first and second quantum numbers. (4)
16. (a) Classify nonspontaneous processes on the basis of quantum confinement and explain the following terminologies (i) wave packets (ii) wavelets (iii) quasiparticles. (4)
- (b) Define the de Broglie wavelength of matter waves when kinetic energy is 1.6 eV . (4)
- Module 5**
17. (a) Define insulation and insulation coefficient. What is the significance of insulation time, insulation rate? Discuss affecting the accuracy of a building and their insulation measures? (4)
- (b) The volume of a hall is 2000 m^3 . It has a total area of 1000 m^2 . If the hall is filled with audience who add another $20 \text{ m}^3/\text{person}$, then find the difference in insulation time. (4)
18. (a) With a neat diagram explain how ultrasonic waves are produced by piezoelectric oscillator. Also discuss the piezoelectric method of detection of ultrasonic waves. (6)

- (b) An ultrasonic source of 0.06 MHz emits three 4 pulse bursts. The first burst which occurs after 200 sec, the velocity of sound in the water is 1500 m/s. Calculate the depth of the sea and the wavelength of the pulse. [4]

Module 3

- (c) (i) Define the construction and working of Ruby laser. [3]
- (ii) What is the principle of holography? How is it done practically? [3]
- (iii) (a) Define numerical aperture of an eye lens and derive an expression for the NA of a ray incident on it. [2]
- (b) An optical fibre made with core of refractive index 1.5 and cladding with a fractional index difference of 0.0008. Give refractive index of cladding and numerical aperture. [4]

(1403450)



ENHANCED PHYSICS (FOR NON-ELECTRICAL)**Module 1:****Harmonic oscillations**

Harmonic oscillations, Damped Harmonic motion-Derivation of differential equation and its solution, Over damped, Critically damped and Under damped Case, Quality factor/Eigenvalue, Forced oscillations-Differential Equation-Derivation of expressions for amplitude and phase of forced oscillations, Resonance Frequency, Resonance frequency, Damping of Resonance, Electrical analogy of mechanical oscillators.

Wave motion, Derivation of wave dimensional wave equation and its solution, Three dimensional wave equation and its solution, the dispersion, reflection, refraction, interference and diffraction waves, Transformation relation in a rotating frame, Diffraction of light by a grating.

Module 2:**Wave Optics**

Interference of light waves, Interference of waves, Theory of thin film - Coatings (Reflection, transmission, absorption), Derivation of the conditions of constructive and destructive interference, Interference due to wedge shaped films-Determination of thickness and wavelength for optical phenomena, Newton's rings-Determination of wavelength and refractive index, Antinodes and anti-nodes.

Diffraction of light, Central and Divergent Beam of wave, Diffraction grating-Deriving equation, Rayleigh criterion for limit of resolution, Resolving and Dispersive power of a grating with expression for dispersion.

Module 3:**Quantum mechanics & Nanoelectronics**

Introduction for the need of quantum mechanics, basic result of particle, wave-particle duality, Application of quantum theory to nucleus and atomic nuclei, Heisenberg's uncertainty principle, formulation of time dependent and time-independent Schrödinger wave equations-Practical application of wave function, Particle in a one-dimensional box-Determination for normalized wave function and energy eigen values, Quantum mechanical tunneling (tunneling barrier).

Introduction to nanoscience and technology, barriers in surface to reduce noise for nanoelectronics, Quantum confinement in one dimension, two dimension and three dimension-Nano physics, Nano wires and Quantum dots, Properties of nanomaterials-nanomaterials, electrical and optical, Applications of nanotechnology (quantum dot laser).

Module 4:**Acoustics & Ultrasonics**

Acoustics, classification of sound waves, characteristics of musical sounds-Pitch & Frequency, Intensity or intensity measurement of acoustic bio-molecules in water, Acoustic diffraction, Acoustic resonance, Standing waves- behind the walls (acoustic)亥子墙 effecting architectural acoustics and their remedy.

Ultrasonics-Generation- piezoelectric effect, piezoelectricity-Indirect and Resonant wave generation, Detection of ultrasonic waves - Thermal and Photoelectric

wavelets, Ultrasonic diffraction, Doppler for the velocity of ultrasonic waves in a liquid, Application of ultrasonic waves - SONAR and medical.

Module 2

Laser and Fibre optics

Properties of laser, Hologram and emission of radiation, Spontaneous and stimulated emission, Einstein's coefficients (absorption), Population inversion, Maltese cross, basic components of laser, Laser medium, Pumping mechanism, Optical resonator, cavity, working principle, Construction and working of Ruby laser and Helium neon laser, Generation and working of semiconductor laser, Applications of laser, Holography, Ultrasonics, Sonar, Biopsies and photograph, Recording of hologram and reconstruction of image, Applications

Persepective of : propagation of light, forces of interaction, mass and energy, Interference, Numerical aperture, Diffraction, Fiber optic communication system, Beam splitter, coupler, Modulator and photodiode, Evaluation, ABS, POM, polarimetry, modulated and phase modulated images

Text Books

1. D.J. Gossard, A. M. van Heijst and M. A. van Vliet "A text book of engineering physics", Oxford Univ. Press, 2nd edition, 2008.
2. R. K. Pathria, R.C. Beig "Engineering Physics", McGraw Hill Education, 2nd edition, 2007.

Reference Books

1. Arthur Beiser, "Concepts of modern Physics", Tata McGraw Hill Publications, New Delhi, 2003.
2. Eric Madelung, Roman Hensel, "Basic Engineering Physics", Springer Universitext Press, 2008.
3. M. N. Ghosh & S. Ganguly "Concepts of Engineering Physics", IITK Press, 2008.
4. Anil D. S., "Engineering Physics", PHI Publ., 2002.
5. Jayant Chaturvedi, "Digital", Utkarsh IIT Education, 2nd edition, 2007.
6. T. G. Drayton, "Name The Essentials", McGraw-Hill India Ltd, 2007.
7. S. K. Jain, "Lasers and their applications", Pearson Education/Outstanding, 2nd edition, 2004.
8. P. K. Rao, "Advanced engineering physics", Phasor books, 2nd edition, 2001.
9. C. D. Deshpande and A. Patel, "A text book of engineering physics", Cengage publications, 2nd edition, 2008.

Course Contents and Lecture Schedule

LC	Topic	No of hours
Objectives and Review (1 hour)		
1.1	Harmonic oscillations, central forces; superposition of differentiable functions and its solution; linear algebra; linear differential equations; Fourier series expansion.	2 hrs
1.2	Waves: oscillations; different representations of waves for amplitude and phase; of linear oscillators; analysis; Fourier transform for transient signals; quality factor and resonance of transients; Divergence and energy of mechanical oscillators.	2.5
1.3	Wave motion: Derivation of one-dimensional wave equation and its solution; Three-dimensional wave equation and its solution by separation of variables.	2 hrs
1.4	Distinguish between transverse and longitudinal waves; Transverse vibrations of a stretched string; spectrum of transverse vibration.	2 hrs
Wave Optics (3 hours)		
2.1	Interference of light: principle of superposition of waves; Theory of thin film interference (Fabry-Pérot system); Derivation of the conditions of constructive and destructive interference.	1 hrs
2.2	Interference due to image stepped film; Derivation of thickness and wavelength of optical gratings; Sommerfeld's rings; Measurements of wavelength and refractive index; Interference fringes.	1 hrs
2.3	Diffraction of light; Fraunhofer and Rayleigh theory of diffraction; Diffraction grating; Rayleigh criterion.	2 hrs
2.4	Rayleigh criterion for limit of resolution; Resolution and Dispersion power of a grating with dispersion law (dispersion).	1 hr
Quantum Mechanics (Electron Optics) (4 hours)		
3.1	Introduction to the need of Quantum mechanics; Wave nature of particles; DeBroglie's postulate; Application of electron microscope to a diffraction pattern from a thin metal foil; Bragg's interference patterns.	2 hrs
3.2	Formulation of time dependent and stationary Schrödinger wave equations; Physics of wave function; Fourier series in a one dimensional box; correction for normalised wave function and orthogonality rules; Quantum mechanics of tunneling phenomena.	4 hrs
3.3	Introduction to semiclassical and hydrodynamic models in surface to volume ratio for semimetallic quantum conduction in two dimension, two dimensional and three dimensional free space; Fermi velocity and quantum size effect.	2 hrs
3.4	Properties of semiconductors; electrical and optical applications of nanotechnology (background).	1 hr
Assessment & Assessment (3 hrs)		
4.1	Answers: Classification of semiconductors; Conductors and	2 hrs

	ii) noise reduction of Acousto-optic or intensity Measurement of noise (Gyro-accelerometer or 2DPI). Accelerometer, Accelerometer-Accelerometer (non-inertial)- Sensitive to vibration	
4.2	Noise filtering techniques and their merits.	2 hr
4.3	Unbalance-mass- compensation effect and Mass-shaker effect, magnetostatic effect and Piezoelectric effect - Working principle of shakers, types - Normal and Resonance methods	2 hr
4.4	Dynamic measurement technique for the velocity of structures versus in a fixed Applications of shakers versus 2DPI, PCT, and Method	2 hr
B. Laser and Fibre optics / Beam		
5.1	Principle of laser, Application and sources of laser, Semiconductor and Stimulus emission, Stimulus conditions for emission, Degradation process, Unstable state, basic components of laser, Gain medium, Pumping mechanism, Optical resonant cavity, working principle	2 hrs
5.2	Generation and control of laser beam and Pulse wave beam Generation and control of stimulated beam (Q-switch), Application of laser	2 hrs
5.3	Holography, Difference between hologram and photograph, Recording of hologram and reconstruction of image, Applications	1 hr
5.4	Light Wave Division of, propagation of light, Types of Modulation and broad band filters, numerical aperture, resolution, Microscopic communication system (Micro diagram), Industrial, Medical and Biotechnology applications, Fiber optics, optical fiber modulated and Phase modulator sources	3 hrs

CIT 300	Induced Disorders	SEMESTER	1	2	3	CREDIT	CRITERIA OF ASSESSMENT
			002	0	0		

Prerequisite: To enable the students to acquire knowledge in the concepts of chemistry for engineering applications and to familiarise the students with different application related topics like thermodynamics, stoichiometry, volumetric methods etc. It familiarises the students with topics like: materials of corrosion, corrosion prevention methods, basic considerations, polymers, crystallisation etc., which results the basic design abilities and skills that are relevant to the study and practice of chemistry.

Prerequisite courses of chapters included in the syllabus (both in addition)

Course outcomes: After the completion of the course the students will be able to:

- CO1 Acquire the basic concepts of stoichiometry and corrosion to explore its possible applications in various engineering fields.
- CO2 Understand various corrosion control techniques available in nature and its applications.
- CO3 Acquire the knowledge of various method for characterising a chemical structure of a compound. Understand the basic concept of Zeta for surface characterization of nanomaterials.
- CO4 Learn about the basic of thermodynamics and its application. Apply the knowledge of evaluating polymers and advanced polymers in engineering.
- CO5 Identify various types of colour indicators methods to develop skills for testing processes.

Mapping of learning outcomes with program outcomes

	POL	POL2	POL3	POL4	POL5	POL6	POL7	POL8	POL9	POL10	POL11	POL12
CO1	0	2	1									
CO2	0	2		1	2							
CO3	0	2		1	2							
CO4	0	2										
CO5	0			1			1					

Assessment Outline

Student's Category	Continuous Assessment Tasks	Total Semester Examination
Attendance	1	1
Understanding	18	18
Apply	12	12
Analyze		
Evaluate		
Create		

Total Semester Examination weightage: There will be two parts- Part A and Part B. Part A contains 18 questions (3 questions from each module), having 2 marks for each question. Student should answer all questions. Part B contains 8 questions from each module, of which student should answer any 6, each question carrying maximum 1 mark each and carries 12 marks.

Course Level Assessment Questions**Source Outcome 1 (SO 1)**

- Q. 1) Write a balanced chemical equation for reduction reaction
[2 Marks]
- Q. 2) List three important advantages of environmental reaction
[3 Marks]
- Q. 3) (a) From the following calculate atomic ratio of C_2H_6 and O_2 .
[3 Marks]
 (b) Calculate the % of the following oil at 20°C, C_8H_{18} [20%], C_7H_16 [20%], C_6H_14
 C_5H_{12} [24%], C_4H_10 = 4.7% & C_3H_8 = 8.2%.
[3 Marks]

Source Outcome 2 (SO 2)

- Q. 1) State four important laws
[3 Marks]
- Q. 2) List the important applications of stoichiometry
[3 Marks]
- Q. 3) (a) What is Chemical shift? What are factors affecting chemical shift? δ (ppm) is the measure of chemical shift using the concept of chemical shift.
[3 Marks]
- (b) Calculate the total content of Na_2CO_3 in 7.0 g of a mixture containing 4.42 g of Na_2CO_3 , when the atomic masses of Na , oxygen and carbon are 23 and 12 u respectively.
[3 Marks]

Source Outcome 3 (SO 3)

- Q. 1) Distinguish between TGA and DTG
[2 Marks]
- Q. 2) Give four differences between GPC and TGA
[3 Marks]

1. (a) Explain the principle, components and processes of HCL.	[2 Marks]
(b) molecular formula of $\text{C}_2\text{H}_5\text{OH}$.	[4 marks]
Outcome Outcome # 800-16	
2. Define the functional isomers in acids/bases.	[2 marks]
3. When are functional groups 10% ionised?	[2 marks]
4. (a) If HCl is dissociating completely how it is depicted? Give the structure of polyacrylic acid.	[2 Marks]
(b) Draw the structure of a possible for $\text{C}_2\text{H}_5\text{OH}_2\text{O}_2$.	[4 marks]
Outcome Outcome # 800-17	
1. What is degree of freedom?	[2 marks]
2. Define 1000 ppm.	[2 marks]
3. (a) Explain the IUPAC nomenclature of ketones.	[2 Marks]
(b) Standard heat water contains 22 g of CaCO_3 per litre. If we require 100 ml of 8750 ppm formic acid water solution, of 10% solution formic acid water after diluting required 14 ml 8750 ppm. Calculate the necessary percentage of the given amount of water in terms of ppm.	[4 Marks]

Water Catchment Project

Total Page:

Page No. _____

Page No. _____

ANANTAPURAM TECHNOLOGICAL UNIVERSITY

WATER CONSERVATION & RECHARGE PROJECT

Course Code: ENM108

Course Name: WATER CONSERVATION & RECHARGE

Max. Marks: 100

Duration: 2 hours

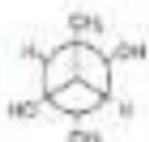
PART A

Answer all questions, each carries 2 marks

1.	What is polarisability (dielectric) ? How this and polarity determine solubility?	2
2.	What is Dielectric constant? Name a difference from dielectric constant?	2
3.	Which of the following molecules can give 3 isomerism? Give reason?	2
(a) $\text{C}_2\text{H}_5\text{OH}$	(b) H_2O	(c) H_2O_2
4.	Which of the following molecules shows UV visible absorption? Give reason.	2
(a) Ethene	(b) Butane	(c) Benzene

1. Differentiate the visualisation techniques used in TGA
2. State the three important applications of chromatography.
3. Draw the Coates propagation formula and find $k_{\text{A}}^{\text{obs}}$ given $k_{\text{P}} = 10^{-4} \text{ L} \cdot \text{mol}^{-1} \cdot \text{min}^{-1}$, $k_{\text{I}} = 10^{-3} \text{ min}^{-1}$, $k_{\text{d}} = 10^{-2} \text{ min}^{-1}$, $[M]_0 = 10^{-2} \text{ mol L}^{-1}$, $[A]_0 = 10^{-3} \text{ mol L}^{-1}$, $T = 400 \text{ K}$.

20
16
16



4. Write the structures of all polyacrylates formed
when $\text{CH}_2=\text{CHCOOCH}_3$ reacts with
a) $\text{CH}_2=\text{CHCOOCH}_3$
b) $\text{CH}_2=\text{CHCOOCH}_2\text{CH}_3$

8
8
8

PART B

Answer any one full question from each module, and question carries 20 marks

Module 1

11. a) Describe the construction of a dry cell. Give the reactions that take place in the electrodes during charging and discharging. What happens to overall emf when cell is 100% charged?
b) Calculate the standard electrode potential of Cu_2 if its reduction potential at -28°C is -0.2388 V and the concentration of Cu^{+2} is 0.010 M .
12. a) Explain the mechanism of photochemical conversion of benzene to benzene-1-oxide in acidic wet benzene environment.
b) Calculate the evolution percentage of zinc acetate.

20
20
20



use the above data to calculate reduction of the zinc in $\text{Zn}(\text{ClO}_4)_2 \cdot 2\text{H}_2\text{O}$ series used to prepare acidic medium in water treatment involving Zinc.

Module 2

13. a) What is spin-spin splitting? Given the IR spectrum of $(\text{CH}_3)_2\text{CH}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_3$ ($\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$) taken from NMR spectrometer. Use to identify the two systems.
b) A dilute solution of concrestone-based glass consists of CaO at $10\% \text{ wt}$, which is concentration where the phase behaviour of a glass under same conditions, And the concentration of the two solutions.
- Or
14. a) Explain the basic principle of UV-VIS spectrometry. What are the possible electronic transitions? Explain with examples.
b) Show the chemical reaction of $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$ and H_2O_2 . Which of them are thermal?

20
20
20

Module 1		
15.	a) Define the concepts, terminology and mechanism involved in gas chromatography. b) Define the term of $\text{CaCO}_3/\text{Na}_2\text{CO}_3$ with its uses.	10 Or
16.	a) Define the various chemical methods used for the synthesis of nanoparticles. b) Name five widely used scandium (III) compounds of polymers?	10 Or
Module 2		
17.	a) What are environmental clean sheets and decomposition of 2, 4-dimethylphenoxanes. b) What is conformational form? Is it more stable in molecules? c) Where is IEDC/Cu properties and applications.	10 Or
18.	a) Explain the nucleophilic addition with suitable examples. b) Define DADT. Draw a detailed diagram.	10 Or
Module 3		
19.	a) What are ion exchange resins? Explain the exchange process for removal of hardness of water from industrial wastewater applications? b) In a certain reactor effluent to 1000 ml with diameter 10 cm, the initial reaction time was 10 min, the dissolved oxygen lost after 2 days of incubation was 2.4 ppm. Find the rate of the reaction.	10 Or
20.	a) What is a colloidal system? Explain its various treatment? Give the flow diagram, bubble etc., involving of breaking lines. b) Calculate the temperature and conductivity readings of a water sample which contains $[\text{Ca}^{2+}] = 180 \text{ mg/L}$, $[\text{Na}^{+}] = 122 \text{ mg/L}$ and $[\text{Cl}^{-}] = 122 \text{ mg/L}$.	10 Or

Topics

Module 1:

Electrochemistry and Corrosion:

Corrosion - Difference between corrosion and electrochemical cells - Corrosion cell - half reactions - self conserving - different types of corrosion - Hg/Hg_2 electrode - Zn/ZnO - General corrosion - **Soda Ashness** - Construction and Working - Single electrode potential - **potentiometer** - Potentiometric titration - Determination of F^- using colored electrodes - Determination of pH using glass electrode - Electrochemical series and its applications - Free energy and ESR - Nernst Equation - Oxidation - single electrode area cell (Thermodynamics) - Application - Variation of heat with temperature - Thermodynamics - Titration - Titration - Oxide reduction - Lithium ion cell - ammonium and working Conductivity - Measurement of conductivity of a solution (numericals).

Corrosion, Passivation and de-passivation - anodization, Galvanic series, Redox potential - difference plating - resistor and mixed plating

Module 3

Spectroscopic techniques and Applications

Introduction - types of spectrum - Electromagnetic spectrum - Molecular energy levels - Boltzmann's law (Boltzmann's Distribution) - Principle - Types of electronic transitions - Energy level diagram of atoms, molecules, lattices and proteins; Preparation of UV-visible spectrometer and applications of UV-visible - Principle - Number of vibrational modes - Vibrational energy states of a diatomic molecule and Determination of force constant of diatomic molecule (Harmosch's - Hopkins, N. 1915) spectroscopy - Principle - Relation between field strength and frequency - chemical shift, spin-spin splitting (hyperfine splitting) - coupling constants (paramagnetic) - applications of NMR including MRI (brief).

Module 4

Instrumental Methods and Nanomaterials

Thermal analysis (TA) - Principle, instruments and their applications - role of TA in food and polymers, DNA-fingerprint, Raman spectra (block diagram and applications - one of DSC, TGA and DSC), Chromatography (block diagram and applications - one of GC, LC, HPLC, GC); Chromatographic methods - basic principle and applications of column and TLC; Nanoscale focus: dc and microwave, transducers (block diagram) - oscillator ring and applications.

Nanomaterials - Definition - Classification - Chemical methods of preparation - Hydrolysis and Solvation - Applications of nanomaterials - Surface characterization (SRI) - Principle and Instrumentation (block diagram).

Module 5

Stereochemistry and Polymer Chemistry

Isotachroisomeric chain rotation, Fractional, racemic and heterochirality - Definition with example - Preparation of 2D stereocarboisomers, Derivatives, Young and Miller's rule of substituted methanes and stereo-heterocyclics - Isomericism concept in acidic bonds and substituted carboxylic acids and CO reactions, PC NMR - Tetrahedral examples - Optical isomerism, Chirality, Chirahomers and Chirahomologs with examples, Conformational analysis of ethers, isomers, substituted methanes and methyl substituted carboxylic acids.

Polymer - Definition - Types - Random, Alternating, Block and Graft copolymers - ABS - preparation, properties and applications. Crystallization, preparation, properties and applications (Conducting polymers - Doping, Redox and Ferrocene) - preparation, properties and applications. GPC - Principle, construction and advantages.

Module 6

Water Chemistry and Sewage Water Treatment

Water characteristics - hardness - Types of hardness: Temporary and Permanent - Dissociation of hard water - units of hardness ppm and mg/L - analysis of hardness (hardness) - definition of

Kamlesh, 2021, method (numerical) - Numerical methods for solving differential equations, principle, process and advantages. *Advanced materials - principle, process and advantages*. Mysore University, India. (Available online: <http://www.mysoreuniversity.ac.in/Downloads/Books/Engineering%20Sciences/Advanced%20Materials.pdf>)

Dasgupta, Aswani, 2007 - numerical methods (numerical methods, method, 2007 and co-authors, application, analysis, procedure and significance) (numerical, solved, method, -Purani, Dasgupta and Tattwam - Free e-book) (Solving Numerical Methods).

Text Books

1. E. L. Hinchliffe, Samaddar, N. S. Bhattacharya, "Engineering Chemistry", (2019), (Available: <https://www.pearson.com/9789811339007.html>).
2. P. W. Atkins, "Physical Chemistry", Oxford University Press, 10th edn., 2011.

Reference Books

1. C. H. Bamford, "Fundamentals of molecular spectroscopy", (Available: <https://doi.org/10.4236/jas.201909199>).
2. Donald J. Neiva, "Introduction to spectroscopy", Cambridge University Press, 1st edn., 2005.
3. R. S. Muller, J. D. Roberts, M. S. Tannenbaum, "Principles of Physical Chemistry", Wiley Publishing Co., 4th Edition, 2007.
4. A. K. Wilson, J. J. Morris, "Infrared and Raman Spectra of Organic Compounds", CBS Publishers, 7th edition, 2008.
5. George L. Boatz, Samuel J. Oatis, "Introductory Chemistry of Organic Compounds", 4th edn., 2009.
6. Raymond E. Boydston, Charles C. Canfield, "Inorganic Chemistry: An Introduction", Prentice Hall, 14-15th Pearson Edition, 2008.
7. Mukundan, R.; Venkateswaran, Ravinder K. Rao, "Engineering Chemistry", OUP, 2012, 2013.
8. Khurmi, "Engineering Chemistry", 1st Publication, 2000.
9. Rev. C. Nagappa, "Engineering Chemistry", Dr. Anupama Publishers, 2010.
10. Somayajulu, G. Venkateswara Rao, "Text Book of Engineering Chemistry", L. Chand & Company, 11th edn., 2011.

Course Contents and Lecture Schedule

No.	Topic	No. of lectures Per Week
1.	Electrochemistry and Conductance	3
2.	Conductivity - difference between ohm and molar electrical conductivity - self resistances - self representation - different types of conductors (ionic) - molecular conductors and derived conductors - metal conductors - conduction and working.	3
3.	Digital voltmeters - definition - half-wave diode - double layer - 2. Determination of E° using several methods - Determination of pH using glass electrode - Electrochemical series and its applications - Free energy and EMF - Nernst Equation - Determination using electrodes and cell (Nernstian) Application - Variation of cell voltage with temperature.	3
4.	Determination of current - resistances (Zero resistance and DC ammeter) - introduction and working - conductors - measurement of conductance of a solution (Dissociation)	3
5.	Concentration of electrochemical reactions - molality, molarity, molality ratio method - dilution - electrode placing - Concentration related placing	3
6.	Selective sensors, techniques and Applications	3
7.	Microanalysis - Theory of spectrum - absorption and emission - Microscope design tools - color selection for microscopes	3
8.	UV-visible spectrometry - Principles - Theory of absorbing molecules - Design, functional groups of solvents, solubility, ionization and dissociation, measurement of UV-visible absorption and absorption	3
9.	P-D spectrometry - Principles - Number of vibrational modes (Vibration, Group, states of a diatomic molecule and - Determination of force constant of diatomic molecule [Lennard-Jones] - Applications	3
10.	NMR spectroscopy - Principles - Relation between field strength and frequency - chemical shift - spin-spin coupling (second problem) - coupling constants (definition) - applications of NMR, including 13C-NMR	3
11.	Instrumental Methods and Interferences	3
12.	Flame analysis - TGA - Atomic, Potentiometric, Block diagram and Applications - Use of CALCDAT and programs (TGA) - Block diagram and applications - use of calcplot, tga	3

3.3	Chromatographic methods - Basic principles and applications of column and TLC - Detection System -	3
3.3	el. and radioisotope, Instrumentation block diagram - detection, capillary and HPLC	3
3.4	Electrochemistry - Definition - Classification - Chemical methods of protection - nucleophilic and addition - Applications of - electroreactions - surface electrochemistry-OCM - Principles and Instrumentation block diagram.	3
4	Sensitometry and Volume Detection	3
4.1	Conjugate-base and their physical properties, Debye-Hückel and Hammett - Definition of Hammett - Representation of Hammett equation, Debye-Hückel model and Taft's equation of substituted methanes and ethers. Determination of Hammett constant in soluble bases and substituted benzene derivatives and OCM reaction.	3
4.2	H.D reaction - Toluene and styrene - Optical isomerism, Optical, Chirality, Chirons and Chiroptical methods. Difference with enantiomers.	3
4.3	Determination analysis of ethane, propane, butane, butene, methane, water and alcohols by flame ionization.	3
4.4	Colorimetry - colorimetry - HPLC - Absorbance, Wavelength block and light scattering - AFS - photometry, chromatography and absorption. Polarography, potentiometry and voltammetry, conductometric, potentiometric, polarographic and voltammetric - protonation, deprotonation with applications. OCM - Photoconductivity and photoemission.	4
5	Water Chemistry and Sewage Water Treatment	3
5.1	Water chemistry basic - Hardness - Types of hardness Turbidity and Potassium - Characteristics of Hard water - units of hardness, ppm and mg/l, causes of hardness (Numerical) - Formation of hardness EDTA method (Numerical). Water softening mechanism exchange, precipitation, coagulation and flocculation. Reverse osmosis principle, process and advantages.	3
5.2	Drinking water treatment (soft) - Chemical methods - chlorination, water analysis and its limitation.	3
5.3	Statistical methods (S.M) - Assumption, zero sum probability, binomial distribution, Poisson, normal, estimator, confidence level, probability and significance (Numerical).	3
5.4	Design water treatment - Filter, sediment and tanks - flow diagram - - Feeding filter and clarifiers.	3

EN	PHYSICS Mechanics	CAT000249	1	T, P	2006/07	Date of introduction:
001		001	1	1	1	2006

Possible uses of the course is to expose the students to the fundamental concepts of mechanics and enhance their problem-solving skills. It introduces students to the influence of applied forces on an object and the subsequent processes of the rigid bodies while stationary or in motion. After this course, students will be able to recognize similar problems in real-world situations and respond accordingly.

Prerequisite(s)

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

001	Identify principles and theories related to the study of mechanics
002	Identify various variables like components of forces or reaction acting on the rigid body
003	Apply the principle of equilibrium to solve practical problems involving different force systems
004	Demonstrate appropriate reasoning, principles or formulas to solve problems of mechanics
005	Solve problems involving rigid bodies, applying the principles of concurrent resultant forces

Mapping of course outcomes with program outcomes (Worth in assessment)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12
001	-	-	-	-	-	-	-	-	-	-	-	-
002	-	-	-	-	-	-	-	-	-	-	-	-
003	-	-	-	-	-	-	-	-	-	-	-	-
004	-	-	-	-	-	-	-	-	-	-	-	-
005	-	-	-	-	-	-	-	-	-	-	-	-

Assessment Matrix

Blooms Category	Continuous Assessment Test		End Semester Examination Marks
	Test 1 Marks	Test 2 Marks	
Remember	10	10	10
Understand	10	10	10
Analyse	10	10	10
Evaluate			
Create			

mark distribution

Total marks	Oral marks	Written marks	Discussion
120	20	100	10 marks

Continuous Internal Evaluation Pattern:

Attendance	20 marks
Continuous Assessment Test (2 numbers)	20 marks
Assignments (Quiz/Quizzes) project	20 marks

Test, Semester, Examination Details: There will be two parts Part A and Part B. Part A consists 20 questions with 2 questions from each module, having 5 marks for each question. Students should answer all questions. Part B consists 2 questions from each module which students should answer within 30 minutes. Total duration can have a maximum 2 hours duration and carry 64 marks.

Course Level Assessment Questions

Part A

Course Outcome 1 (CO1): One question from each module to meet the course objective 1. To recall principles and theories related to rigid body mechanics.

1. Explain D'Alembert's principle

2. Distinguish between statics and dynamics

3. Define and explain perpendicular axis theorem

Course Outcome 2 (CO2): One question from each module to meet the course objective 2. To recall, recollect the components of work and kinetic energy of rigid body

1. A string suspended from All of your 2 m is carrying point loads 2 kg, 2 kg and 2 kg at 2m, 2m and 2m respectively from support A. Calculate the support reaction at A.

2. A person holding one end of a suspended massless string. The bar is suspended by two ropes that attach to the ceiling. Diagram the forces acting on the combination of person and bar.

3. While you are riding your bike, you turn a corner following a circular path. Illustrate the forces that affect your bike in turning along the circular path?

Part B

All the questions under this section shall assess the learning levels corresponding to the course outcomes listed below.

G03	To apply the conditions of equilibrium to various general problems involving stiffened-based systems.
G04	To choose Newton-Raphson, gradient or formulae to solve problems of mechanics.
G05	To solve problems involving rigid bodies, applying the principles of distributed loads and moments.

2. Two identical rods of weight 100 N are suspended by an inclined plane and a vertical wall, from the midpoint of the same at contact A, B, C. Assuming all the surfaces to be smooth,



Course outcome identifier	Description of outcome statement	Learning level assessed	Marks allocated
G03	To apply the conditions of equilibrium to various general problems involving stiffened-based systems.	Applying – (Solve any three tests (Diagram that represents equilibrium state where body is balanced))	4
G04	To choose Newton-Raphson, gradient or formulae to solve problems of mechanics.	Applying (Prove the equations and formulae required for calculation)	4
G05	To solve problems involving rigid bodies, applying the principles of distributed loads and moments.	Applying (Solve this problem based on the description given in G03 and G04)	2
Total:			10

3. If cylindrical axis, 50 mm diameter and 1000 mm long, is increased with a horizontal velocity of the turning at uniform speed of 2 m/s. Assuming there is no slip at points of contact determine (i) angular velocity of axis (ii) angular acceleration of axis if velocity of contact changes to 5 m/s. Also compute the moment acting about the axis of 1000 mm in both cases.

Course outcome identifier	Description of course outcome	Learning level assessed	Marks allocated
CO3	To apply the conditions of equilibrium to various practical problems involving different force systems.	Applying – (Determine free body diagram that represent state of the body.)	4
CO4	To assess appropriate theories, principles or formulae to solve problems of mechanics.	Applying – choose the equations and formulae required for calculation	4
CO5	To solve problems involving rigid bodies applying the properties of distributed areas and masses	Applying – solve the problem based on the description given in CO2 and CO4	6
	Total		14

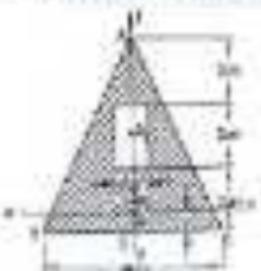
E. Determine the reaction of the given system:



Course outcome identifier	Description of course outcome	Learning level assessed	Marks allocated
CO3	To apply the conditions of equilibrium to various practical problems involving different force systems.	Applying – (Determine the condition of equilibrium for the given geometrical shape)	4
CO4	To assess appropriate theories, principles or formulae to solve problems of mechanics.	Applying – choose the equations and formulae required for calculation	4
CO5	To solve problems involving rigid bodies, applying the properties of distributed areas and masses	Applying Solve the problem based on the description	6

	student name	given in Class 11	
Topic			14

4. A regular tetrahedron rests in a triangular container shown. Find moment of inertia about the vertical axis passing through the base of the container about 10 cm.



Learning outcome identifier	Description of student outcomes	Learning level assessed	Skills assessed
CO3	To apply the conditions of equilibrium to solve problems involving different temperatures	Assessing [Given the condition of moment of inertia, find the given geometrical shape]	b
CO4	To choose appropriate physical formulas to solve problems of mechanics	Assessing [Choose the equations and formulae required for calculation]	b
CO5	To solve problems involving light waves applying the properties of diffracted waves and waves	Assessing [Solve the problem based on the concepts given in the text book]	b
Total:			14

Q1 (cont.)

Page no. _____

Date _____

MECHANICAL ENGINEERING TECHNOLOGICAL KNOWLEDGE FROM LEARNERS' TECHNICAL COMMUNICATIONS
ASSESSMENT & TEST

Course Grade: B7/13B

ENGINEERING MECHANICS

May Marks: 00

Supplementary: 00/00

Part A

ANSWER ONE QUESTION EACH FROM EACH OF THE FIVE

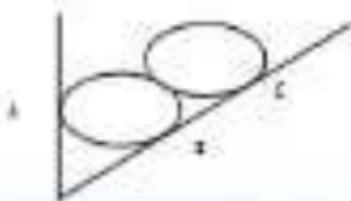
1. Explain D'Alembert's principle.
2. Distinguish between a system & a system boundary.
3. State any three principles of static equilibrium.
4. A simple suspension bridge is carrying 20000 tons of traffic. The bridge is supported by two towers that stand on the ground. Calculate the resultant reaction force.
5. A person holding a circular bar, is suspended horizontally by ropes. The bar is suspended by two ropes that each is inclined 30° from the vertical. Compute the total weight of the combination of person and bar.
6. While you are riding your bike, you hear a siren following a stationary bus. Does the bus have any effect on your bike's motion regarding the circular path?
7. Define degrees and undamped free vibrations.
8. State the equation of motion of a simple rigid body, rotating about its fixed axis.
9. Summarise the significance of instantaneous centre in the analysis of rigid bodies undergoing rotational motion.
10. Explain the principle of mechanics applied in the evaluation of classic collision of rigid bodies.

TOTAL

(Answers one full question from each module, each question carries 10 marks)

Module 4

- (i). Your Isosceles hollow cone of weight 100 N rests supported by an inclined plane, making an angle of 30° with the vertical, and a horizontal wall. Give the reactions at the points of contact 1, 2, 3. Assume all the surfaces to be smooth. (14 marks)



12. A string tied to a wall is used to pass over a pulley placed an even from it. A weight w is attached to the string such that the string straight by the floor by support on the wall as the factor of adhesion of weight. Determine the force F required to maintain 200 kg heavy in position for $\theta = 22^\circ$. The diameter of pulley is negligible. [24 marks]

Module - 2

13. Two blocks A, B, C are resting against a wall and the floor as shown in figure below. Use the value of frictional force if applied to the lower block than will hold the system in equilibrium. Coefficients of friction are: 0.20 at the floor, 0.3 at the wall and 0.3 between the blocks.

[24 marks]

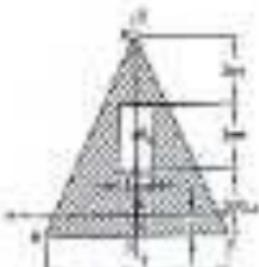


14. A block is being accelerated across a surface. It has a mass of 5 kg as shown below. Find the frictional force. [24 marks]



Module - 3

15. A rectangular block of mass 10 kg is shown in figure. Find moment of inertia about the axis of rotation through the center of the rectangle. [24 marks]



11. Question 11 has both axial and radial components. Waller supports a 2000 N/m² pressure load in the x_1 -direction. Gravity g is fixed to \hat{x}_1 by a rule. The density is negligible. Determine the unknown force components using (a), (b) and (c). [4 marks]

Module 4

12. A cricket ball is thrown with a初 velocity of 30 m/s at an angle of 60° to the horizontal, with an initial velocity of 30 m/s. Integrate to determine a height of 10 m from the ground. Show the results from the worked [4 marks]

Module 5

13. An engine of weight 200 kg pulls a van weighing 1200 kg up an incline of 1° in 20 s. The van starts from rest and moves with constant acceleration against a resistance of 5 N/kg. (a) determine a maximum speed of 20 km/h in 1 km distance. (b) determine the tension in the coupling between the two engines and the traction forces developed by the engine. [4 marks]

14. A cylindrical pipe, 20 cm diameter and 20 cm thickness having mass of 12 kg, is connected with a horizontal conveyor belt running at uniform speeds of 2 m/s. Assuming there is no slip at points of contact determine (i) angular velocity of pipe (ii) angular acceleration of pipe if velocity of conveyor changes to 3 m/s in 20 seconds. Also compute the moment acting about the axis of the pipe in each case. [4 marks]

MODULES

Module 1

Introduction to engineering mechanics-Static analysis of structures - free body diagram, free body diagram, law of equilibrium, principle of superposition and transmissibility, law of action and reaction, choice of force diagrams.

Concurrent coplanar force system and resolution of forces-Resultant of concurrent and collinear forces - methods of resolution - methods of moment - polygon of moments - polygon of forces.

Module 2

Free body diagram - Coulomb's law of friction - analysis of single bodies - wedge, ladder, analysis of connected bodies.

Parallel coplanar forces - couple - resultant of parallel forces - series of parallel forces - equilibrium of parallel forces - Google search subject on concentric force systems - General coplanar force system - resultant and equilibrium equations.

Module 3

Concept of concurrent axes - moment of inertia about axis and moment of inertia about perpendicular axis of rotation - radius of gyration - moment of inertia of rectangular frame and disc.

Method of moments - solution of concurrent forces, moments and couple - free body diagram, equilibrium of concurrent forces (method of moments only)

Module 4

Dimension - coordinate conversion - coordinate transformation matrix

Kinetics - equation of motion - D'Alembert's principle - forces on fixed and free rigid bodies, method of successive bodies, impulse momentum equation and work energy equation (principle only).

Concurrent translation - equations of kinematics - projectile motion (only) Kinetics - equation of motion, linear momentum and work energy equation (principle only)

Module 5

Discrete - examples 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 (Centroidal axis).

Simple harmonic motion - free vibration - degree of freedom - undamped free vibration of spring mass system (definition of degrees of freedom)

Text Books

1. Timoshenko and Young, Engineering Mechanics, McGraw-Hill Publications.
2. Bhansali, I. R., Engineering Mechanics- Statics and Dynamics, Pustak Mahal of India.
3. R. C. Hibbeler and Ashok Sarpak, Engineering Mechanics, Vol. 1_Statics, Vol. 2_Dynamics, Pearson Education.

References

1. Horner, J. und Ingraham, G.: *Managing Networks - mit, Laut und Lassen*. Berlin: Springer.
2. Tavel, A.C.: *Managing Networks - Tools and Dynamics*. Oxford: Blackwell.
3. Shanken, S.: *Managing Networks*. New York: International Publishers.
4. Kieser, W. und Kiefer, D.: *Networks - Modelle und Methoden für Organisationen*. 10. Auflage. Wien: Vitis Verlag.
5. Kieser, W. und Schatzbauer, R.: *Managing Networks - Daten und Strukturen*. Wien: Publishing House Pöhl.

Course Contents and Lecture Schedule

Module	Type	Course objectives addressed	No. of hours
1	Module 1		Total 1
1.1	Introduction to managing networks - introduction of terms and structures - Data principles of networks - Development from equilibrium to non-equilibrium and heterogeneity, role of actors and reaction (reaction dynamics)	CO1, CO4 CO2	1
1.2	centrality measures principle of heterogeneity of actors and roles of actors - concepts for node role change processes - comparison of the evolution of actors' reactions and evolution of actors' links over the social - numerical example for evolution	CO1, CO2 CO3	1
1.3	Consistent reaction laws - analysis of consistent laws - methods of simulation - Illustrative numerical example - leader election problem solving	CO1, CO2 CO3	1
1.4	Analysis of consistent laws - methods of representation/proofs Theorem of Menger - Illustrative numerical example - leader election problem solving	CO1, CO2 CO3	1
1.5	Analysis of consistent laws systems - consistent problem solving - lesson 1 - Isomorphism criteria	CO1, CO4 and CO5	1
1.6	Analysis of consistent laws systems - consistent problem solving - lesson 2 - Isomorphism criteria	CO1, CO4 and CO5	1
1.7	Analysis of consistent laws systems - consistent problem solving - lesson 3	CO1, CO4 and CO5	1
2	Module 2		Total 2
2.1	vector - using vectors - Cayley's law of Action - analysis of single linear dissipative examples in integer and continuous	CO1 CO2	1

	<u>assess problem solving techniques using problems from weights and levers</u>		
3.3	Friction on Inclines - analysis of component forces - determine numerical answers - repeat assess problem solving	CDS, CDA and CSC	1
3.4	Friction on Inclines - repeated problem solving	CDS,CDA and CSC	1
3.5	Resultant forces - touch - resultant of parallel forces - centre of parallel forces - equilibrium of parallel forces - simple biomechanics in common objects	CDS, and CSC	1
3.6	Resultant parallel force system - resultant and equilibrium equations - fluctuating forces	CDS, and CSC	1
3.7	Resultant force system - Standard problem solving - focus on problem solving tool	CDS, CDA and CSC	1
3	Module 3		Task 2
3.1	concept of work and transfer gravitational energy - analysis of figures in combination - composite work examples for humans - problems for practice to be done by self	CDS, and CSC	1
3.2	Transfer of energy - parallel axis theorem - examples for illustration - problems for practice to be done by self	CDS, and CSC	1
3.3	Transfer of mass - parallel axis theorem - example for illustration to be given as handout and discussion on the related example	CDS, and CSC	1
3.4	Transfer of mass problems - problems related to moments and moments of inertia - problems for practice to be done by self	CDS, CDA and CSC	1
3.5	Polar moment of inertia, Radius of gyration, Mass moment of inertia defining, vector and uniform disc	CDS, and CSC	1
	<u>Theorem of Pappus-Guldinus - Concentration</u>		
3.6	Introduction to forces in space - resultant, representation of forces, moments and couples - simple problems to illustrate vector representations of forces, moments and couples to be done in class	CDS, and CSC	1
3.7	Solutions to practice problems - resultant and equilibrium equations for concurrent forces in space - composite forces in space - 3 simple problems to illustrate the application of resultant and equilibrium equations for concurrent forces in space	CDS,CDA and CSC	1
4	Module 4		Task 2

4.1.	Introduction to dynamics - mass of continuous bodies - equations of dynamics - problems to reduce the entropy - additional problems involving extended application of entropy	CCC, and CCD	1
4.2.	Solutions for exercises with necessary expandable group as handout - introduction to kinetics - equation of motion - D'Alembert's principle - illustration of the kinetics using one numerical exercise from mechanics having rigid multibodies	CCC, and CCD	1
4.3.	Motion of continuous bodies / example for D'Alembert's principle to be given as handout and discussion in the solved example - problems for practice to determine by self	CCC, CC4 and CC5	1
4.4.	Classification of mechanical systems problem solving	CCB, CCC & CC8	1
4.5.	Curvilinear translation - factors of dynamics - properties matter - simple problems to reduce the entropy - introduction to kinetics - equation of motion - illustration of the kinetics using numerical examples	CCB, CC4 & CC8	1
4.6.	Kinetics another solving - nonlinear and curvilinear translation	CCB, CC4 & CC8	1
4.7.	conservative multi-mass-spring system and work-energy equation translation - discussions to bring out different version classification of mechanical systems kinetics on elements of momentum and mass energy equation (curvilinear translation).	CCC, and CCD	1
Module 2			task 2
5.1.	kinetics of rigid bodies - introduction to kinetics for a rigid body rotation - kinematics of rotation - solution of rotation for a rigid body rotating about a fixed axis - simple problems for illustration	CCC, and CCD	1
5.2.	rotation under a constant moment - kinetic energy problem solving	CCD, CC4 and CC8	1
5.3.	rotation under a variable moment - kinetics problem solving	CCB, CC4 and CC8	1
5.4.	Planar motion of rigid bodies - instantaneous centre of rotation concept notes	CCB, and CCD	1
5.5.	resolution of forces - instantaneous centre of rotation / concept notes	CCB, and CCD	1
5.6.	kinetics of rotation - analysis of single degrees of freedom beam systems - illustration of mechanical systems as spring-mass systems (beam with)	CCB, and CCD	1

6.6	EOOD spring mass system frequency of motion = unbalance free vibration frequency - concept of natural frequency Free vibration frequency due to initial conditions Damped oscillations or dissipation of residual stresses and free vibration frequencies for the undamaging load	EOO, EOU	1
6.7	Free vibration analysis of EOED spring mass system - Problem solving effect of damping on free vibration frequencies (20100212090)	EOO and EOU	1



NET	Industries & Business	CATEGORY	1	7	3	CRD01	Date of introduction
NET	Business	NET	2	2	2	1	2012

Possibility: To enable the students to effectively perform technical communication through practical representation on the global standards.

Transpiration (T2)

Course Outcome: After the completion of this module the student will be able to

CO1	Identify the problem of cost reduction based on different standards.
CO2	Import multiple engineering properties of designs by visualizing them in different positions.
CO3	Draw isometric views and isometric surfaces of a given object.
CO4	Import profile drawing along the principle of sections and perspective projections to calculate slopes in three dimensions.
CO5	Convert 2D views to orthographic views.
CO6	Draw multi-view projections and section views of structures using various tools.

Mapping of course outcomes with program outcomes

	P0	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
CO1	2												
CO2	3												
CO3	2												
CO4	2												1
CO5	2												1
CO6	2												1

Assessment details

Assessment Details	Continuous Assessment Test		End Semester Examination (100 marks)
	Test 1 (20 Marks)	Test 2 (20 Marks)	
Written	2		20
Practical	20	20	20
Total			
CGPA			

Mark distribution

Total Marks	CA (Marks)	Mid (Marks)	Final Examination
100	40	40	20 hours

Continuous Internal Evaluation pattern:

Midterms 10 marks

Course outcome 1 consists of 10 marks (2 marks for L1 and class work 20 marks)

Course outcome 2 consists of 10 marks (2 marks for L1 and class work 12 marks)

End Semester Examination Pattern:

CBSE will be of 2 hour duration or 100 marks answer booklet and will be for 100 marks. The question paper shall contain two questions from each module of Section A only. Student has to answer only one question from each module. Each question carries 10 marks.

Course Level Assessment Questions:

Question may be framed based on the syllabus given under performance assessment.

Course Outcome 1 (CO1)

- i. sketch solids in different quadrants at any given orientation.
- ii. Problems on lines and planes
- iii. Use Hot image, reference and hidden lines

Course Outcome 2 (CO2)

- i. Draw orthographic views of solids and combination solids
- ii. Draw views of solids enclosed in any two reference planes.
- iii. Draw several views enclosed in both reference planes

Course Outcome 3 (CO3)

- i. Draw views of solids contained by a cutting plane
- ii. Width, total end thickness of cutting plane from 2D views of the section
- iii. Draw development of frontal surface of solid and its hidden views

Course Outcome 4 (CO4)

- i. Draw isometric visual relations of solids
- ii. Draw isometric visual relations of combination of solids
- iii. Draw isometric views of solids

Course Outcome 5 (CO5)

- i. Draw Orthographic views of solids from given three dimensional view

Course Outcome 6 (CO6):

1. Draw the given figures including dimensions using 3D software.
2. Create 3D model using existing software from the given orthographic views or 3D figures for framed IC boards.

Model Question Paper

Ex-Date:

14/05/17

Fig No. _____

Name: _____

**AN ABDUL KALAM TECHNOLOGIES UNIVERSITY TRUST UNIVERSITY LEVEL DEGREE EXAMINATION,
SECOND SEMESTER**

Course Code: MCT 128

Unit Code: MCA/ME/128

Mathematics-128

Time: 3 hours

PART A

Answer all Questions. Each question carries 2 Marks.

Indications: Before necessary Computation lines

- Draw necessary dimensions.
- Indicate any 0.50 mm dimension from each module.
- Each question carries 20 mgms.

QUESTION 1

1. The end point A of line A is 10 mm above XY and 20 mm in front of YZ. The other end of the line is 20 mm above XY and 40 mm behind YZ. The distance between the end points is 10mm. Draw the projections of the line AB in first angle and true inclination of the line with the principal plane. Also locate the centre of the line.
2. One end of a line A lies 10 mm from base line principal plane of projection. The other end of the line is 20 mm above XY and 40 mm in front of YZ. The true length of the line is 10mm. Draw the projections of the line AB in second angle. Also indicate dimensions, direction length and plan length. Also locate its centre.

QUESTION 2

2. A rectangular prism of base side 22 mm and height 40 mm, is resting on the ground on one of its triangular faces. The base edge of that face is inclined 30° to XY. Draw the projections of the solid.

4. A hexagonal prism has side 20mm and height 40mm. It has a corner at its base on the ground and the long edge containing that corner inclined at 60° to the vertical. Give three descriptions of the solid.

METHODS

5. A rectangular prism of base 20 mm and height 30mm is resting with its base on the ground and having an edge of the base at an angle of 14° to the vertical. The top edge of the prism is a translation of parallel edges 10mm and 20mm. Show the positions showing the two edges. Find the inclination of the cutting plane with the ground plane.
6. Draw the development of a frustum of a pyramid of base side 20mm and height 20mm. • centre a circle from a corner of the base, draw the periphery and back to the same point through the other two diameters. Show the position of the cutting in the development plan.

METHODS

7. The bottom of a cone has base diameter 10mm and its slant height 10mm has a height of 8mm. It is placed centrally on one of a rectangular slab of base 20mm and of thickness 20mm. Give the construction of the combination.
8. A hexagonal prism has base side 20mm and height 30mm. A section of diameter 40mm is placed centrally on one of its faces. Show the construction of the combination.

METHODS

9. Show the perspective view of a pentagonal prism, 20mm side and 30mm long lying on one of its rectangular faces on the ground and having its axis perpendicular to ground plane. One of its horizontal faces touches the ground plane and the major corner distance from it is 40 mm above the ground plane and lies in the central plane, which is parallel to the left of the centre of the front.
10. Draw three orthographic views with dimensions of the object shown in figure below.



Section D: Calculus

1. solving the problems involving the applications of the first derivative
 - finding the length of a curve = 6 marks
 - finding the inflection points = 2 marks
 - finding the local maximum = 2 marks
 - solving horizontal asymptotes = 2 marks
 - solving vertical asymptotes = 2 marks
 - differentiating and integrating = 2 marks

Total = 22 marks

2. solving the problems involving the length of the line = 6 marks
 - finding a polynomial by any method = 6 marks
 - finding length of a curve and plan = 2 marks
 - finding a distance = 2 marks
 - solving horizontal asymptotes = 2 marks
 - solving vertical asymptotes = 2 marks
 - differentiating and integrating = 2 marks

Total = 22 marks

3. solving initial position plan and solution = 4 marks
 - first derivative = 2 marks
 - second derivative = 2 marks
 - solving initial position = 2 marks
 - differentiating and integrating = 2 marks

Total = 22 marks

(Any one method or combination of methods for solving can be used)

(If initial position is missing, then minimum 20% marks may be allotted for the answer)

4. solving initial position plan and solution = 4 marks
 - first derivative = 2 marks
 - second derivative = 2 marks
 - solving initial position = 2 marks
 - differentiating and integrating = 2 marks

Total = 22 marks

(Any one method or combination of methods for solving can be used)

(If initial position is missing, then minimum 20% marks may be allotted for the answer)

5. solving initial position plan and solution = 4 marks
 - solving position changes for given condition = 2 marks
 - drawing line shapes = 2 marks
 - finding inflection points / solving plans = 2 marks
 - differentiating and integrating = 2 marks

Total = 22 marks

6. solving initial position plan and solution = 4 marks
 - development of the pyramid = 6 marks

	Welding string in development - 2 marks	
	Welding string in direction - 1 mark	
	Welding string in other - 1 mark	
	Demonstrating and maintaining - 1 mark	Total = 10 marks
1.	Opening initial positions - 4 marks demonstrating 360° - 4 marks demonstrating 180° of Platinum - 2 marks Demonstrating and maintaining - 2 marks	Total = 10 marks
	(+ Deviation is 2 marks) / Demonstrated initially if needed Reduced 1 marks if demonstrated twice or below	
2.	Opening intermediate positions - 2 marks demonstrating - 2 marks Demonstrating 180° of green - 2 marks demonstrating 90° of orange - 2 marks Demonstrating and maintaining - 1 marks	Total = 10 marks
	(+ Deviation is 2 marks) / Demonstrated initially if needed	
3.	Opening the plan and opening the action plan - 4 marks Welding identified areas - 2 marks Welding other areas - 2 marks Opening the subsequent view - 2 marks Demonstrating and maintaining - 2 marks	Total = 10 marks
4.	Drawing the elevation - 2 marks Drawing the plan - 2 marks Drawing the side view - 2 marks Captioning individual stages - 2 marks Demonstrating and maintaining - 2 marks	Total = 10 marks

EVALUATION

Social Function:

- All rights processes to be followed.
- Student A presents solutions to his problems at ALL times.
- Student B needs to be consulted on problems.

STRUCTURE

Module 1:

Introduction: Definition of technical drawing in engineering field. Types of lines, Dimensioning, 3D solids of revolution for technical drawing.

Dimetric projection of Triangles and Lines: Dimension of project in different quadrants. Dimension of straight lines defined as one plane and inclined to both planes. Types of lines. Indication of lines with common planes. True length of line indicated on each of the reference planes.

Module 2:

Orthographic projection of solids: Projection of simple solids such as triangular, rectangular, square, Pentagonal and hexagonal prisms, pyramids, cones and cylinders. Indication of solids in orthographic projection including profile view. Position of edges with axis referred to one of the reference planes and with axis inclined to both reference planes.

Module 3:

Isometric Drawing: Isometry of Triangles, Pyramids, Cones, Cylinders with axis in vertical position and axis for different section planes. True shape of the sections. True Sectioning true section planes when the true shape of the section is given.

Development of Surfaces: Development of surfaces of the above solids and solids having different section planes. Dimensioning development lines from true points on the surface.

Module 4:

Assembly Drawing: Isometry of Triangles, Pyramids, Cones, Cylinders, Development of Pyramids, Indication of cones, spheres, hemispheres and their combinations.

Module 5:

Perspective Projection: Isometric projection of triangles and Polyhedra with axis perpendicular to the ground plane, axis perpendicular to section plane.

Construction of Isometric views by construction of observer views in orthographic views.

STRUCTURE

(To be completed in 20.2.14)

Introduction to Computer-Aided Drawing: Role of CAD in usage and development of new products. Advantages of CAD. Creating two dimensional drawing with dimension using suitable software (Minimum 2 exercises mandatory).

Introduction to Solid Modeling: Drawing 3D models of various components using suitable modeling software. (Minimum 2 exercises mandatory).

Text Books

1. BISHOP, D., Engineering Drawing, Charter Publishing House Ltd.
2. JUNE, G.G. Engineering Graphics, Pearson-Hall India Publishers.

Reference Books

1. ANGULANI, S.S., Engineering Graphics, Achuthanayagam Publishers.
2. AGARWAL, R. and AGARWAL, C.M., Engineering Drawing, Tata McGraw Hill Publishers.
3. BURGESS, L., Engineering Drawing, Pearson Publishers, 2nd edition, 2007.
4. DUFF, J. M. and KEE, M.A., Engineering Design and Visualization, Cambridge University Press.
5. HOBSON, G.H., HOBSON, A.P. and LEADER, A.L., Engineering Graphics with AutoCAD, PH.
6. LUCAS, H., WILKINSON, J. and DUFF, J.M., Fundamentals of Engineering Drawing, PH.
7. LUGONES, J.L., Engineering Graphics, Cengage Publishers.
8. VENKATESH, P., Engineering Drawing and Graphics, Prentice-Hall International Publishers.

Course Contents and Lecture Schedule

Sl.	CONTENTS	No. of Hours
MODULE I		
1.1	Introduction to graphical tools of engineering drawing	3
1.2	Conversion of given statements of problems, different elements involved in drawing, conversion of different drawings	3
1.3	Selection of lines, indicators and others, types of lines to be drawn, measured method of solving problems on lines	3
1.4	Problems on lines using measured method	3
1.5	Use of various method of solving problems on line measured method	3
MODULE II		
2.1	Introduction of different views, Orthographic projection and drawing of solids	3
2.2	Problems on various solids formed by two planes	3
2.3	Problems on various solids formed by three planes	3
2.4	Problems problems on solids formed by four planes	3

	MODULE 9	
9.1	Introduction to scatter plots, Q-Q plot and LSC. Analysis of learning outcome points and finding out effects.	3
9.2	Problems on scatter of different variables	3
9.3	Problems on the Tukey's Biplot	3
9.4	Methods of decomposition of effects, seasonal effects	3
	MODULE 10	
10.1	Methods of forecasting linear and Polynomial, seasonal effects, Problems on growth rates	3
10.2	Forecasting problems on Trendline problems, Cyclical and Seasonal	3
10.3	Problems on combination of different series	3
	DISCUSSION	
11.1	Introduction to progressive projection, different plans, future projections Progressive problems on pyramid	3
11.2	Progressive problems on pyramid	3
11.3	Problems on representation of a general curve into segments problems	3
	EXCERPT 4 (De-revised total = 112 hrs)	
1.	Introduction to GCD and SVD, Familiarizing features of GCD technique, Problems on making connections	3
2.	Practical session on coding	3
3.	Introduction to auto-modelling and others	3
4.	Practical session on auto-modelling	3

ID	NAME OF THE SUBJECT AND SUBDIVISION AND SEMESTER	CATEGORY	0	1	2	SEMESTER	YEAR OF IMPLEMENTATION
			ES	ES	ES		

Principle:

Objectives of this course is to provide an insight and includes the essentials of civil engineering design, to the students of all branches of technology and to provide the students an illustration of the significance of the Civil Engineering Profession in solving the societal needs.

To inculcate the students to the basic principles of mechanical engineering

Prerequisite (s):

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

CO1	Analyse the role of civil engineer in society and to relate the various disciplines of Civil Engineering
CO2	Identify different types of buildings, building components, building materials and building construction
CO3	Explain the basic requirements, functions, materials, components and methods of functioning
CO4	Compare the basic infrastructure services (AEP, WAPC, drainage, telephones and roads)
CO5	Discuss the NEEDS, Analysis, synthesis, design, management and maintenance for green buildings.
CO6	Analyze the environmental policies and calculate its efficiency
CO7	Evaluate the economy and resources of IC Engine
CO8	Explain the basic principles of Refrigeration and Air Conditioning
CO9	Describe the working of hydraulic machines
CO10	Explain the working of power transmission elements
CO11	Describe the basic manufacturing, welding and forming processes

Mapping of course outcomes with program-outcomes

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CO1	2	1	*	*	-	3	5	4	-	-	-	-
CO2	5	3	*	1	5	*	*	5	-	-	*	*
CO3	5	3	*	*	3	-	-	-	3	-	*	*

CSE	8	1	0	1	8	0	0	0	0	0	0	0
CSE	8	1	0	1	8	0	0	0	0	0	0	0
CSE	8	1										
CSE	8	1										
CSE	8	1										
CSE	8	1										
CSE	8	1										
CSE	8	1										

Assessment Report

Sloane's Category	Basic Civil Engineering			Basic Mechanical Engineering		
	Continuous Assessment		Semester Examination (marks)	Continuous Assessment		Semester Examination (marks)
	Test 1 marks	Test 2 marks		Test 1 marks	Test 2 marks	
Competence	8	8	32	18	78	18
Commitment	32	32	32	12.8	12.8	24
Highs				8	8	16
Middles						
Bottoms						
Deep						

Mark distribution

Total Marks	CB Marks	SSE Marks	SG Question
100	80	80	0 hours

Continuous strand evaluation pattern

Attendance	22 marks
Continuous Assessment Test 1 (marks)	22 marks
Assignment/Class Project	22 marks

Semester Examination Pattern

There will be two parts, Part I – Basic Civil Engineering and Part II – Basic Mechanical Engineering. Part I and Part II carries 32 marks each. For the one semester examination, part I carries 2 parts.

Part A and Part B. Part C contains 8 questions carrying 4 marks each (not exceeding 2 questions from each module). Part B contains 2 questions from each module half of which are to be answered. Each question carries 20 marks and can have maximum 2 sub-divisions. The pattern for oral examination for part C is same as that of part A. However, student should answer both part A and part C in separate answer booklets.

Course Level Assessment Questions

Course Outcome CO1: To recall the role of civil engineer in society and to relate the various disciplines of Civil Engineering.

1. Explain the role of Civil engineering in the overall infrastructural development of the country.

Course outcome CO2: (One question from each module and not more than one)

Watch different types of buildings, building components, building materials and building construction

c. discuss the different basic construction processes

Course outcome CO3: (One question from each module and not more than one)

Discuss the importance, advantages and disadvantages of recycling

1. Explain the importance of recycling in Civil Engineering

Course outcome CO4: (One question from each module and not more than one)

Examine the basic infrastructure services (SAC, AC, DC, electricity, irrigation and roads).

c. Discuss the civil engineering aspects of these infrastructure services in buildings

course carrying 2 marks from each module and not more than one

Discuss the materials, energy and cost, water management and environment in green buildings

1. Discuss the relevance of Green building in society

Answers to Question paper 2 (2) of question from each module, Part A (2) question carrying 10 marks

Course Outcome CO1: (One full question from each module and each question can have maximum 2 sub-divisions)

To recall the role of Civil engineer in society and to relate the various disciplines of Civil Engineering
CO2 Questions

1. Explain the types of buildings you encounter. Explain briefly each in about three sentences
a. Discuss the components of a building with a neat figure.

2. What are the major disciplines of civil engineering and explain their role in the infrastructural framework.

3. Explain the role of NBC, BS & CECI norms in building rules and regulations prevailing in our country.

Course Outcome 4 (CO4) & Course Outcome 5 (CO5) Two full question from each module and both questions can have maximum 2 sub-questions

Define the basic of buildings, building components, building materials and building construction & describe the major terms, objectives and processes of surveying.

CO Questions

- a. What are the different kinds of surveys available and discuss their use.
b. Define properties of good building tools. Explain any five.
- a. List and problems faced during construction materials used for construction.
b. Explain the objectives and principles of surveying.

Course outcome 4 (CO4) & Course outcome 5 (CO5) Two full question from each module and both questions can have maximum 2 sub-questions

Examine the basic of buildings across NBC, HVAC, insulation, assembly and terms & Discuss the insulation, cooling systems, code management and requirements for green buildings.

CO Questions

- a. Draw the sketch of your plan of one residential unit with legend note.
b. Explain the energy systems and code management in Green building.
- a. Draw the sketch of following numbers (i) adiabatic process having
iii) constant volume, and iii) constant heat. 
b. discuss the dual importance of HVAC in a commercial building.

Course Outcome 6 (CO6)

- a. An air standard cycle with the compression ratio is 7 and expansion ratio is 20/7. If the maximum temperature of the cycle is 220°C. Then
 - Heat supplied per kg of air
 - Heat rejected per kg of air
 - Efficiency.

Take Cp = 1.005 kJ/kg/K and Cv=0.714 kJ/kg/K.
- A Carnot cycle works with adiabatic compression ratio of 3 and isothermal expansion ratio of 3. The volume of air at the beginning of isothermal expansion is 0.6 m³. If the maximum temperature of the cycle is 1000 K to 300 K and isobaric compression ratio is 10, calculate the isothermal expansion efficiency of the cycle.
- an idealized cycle, it consists of two adiabatic processes and of isothermal heat exchange. The temperatures at the beginning and end of expansion is 200°C and 300°C. Calculate the ideal efficiency of the cycle.

4. Explain the concepts of CFD and FEM in 3D designs.

Course Outcome 1 (CO1)

- With the help of a real sketch explain the working of a windmill design.
- Compare the working of a windmill with a wind turbine.
- Explain the classification of turbines.

Course Outcome 2 (CO2)

- Explain the working of a pump or compressor with its working principle.
- With the help of a real sketch, explain the working of a reciprocating pump.
- Define CFD, specific humidity, relative humidity and dew point temperature.

Course Outcome 3 (CO3)

- Explain the working of a single stage centrifugal pump principle.
- With the help of a real sketch, explain the working of a reciprocating pump.
- A pump with a pump cylinder length of 10 m at 200 rpm. The discharge is $2 \text{ m}^3/\text{s}$. If the overall efficiency of the pump is 100%. Determine the power required by the motor.

Course Outcome 4 (CO4)

- Explain the working of a steam and gear pump with the help of their sketches.
- Sketch a single stage pump.
- Name different parts of gear pump and system.

Course Outcome 5 (CO5)

- Describe the processes which can be performed using drilling machine.
- Explain the functions of various accessories used in drilling.
- With a real sketch explain the working principle of a drill.

Related Question Paper

by Code No. 20202

page 2

Reg No. _____

Name _____

**AN AUTONOMOUS TECHNOLOGICAL UNIVERSITY FIRST SEMESTER 3RD YEAR DEGREE EXAMINATION
NORTH E. TERM**

Course Code: PGT-100

Course Name: CAD/CAM/CAE AND COMPUTER AIDED DESIGN

Page No. 100

Total No. of Pages

www.tatc.org.in/sem2/examquestion/paper100.pdf

Part I-Basic Civil Engineering

PART A

(Answer all questions. Each question carries 4 marks)

1. Explain relevance of Civil engineering in the overall infrastructural development of the country. (4)
2. Discuss the differences between plain soil and改良土 (4)
3. Explain different types of soil with their properties. (4)
4. What are the different kinds of compaction and what is their use? (4)
5. Define bearing capacity of soil. (4)

[16 x 4 = 64]

PART B

Answer any four questions from each module:

MODULE - I

- Q1. List out the types of buildings by your viewpoint. Explain any one, each in about five sentences. (8)
- Q2. Discuss the components of a building with a neat figure. (8)
- Q3. What are the major disciplines of civil engineering and explain their role in the infrastructural framework. (8)
- Q4. Explain the role of SAC, BIS & ISSI norms in building rules and regulations prevailing in our country. (8)

MODULE - II

- Q1. What are the different kinds of construction materials used in construction. (8)
- Q2. List the uses of good building units. Explain any five. (8)
- Q3. Name the various fine weather construction materials used for construction. (8)
- Q4. Explain the objectives and processes of surveying. (8)

MODULE - III

- Q1a. Draw the elevation and plan of one brick thick wall with English bond. (8)
- Q1b. Explain the energy systems and their management in Green buildings. (8)
- Q2a. Explain each of the following foundations: (i) Infilled propp beam, (ii) Cantilever footing and (iii) Continuous footing. (8)
- Q2b. Explain the civil engineering aspects of L&T and TATA in a commercial building. (8)

[16 x 4 = 64]

STMT 01: BASIC MANUFACTURING PROCESSES

PART A

Answer all questions. Each question carries 4 marks.

1. Sketch the P-V and T-s diagrams of a Carnot cycle and list the processes.
2. Define the working of an isothermal gear train.
3. Define casting and centrifugal casting process.
4. Differentiate between welding and brazing.
5. Explain the principle of extrusion manufacturing.

5 x 4 = 20 marks

PART B

Answer any full question from each module.

Module A:

- B. In an air-standard Otto cycle the compression ratio is 7 and maximum engine temperature is 227°C.
i) If heat addition is 70 kJ/kg find
a) Isentropic efficiency of the cycle
b) Brake thermal efficiency
c) Mean effective pressure

$$T_1 = 227 + 273 = 500 \text{ K}$$

20 marks

10

- C. Explain the working of a 2-stroke Diesel engine with neat sketches.
D. Define the fuel economy of a petrol engine.

2 marks

2 marks

Module B:

- E. a) Explain the working of a two-stage compression process with the help of a flow diagram.
b) Define: total/absolute humidity and dew point temperature.
c) List the parts of heat exchangers used in the working of a refrigeration plant.

5 marks

2 marks

20 marks

10

- F. Define: R value, high, ultra high, low high and class rating rolls with neat sketches.

20 marks

10

- G. Define the two working processes with a neat sketch.
H. Differentiate between up scaling and down scaling operations.

2 marks

2 marks

20 marks

Module 1

General introduction to Civil engineering: Advances of Civil Engineering in the social infrastructure development of the country. Feasibility of an project in involving the safety of built environment. brief introduction to major disciplines of civil engineering like, transportation Engineering, Structural Engineering, Geotechnical Engineering, Water Resources Engineering and Environmental Engineering.

Introduction to buildings: Types of buildings, evolution of buildings, components of a residential building and their functions.

Building rules and regulations: Definitions of NBC, CDL & ZBB norms (brief discussion only).

Building areas: Total area, built up area, floor area, car parking and floor area ratio for a building as per ZBL.

Module 2

Surfacing materials, cohesive and non-cohesive.

Construction materials: conventional construction materials like, stones and soil of building materials (bricks, pipes, concrete, lime and cement).

Common composite construction materials, strengths and tests.

local road surfaces, analysis, reinforcement, disposal of soil.

Modern construction materials: Polymers, glass, ceramics, Plastics, composite materials, thermal and acoustic insulating materials, cladding, panels, insulating materials, modern use of gypsum, prefabricated building components (brief discussion only).

Module 3

Building Fundamentals: Foundations, bearing capacity of soil (brief discussion only), locations of foundations, types – shallow and deep (brief discussion only), shear bearing and framed structures (longer project).

Brick masonry: - Basic and strength test, English bond & Flemish bond patterns with its meaning.

Bricks and Braces: - Functions, types, bonding materials (brief discussion only).

Basic Infrastructure services: water, power, drainage, roads and sewage (brief discussion only), for why for buildings.

Green buildings: - materials, energy saving, water management and environment for green buildings (brief discussion only).

Module 4

Analysis of thermodynamics cycles: Carnot, Otto, Diesel cycles. Definition of efficiency of these cycles. Need to calculate heat added, heat rejected, net work and efficiency. C Engine, O.I, D-Engine, + Diesel engines, using the series of different types of IC Engines. Efficiency of IC Engines (Definitions only); (ii) Dual working and Liquefying systems in V and C Engines, CDL, UNI. Concept of hybrid engines.

Module 5

Properties, units of measurement, converted factors, hydrostatic, buoyant, compression, safe load, shear stress, shear force and its problems, definitions of dry, wet & due point, hygrometry, specific humidity and relative humidity, cooling and dehumidification, causes of unsed conditions.

Description about working with sketches of: Actioning pump, centrifugal pump, Action turbine, Francis turbine and Kaplan turbine. Overall efficiency. Equations on calculation of input and output power of pumps and turbines (both steady state).

Description about working with sketches of: Boil and their types, Boiler and Boiler tube. Single phase distillation.

Module 6

Manufacturing Process: Basic description of the manufacturing processes – Sheet Cutting, Drilling, Boring, Turning, Forming and their applications.

Sheet cutting Processes: Use types of cutting. Description with examples of: Line cutting, Scribing and Stripping and their applications.

Basic machining operations: Turning, Drilling, Milling and Drilling.

Description about working with block diagram of: Lathe, drilling machine, milling machine, the lathe. Examples of GCODEs. Recent and future requirements.

Text books:

1. Langford, J. C., *Introduction to Civil Engineering*, Chesser Publishing House
2. Vithal, A. K. and Prabhu, J. C., *Building Construction*, volumes 1 to 4, Pearson India Education Services

Reference books:

1. Chorlton and Davies (Eds), *The Civil Engineering Handbook*, Blackie Academic and Professional
2. Charles, Peter (Eds) *BSI Building construction handbook*, National Physical Laboratory, London, England
3. Charles, P., *Construction Technology*, Vol. 1 to 8, Longman group, England Chesser Press
4. Jenkins, D. L., *Elements of Civil Engineering*, Chesser Publishing House
5. Karmarkar, M. S., and Samant, J. T., *Handbook for Civil and Construction Engineering*, Pearson Education
6. Langford, J. C. and Chorlton, D., *Building Construction*, Chesser Publishing House
7. Lloyd, W., Chorlton, J. and Shipton, A., *An Introduction to Structural Engineering Part 1*, E&E Davis
8. Atwood, J. H., *Handbook of mechanical engineering*, McGraw-Hill Book Company Inc., New York
9. Jenkins, D. L., *Handbook of mechanical engineering*, Prentice Hall International Inc., Hemel Hempstead, UK
10. S. Bhattacharya, M. J. Palitghosh, *Basic Civil and Mechanical Engineering*, Volume-III, Siva Publications, Patna, Bihar, 2008
11. S. Bhattacharya, *Basic mechanical engineering*, Nitish Books, 2010
12. Bhattacharya, P. Basu, *Mechanical Engineering Civil Books*.

Course Contents and Lecture Schedule

No.	Topic	Course outcomes addressed	No. of Lectures
1	module 1		10/10/1
1.1	General introduction to civil engineering, objectives of civil Engineering & its social significance, development of the country, Possibility of an engineer in creating the future of India environment.	CO1	1
1.2	Brief introduction to major disciplines of Civil Engineering like Transportation Engineering, Structural Engineering, Geotechnical Engineering, Water Resources Engineering and Environmental Engineering.	CO2	1
1.3	Introduction to buildings: Types of buildings, selection of site for buildings, requirements of a residential building and their functions.	CO3	1
1.4	Building codes and regulations: Categories of NBC, IS:800 & IS:456 (Brief Discussion)	CO4	1
1.5	Building area: Dimensions, floor plans, Perimeters, dimensions and Requirements for a building plot (BPL).	CO5	1
2	module 2		10/10/1
2.1	Cement: main types, classification and formulas	CO6	1
2.2	Bricks - classification, properties of good bricks and types of brick	CO7	1
2.3	Stones - Qualities of good stones, types of stones and their uses Concrete - Good qualities of concrete, types of cement and their uses	CO8	2
2.4	Sand - Classification, qualities of good sand and their analysis Bracewood Timber - Characteristics, occurrences and uses	CO9	1
2.5	Common materials : Construction materials, properties and types Steel : Steel construction and steel structures, types and uses	CO10	2

2.8	Use of non-combustion materials - Asbestos-free glass, ceramic tiles, concrete materials, thermal and acoustic insulating materials, decorative panels, waterproofing materials, movement use of gypsum, prefabricated building components (3rd discussion only)	100	3
9	Module 5		
2.1	Foundations - Bearing capacity of soil (saturation only), function of foundations, types - shallow and deep, brief discussion only.	100	3
2.2	Brick masonry - Header and stretcher bond, English bond & Common bond- dimensions and plan (one 2 cm and a half brick wall plus Random rubble masonry).	100	3
2.3	Basic Functions, basic teaching materials (brief discussion only) - Three Functions, Applications - teaching materials (brief discussion only)	100	3
2.4	Heat Distribution pattern (HDP), HVAC, firewalls, load factors and ranges (Civil Engineering aspects only) fire safety for buildings	100	3
2.5	From Building - Materials, construction, heat transmission and dimensions for typical buildings, brief discussion only	100	3
MODULE 4			
4.1	Analysis of thermodynamic cycles (Rankine, Otto, and Diesel) - behaviour of efficiency of these cycles. Problems in selecting best suited thermodynamic cycle and efficiency	100	3
4.2	Co-ordinates, Co-periodic - periodic signals, using the pair of efficient tools of co-ordinates, efficiencies of co-periodic signals	100	3
4.3	No. Real, scaling and translating systems in 2D and 3D Signals, DFT, term, concept of Fourier series	100	3
5	MODULE 5		
5.1	Refrigeration units of refrigerators, reversed Carnot cycle, CO ₂ , vapour compression cycle (brief description and no problems)	100	3
5.2	Definitions of dry, mean & dew point temperatures, specific humidity and relative humidity, Cooling and dehumidification, latent & sensible air constituents	100	3

8.2	Description about working with concrete : Describing pump centrifugal pump, Vibrator, cutting,震動振動和震動振動 Overall efficiency, Performance requirements of input and output power of pumps and turbines, low voltage insulation	2
8.3	Description about working with woodchips, soil and other materials and structures, single piece cutters	2
9	Method 6	
8.2	Manufacturing process basic description of the manufacturing processes - Sand Casting, Forging, Rolling, Drawing and their applications.	2
8.2	Basic Joining Processes and types of joining, Description with examples of Riveting, Soldering and Braze and their applications	2
8.2	Basic Machining operations, Turning, Drilling, Milling and Drilling Description about working with basic degrees of Justice, Drilling machine, Milling machine, CNC Machine	2
8.2	Principle of CAD/CAM, Rapid and Additive manufacturing	1



ART 136	NAME OF ELECTRONIC MEDIUM ELECTRONIC'S INFORMATION	CATEGORY	FORMAT			SUBJECT	NAME OF INFORMATION
			1	2	3		
			1	2	3		

REFERENCES

This course aims to (i) equip the students with an understanding of the fundamental principles of structural engineering to prepare an engineer of tomorrow; and (ii) introduce the working principle and examples of fundamental structures. It also (iii) provides an overview of concepts of sustainability, resilience and circularity as three elements in today's construction.

Francesca Tassan and Silvana Paganini / *Journal of Aging Studies* 27 (2013) 93–103

From this point, the names of the most prominent physicians who have practiced in this city

III-1	Apply fundamental concepts and various laws to solve simple DC networks.
III-2	Distinguish and solve problems of magnetic circuits.
III-3	Apply the fundamental laws of electrical engineering to solve simple AC circuits in steady state.
III-4	Understand the meaning of a voltage source.
III-5	Understand the principle of an inductor, resistor and capacitor.
III-6	Understand the principle of transformer and its applications.

Power of some estimators with respect to others

Wenchee Tsai

Student's Category	Basic Electrical Engineering			Basic Electronics Engineering		
	Continuous Assessment Tasks		Examination Duration (Hours)	Continuous Assessment Tasks		Examination Duration (Hours)
	Test 1 (Marks)	Test 2 (Marks)		Test 3 (Marks)	Test 4 (Marks)	
Summative	3	3	33	33	33	33
Formative	11.5	12.5	33	33	33	33
Avg.	12.2	12.2	33			
Grade						
Total						
Date						

Mark distribution

Test Grade	CH marks	80% marks	80% Question
80	80	80	8 hours

Continuous Internal Evaluation Pattern

Attendance	22 marks
Continuous Assessment Test (2 numbers)	22 marks
Assignments/Quizzes/Class projects	22 marks

Final Semester Examination Pattern: There will be two parts, Part I – Basic Electrical Engineering and Part II – Basic Electronic Engineering. Part I and II will have 12 marks each. Part I and semester examination, part I consists of 3 parts - Part I-Apart I and II. Part II contains 8 questions carrying 1 mark each (one question from each module). Part II consists 2 questions from each module out of which one is to be answered. Each question carries 1.5 mark and can have maximum 3 sub-questions. The pattern for the semester examination for part I is same as that of part II. However, student should answer both part I and part II in respective exam books.

Course level Assessment Questions

Course Outcome 1 (CO01)

1. Solve problems based on current division rule.
2. Solve problems with mesh/mesh analysis.
3. Solve problems on Node/Node Transformation.

Course Outcome 2 (CO02)

1. Problems on series magnetic circuits.
2. Problems on parallel-magnetic circuit.
3. Problems on complex-magnetic circuit.

4. Course Outcome 2 (CO02)

1. problems on self-inductance, mutual inductance and coefficient of coupling.
2. problems on reactance and average value of alternating waveforms.
3. problems on series circuits.

4. Distortion free and Class A/B and Class C power amplifier.

Course Outcome 4 (CO04): Explain working of a voltage amplifier

1. What is the need of voltage divider biasing in an IC coupled amplifier?

- Define operating point in the context of a BJT amplifier.
- Why is it required to provide voltage and/or current feedback?

Course Outcome 5 (CO5): Explain the principle of an ohmmeter measurement system

- Draw the block diagram of an ohmmeter measurement system.
- What is a thermistor?

- Explain the working principle of operation of digital multimeter.

Course Outcome 6 (CO6): Explain the concepts of radio and cellular communication

- What is the working principle of what waveforms used in a radio transmitter?
- What is the role of two carrier waves, RF carrier and IF carrier in a radio receiver?
- What is meant by cell in cellular communication?

Model Question Paper

Up to date

Page 4

Page No. _____

Name _____

ANNUAL EXAMINEE FORMULATION UNITS IN INSTITUTE OF COMPUTER & INFORMATION TECHNOLOGY,
MORNING TIME

Course Code: EEE111

Course Name: ANALOG ELECTRONICS AND ELECTRONIC ENGINEERING

Date: _____

Duration: 3 hours

Answer both part I and part II in separate answer books

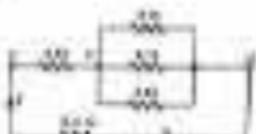
Part I:

ANALOG ELECTRONICS ENGINEERING

PART A

Answer all questions, each question carries 4 marks

- Calculate the output voltage for the CCW connection in the circuit shown, applying Kirchhoff's voltage rule.



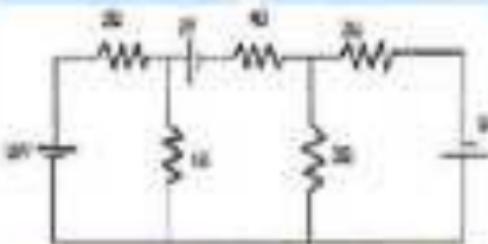
2. Calculate the total and average values of a purely resistive current having peak value 1.0 A.
3. An increasing voltage of $(10+10t)$ V is applied in an AC circuit and the current flowing through the circuit is $(4+3t)/4$. Calculate the impedance of the circuit in ohms per radian. Also determine if it is resistive or inductive.
4. Define the voltage frequency, low and high values of voltage in a linear graph for alternating currents.
5. Compare primary and secondary currents. (1 mark)

PART B

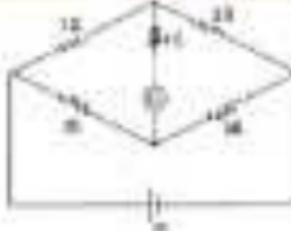
Answer any question from each module, each question carries 10 marks.

Module 2

- B. Calculate the total voltage in the circuit shown, applying node analysis.



- C. (a) Answer any question from each module, each question carries 10 marks.
- (b) Calculate the current through the galvanometer (G) in the circuit shown.



(10 marks)

Module 2

2. (a) State and explain Faraday's law of electromagnetic induction with examples. (4 marks)
- (b) Distinguish between statically and dynamically induced voltages. A conductor of length 8.2m moves in a uniform magnetic field of flux density 1.7 T at a velocity of 30m/s. Calculate the coefficient in the expression if the direction of motion of the conductor is indicated as 10° to the direction of field. (6 marks)
3. (a) Derive the amplitude, form and frequency of a purely sinusoidal waveform. (3 marks)
- (b) A current wave is made up of two components. An ac component and a 200mA dc component, which is a sinusoidal wave with a peak value of 2A. Sketch the resulting waveform and determine its RMS and average values. (5 marks)

Module 3

10. Draw the power triangle and define active, reactive and apparent power in ac circuits. Two coils A and B are connected in series across a 240V, 50Hz supply. The resistance of A is 1Ω and the reactance of B is 0.812Ω. If the input from the supply is 50W and 12Vrms, find the total value of A and the resistance of B. Also calculate the voltage across each coil.
11. A balanced three phase load consists of three coils each having resistances of 10Ω and inductances 0.025H. It is connected to a 415V, 50Hz, 3-phase ac supply. Determine the phase voltage, phase current, power factor and active power when the loads are connected in (i) star (ii) delta.

(10 marks)

Part 2

Basic Electronics Measurements

Part 3

Answer all questions with another (total 4 marks)

1. Give the specifications of a resistor. This value is determined on a resistor test fixture. Why? (a) 10Ω and 25Ω. What are the minimum and maximum resistance values accepted from this resistance?
2. What is meant by load impedance?
3. Explain the working of a full bridge bridge rectifier.
4. Discuss the role of coupling and bypass capacitors in a single stage CC coupled amplifier.
5. Define voltage, AC and DC communication systems.

(10 marks)

QUESTION

Answer one question from each module, each question counts 20 marks.

Module 4

- Q. a) Explain with diagram the principle of operation of an ICF converter. [10]
 b) Sketch and explain the typical input-output characteristics of a GTO drive connected in common-emitter configuration. [10]
- [20]
- Q. a) Explain the formation of a potential barrier in a JFET junction diode. [10]
 b) What do you understand by Hall-effect measurement? Draw and explain the IV characteristic of a Hall-measuring device. [10]

Module 5

- Q. a) With the help of circuit diagram, explain the working of an LC coupled amplifier. [10]
 b) Draw the frequency response characteristics of an LC coupled amplifier and state the reasons for the reduction of gain at lower and higher frequencies. [10]
- [20]
- Q. a) With the help of block diagram, explain how an electronic instrumentation system. [10]
 b) Explain the principle of an oscilloscope. [10]

Module 6

- Q. a) With the help of block diagram, explain the working of Super-heterodyne receiver.
 b) Explain the necessity of antenna in a communication system.
- [20]
- Q. a) With neat sketches explain a cellular communication system.
 b) Perform radio communication with the help of a block diagram.

[20+20=40]



MODULE 1: Elementary Concepts of electric Circuits

Elementary concepts of DC electric circuits: basic circuit topologies including voltage, current, power, resistance, and inductance in series and parallel. Current and voltage Division rules; Dependent & independent voltage and current sources. Ohm law and Kirchhoff's laws; resistors, variable resistors in feedback mechanism; semi-conductor junctions and diode problems.

Analysis of DC electric circuits: Mesh current method; Node representation - Solution of mesh equations, Loop voltage methods; node representation solution of mesh equations by matrix methods. Numerical problems.

MODULE 2: Elementary Concepts of Magnetic circuits, Electromagnetic induction and AC Fundamentals

Magnetic Circuits: basic terminologies like flux, flux strength, flux density, reluctance - concept of linear, linear, and non-linear reluctances and mutual inductance coefficient of coupling.

Electromagnetic Induction: Faraday's law, problem, Lenz's law, self-induced and mutually induced EMF's, 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 Power factor of Inductors/Capacitors.

MODULE 3: AC Circuits

AC Circuits: Effect of combination of sinusoidal currents, impediment, Potentiometer, Voltmeter, Ammeter and ammeter form. Analysis of simple AC circuits: Parallel networks, Inductive & capacitive circuits, Resonance and capacitor load; concept of impedance, Average Power, Power factor; Analysis of RL, RC and RLC series combinations, maximum and minimum power. Numerical problems.

Three phase AC systems: Generation of three phase voltage; advantages of three phase systems, parallel AC connections (balanced and unbalanced), relation between line and phase voltages, line and phase currents. Numerical problems.

MODULE 4:

Introduction to Semiconductor Devices: Evolution of electronics - vacuum tubes to semi-conductors. Diodes, Capacitors and Insulators (conventional) Materials and required properties, Specifications, Standard values, rated rating, PN junction diode: Principle of operation, I-V characteristics, principle of zener diode breakdown. Optoelectronics Diodes: PIN and LED structures, Principle of operation, Relation between current gains in DI, IC, and OC, Input and output characteristics of common-emitter configuration.

MODULE 4

Basic electronic circuits and instrumentation: Oscilloscope and power supplies. Basic design discussion of a DC power supply, working of a full wave bridge rectifier, inductor filter (in analysis), working of single stage voltage regulator. Amplifiers: Block diagram of Pulse Ammeter system, Circuit diagram and working of common emitter (IC coupled) amplifier with its frequency response, Design of voltage divider biasing. Electronic measurement: Block diagram of an electronic measurement system.

MODULE 5

Introduction to Communication Systems: Radiation of communication systems - Telegraphy to FDDI. Basic communication: principle of AM & FM, Frequency bands used for various communication systems, Block diagram of super heterodyne receiver, Principle of antenna - relation from polarized charge. Mobile communication: basic principles of cellular communications, principle and block diagram of GPRS.

Text Books

1. D.C. Jaitly and V. Jagadish, "Basic Electrical Engineering", Tata McGraw Hill, 2002.
2. D.C. Gauravendra, "Basic Electrical Engineering", Tata McGraw Hill, 2002.
3. Chittaranjan, Aruneshwar Ray and Devesh Garg, "Basic Electronics - Principles and Applications", Cambridge University Press, 2003.
4. D.C. Jaitly and T.S. Jagadish, "Basic Electrical and Electronic Engineering", Oxford University Press, 2002.
5. Wayne Thomas and Neil Davies, A Textbook Of Basic Communication and Information Engineering, Pearson, 2001.

Reference Books

1. Dr. Tom W. "Electrical Engineering Fundamentals", Prentice-Hall.
2. T. S. Jagadish, D.C. Jaitly, "Basic Electrical Engineering", Oxford Higher Education.
3. Hayt & Kemmerly & Miller, "Engineering Circuit Analysis", Tata McGraw Hill.
4. Hayes, "Electrical and Electronic Technology", Pearson Education.
5. N. S. K. Karmarkar and Jayant Patel, "Basic Electronics Engineering", Pearson Education, United States.
6. Danen and Driscoll, "Principles of Electrical Engineering", CBS Publishers and Distributors.
7. S. R. Lal Mahadev and Neelkanth Deshpande, "Fundamentals of Electrical Engineering", Cambridge University Press.
8. Alvin Karpinski, "Principles and Applications of Analog and Mixed Electronics Circuits", Morgan Kaufmann Publishers, 1995.
9. Goran Gajic, "Basic Electronics", McGraw Hill.
10. A. Bhagat, "Principles of Communication Systems With Applications to Signal Processing in Electrical Communication", Tata McGraw Hill, 2nd edition.

CURRICULUM AND LECTURE SCHEDULE

No.	Topic	No. of Lectures
1	Elementary Concepts of Magnetic Circuits	
1.1	Elementary concepts of DC electric circuits Basic Terminology involving voltage, current, circuit, resistance, cell, Kirchhoff's laws and ohm's law; current and voltage division rules; capacitors & resistors (parallel and series). Compass and Hall Effect Measurements	3
1.2	Series circuit (resistor, capacitor and inductor) non-resonant problems.	1
1.3	Example of DC electric circuits (Kirchhoff's law and Ohm's law representation, solution of network equations) RC, RLC, RLCAC methods (with superposition theorem), solution of transient equations by various methods. Numerical Problems.	4
2	Elementary Concepts of Magnetic Circuits, Electromagnetic induction and AC Fundamentals	
2.1	Magnetic Circuits Basic Terminology (flux, flux density, reluctance, inductance, comparison between electric and magnetic circuits) Series and parallel magnetic circuits with composite methods, numerical problems.	3
2.2	Electromagnetic induction: Faraday's law, problems, and self- mutually induced and互感互感 induced voltages - self-inductance and mutual inductance, coefficient of coupling	3
2.3	Alternating Current Fundamentals: Generation of alternating voltage Representation of sinusoidal waveforms: frequency, period, Average, RMS values and form factor of waveform, Numerical Problems.	2
3	AC Circuits	

8.1	AC Single Phase representation of various quantities Harmo neric, Rectangular, Polar and complex form. Analysis of single AC circuit: AC voltage, Inductive & capacitive reactances and admittance, concept of impedance, phasor, power factor.	1
	Analysis of Δ , Y and π connected AC circuits and equivalent circuits.	1
	Simple numerical problems.	1
8.2	Three phase AC system: Character of three phase voltages, advantages of three phase systems, star and delta connections, balanced three phase between line and phase voltages, line and phase currents, numerical problems.	3
9	Introduction to semi-conductor devices	1
10	Diode as an electronic device - basic idea to new positions in conditional conduction path.	1
11	Transistor: Construction and working, types, applications. Transistor driven, collector biasing (DC, compensation), feedback.	2
12	PN junction diode, principle of operation, PN junction diode, principle of operation, applications	2
13	Silicon Junction Transistor: 100 and 1000 picoseconds, Principle of operation, relation between current gains in CE, CB and CC, input and output characteristics of common-emitter configuration.	3
14	Basic electronic circuits and their applications	1
15	Rectifiers and power supplies: Half wave, bridge conversion of a.c. power supply, Working of a full wave bridge rectifier, separator filter (ac analysis), working of Zener diode voltage regulator	3
16	Amplifiers: Block diagram of Fully-Biased system, circuit diagram and working of common emitter (DC coupled) amplifier with its frequency response, concept of voltage division biasing	4
17	Electronics instrumentation: Block diagram of an electronic instrumentation system	1
18	Introduction to Communication Systems	1
19	Evaluation of communication systems - Telegraphy to DS	2

8.C	Radio communication: principle of AM & DM, Frequency bands used for various communication systems, Block diagram of super heterodyne receiver. Principle of antenna - variation form antenna directivity	3
8.D	Mobile communication: basic principles of cellular communication, principle and block diagram of 2G.	2

Suggested Simulation Requirements for Basic Electronics Engineering

1. Plot V/I characteristics of Diode & Zener diode on a simulator
2. Plot input and Output characteristics of BT on a simulator
3. Implementation of logic sequence on full logic module
4. Simulation of DC coupled amplifier with sine wave supplied
5. Generation of audio signal

Note: The simulations can be done on commercially available softwares like Multisim or similar software to enhance the understanding.



SL.	TEACHING LEARNING ACTIVITIES	CATEGORY	I	F	P	CREDIT
			ONE	2	3	-

Principle: Oral, print, and electronic communication has become a vital tool not only in today's information-rich world given its fast-paced and complex dynamics, are acting professional career but major the key elements of such communication. The objective of this course is to make students with the necessary skills to listen, read, write, and speak at an intermediate and successfully serve any job, technical or otherwise, as well as give them the necessary public relations knowledge and skills.

Pre-requisite None

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

EO1	Create visual and language communication engineering as a profession
EO2	Create, design and effectively communicate a variety of visual content
EO3	Create effective technical presentations
EO4	Create a group-centered presentation logic in a group setting, and strive for general audience interests
EO5	Identify obstacles in listening process and apply listening techniques to overcome
EO6	Create professional and positive documents that are clear and adhering to all the communication conventions

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EO1									3	3	3	
EO2									2	2	2	
EO3									3	3		
EO4									3	3		
EO5									2	2		
EO6	1				2				2	2		

Mark distribution

Test Items	Cr	Mr	Total Marks
Sum	20	20	40

Continuous Integrated Production

Total credits: 50

Attendance:

20 marks

Project assignment:

20 marks

Before the date time and day, students should submit a final estimate for classroom and field studies. This will be considered for 20 marks and reduced to 20.

Teacher assessment

Project report submission and Technical presentation through PPT: 7.5 marks

Learning Task:

2 marks

Group discussion/field trip mission:

7.5 marks

Summative evaluation:

8 marks

Final Semester Examination

Total Marks: 50, Time: 3 hrs.

Course level Assessment Questions

Course Outcome 1 (CO1)

1. List down the ways in which accounts affect local communities.
 - a) institution and meanings
 - ethnography promotion
 - genealogy referring to whole
 - relatives no other
 - discipline generic
2. Explain the following Compound nouns (a) 'Vedic music' & 'Dham mayagan' & 'Sharm Jukun'.
 - a) Given the passage below and prepare notes.

Course Outcome 2 (CO2)

1. Given the passage below and prepare notes.

Mathematics, rightly viewed, possesses not only truth, but supreme beauty—the beauty of solid and austere, the kind of excellence without which is not only of our mortal nature, without the surpassing happiness of knowing an object, yet uniformly true, and capable of a clear definition such as only the greatest art can give. (The Life and Work of Frege)
 The method of inquiry, the sense of being more than mere, what is the substance of the English word more, which is found in mathematics as surely as in poetry, what is less in mathematics deserves not memory to be stored in a head, but is to be assimilated as a part of life, thoughts, and thoughts again and again before the mind with each constant encouragement. And this is to meet men, a long association, a continual comprehension between the idea and the possible. But the world of ours vision knows no substance, no greater freedom, no better is the tragic and the comical—presented often to his audience for admiration after the world from which all good men sprung. Nature, from her essence, herself gives them the useful laws of nature, she generates them gradually created an artful series, where were thought can discern in it natural forms, and where are, at least, of our mortal measure, in measure, from the sheer results of the actual world.

Dr. P. T. Bhagat, Sanskrit mathematician arrived at a conclusion that everything in their work has had the analysis carried out much owing to mathematical methods, which gave birth their analysis

beliefs has been modified by an educational belief, but much else has been added by other means of what was being. The characteristic condition of mathematics is one in which there are two distinct levels of logic: one of logic as mathematics, where most of measures are in mathematics; and in the more basic level, a chain of argument is presented in which every link is relevant to our actions, in which there is an art of logic and logic itself, and the practice of logic must then itself have been thought possible. In much of what passes natural and human, however, embodies what is general in concrete circumstances, whose universal significance arises through their individual traits, but mathematical understanding is present, whatever is said general in its purity, in its very measured清楚ness.

How should the teaching of mathematics be conducted so as to contribute to the highest as much as possible of the high ideal? Here we cannot need, in a great measure, be any guide, but some means may result from our consideration of the ultimate purpose to be achieved.

- From "On the teaching of mathematics" - Bertrand Russell
- 2. Illustrate the advantages and disadvantages of speed reading. Discuss how it can improve comprehension.

Course Outcome 1 (2020):

1. What are the key elements of a successful presentation?
2. Illustrate the importance of non-verbal communication in making a presentation
3. Discuss the various types of technical presentation.

Course Outcome 2 (2020):

1. Discuss 'In today's world, being a good listener is more important than being a good speaker.'
2. Listen to a video file given situation on a particular topic, and present a brief summary of the proceedings.
3. Listen to a seminar lecture in a group discussion.

Course Outcome 3 (2020):

1. Listen & record & write the subtitles for the dialogue.
2. Listen to you mentor by number of effective listening' (one response suitable each of three).
3. What are the different types of interview? How are listening skills particularly important in effective telephone interview?

Course Outcome 4 (2020):

1. Explain the basic structure of a research report.
2. You have been offered an internship in a multi-national software company, and are now offered about 6 months. The director will give you tasks. He has a case in the program "University Relations" of the company asking them if they can change the details associated with your institution.
3. You work in a well-known academic journal at the name "University Relations". You are in charge of editing manuscripts. A student has sent you a letter requesting you to change the classification of his paper to less difficult areas than social. But there are no resources available during the period he has requested for. Optimize an email informing him of the arrangements he has to arrange the matter with his college.

Skills

Module 1

use of language in communication. Significance of technical communication. Vocabulary Development: learned vocabulary, vocabulary used in formal situations and reports, common words, irregular words, compound words, finding suitable synonym, paraphrasing, word analogies. Language Development: subject verb agreement, pastoral passive voice, numerical adjectives, numbered sentences, clauses, conditionals, reported speech, semi-participative voice.

Technology-based communication: Electronic mail messages, video presentations, writing skills using different software, research and study skills, search engines, resources, forums such as Go4U, Brain Exchange, Job Opportunities (USA), LinkedIn, MySkills, LinkedIn, Pigeonhole.

Module 2

Reading, Comprehension, and Summarizing: Reading verbal, visual, written, oral; reading, reading and comprehending short and longer technical texts from journals, newspapers, identifying the various transitions in a text. DICT modules: P002: reading, speed reading, Comprehension, difficulties, understanding subtexts, reading and summarizing, summarizing given notes.

Module 3

Oral presentation: Oral presentation, note drafting & protocol, Presentation skills, Oral communication and public speaking skills, audience orientation, Presentation regarding the material, self-introduction, introducing the topic, answering questions, individual communication practice, communicating effectively.

Discussions and Group Discussions: Introduction to Group Discussion (GD), differences between GD and discussions, articulating GD, understanding GD, understanding the tasks, questioning and clarifying, GD analogies, activities to improve GD skills.

Module 4

Learning and Instruction Skills: Learning: Active and Passive learning, Learning for general content, vs AG up information, intensive learning for specific information, vs analysis, and vs understanding. Developing effective learning skills, barriers to effective learning, Learning as higher mental skills, learning in classroom lectures, role of e-learning technologies, learning in environments and using tools, TBL skills.

Interview skills: types of interviews, successful interviewers, Interview protocols, basic Q&A, job interview, telephone interview, blind interview, cross-cultural interview & panel interview, MCQ related to job interview.

Module 3

Focus: writing technical writing, differences between technical and literary writing, types of writing formats, informal and semi-formal, job applications, Minima presentation, CV presentation (Professional Summary Statement, Objectives, and Reasons), Elements of style, Common Errors in Writing, Describing a process, use of sequence words, Statements of Purpose, Instructions, Checklists.

Definition and Improvement Theory and Report Writing: basic of report writing, Referencing Style (APA format), structure of a report, types of reports, references, bibliography.

Task Definitions

Written Communication: CV writing, Presenting & reading and Minima Preparation - Professional Writing

Reading: Professional writing, Technical Readability Standard, Reading, Doctoral work, Academic documents, qualities of a good practitioner writing skills in both language and use of visual aids.

Listening: Discourse based on audio materials via radio and processes according to Long, Prentiss and Lantolf.

Reading: Survey Reading, Reading with analysis of multi-visual flow, Reading Comprehension Skills, Mock interview and Debate/Group Discussion, comments, focus, critical and creative reading methods.

Reference Books

1. Dugay et al., *Organisational Communication*, Cambridge University Press, Cambridge 2001.
2. Michaela Ferber und Daniela Schrems "Technical Communication: Processes and Practice", 2nd Edition, De Gruyter Verlag Berlin, 2013.
3. Stephan D. Green, "The Art of Graphic Design", 4th Edition, John Wiley & Sons, 2002.
4. Stephan D. Green, "The Art of Graphic Design", 4th Edition, John Wiley & Sons, 2002.
5. Michael Ferber, Daniela Schrems, "Technical Communication", 2nd Edition, De Gruyter, 2013.
6. William Gaskin, *UX: The Elements of Style*, 2nd Edition, Pearson, 2008.
7. William Gaskin, *UX: The Elements of Style*, 2nd Edition, Pearson, 2008.
8. William F. Breyfogle, *Process Improvement Methods*, W.H. Freeman & Company, San Francisco, 2000.
9. William F. Breyfogle, *Process Improvement Methods*, W.H. Freeman & Company, San Francisco, 2000.
10. William F. Breyfogle, *Process Improvement Methods*, W.H. Freeman & Company, San Francisco, 2000.
11. William F. Breyfogle, "Process Improvement Methods", 2nd Edition, Pearson, 2014.
12. William F. Breyfogle, "Process Improvement Methods", 2nd Edition, Pearson, 2014.

ID 002	PROGRAMMING	CREDITPOINT	L	T	P	CREDIT	YEAR OF IMPLEMENTATION
			06	2	0		

In particular, the syllabus is concerned with the task of preparing the students to become capable of writing Haskell C programs to solve computational problems that they may have to solve in their professional life. The course content is divided in four the essential components: Fundamentals which can be taught within the first week of the curriculum. This course has got 2 Points per week for continuing programming in C. After solving 24 mandatory programming problems given at the site. The instructor is supposed to give homework assignments to write the total programs in the rough notes as and when the required theory part is covered in the class. The students are expected to write programs with the rough notes program undertaken in the rough notes for the last classes.

Prerequisites:

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

001	write a simple working program and discuss the same in front of the instructor.
002	Devise, resolve & C programs with branching and looping statements, while using functions, loops, functions, arithmetic operators.
003	Devise, resolve & C programs with arrays, structures or union for solving the tasks in the assignments.
004	Solve a given computational problem into a number of modules utilising a modular architecture. A chapter for using modules if required, to find the solution to the computational problem.
005	Write Haskell C programs which are suited for memory managing and concurrent processing.
006	criticise Haskell C programs written by the students for solving the computational tasks.
Assessments - Capability of a student must be following	
1. Able to code in C/C++	
2. Able to code in Haskell C for modular and functional	
3. Able to code in C/C++ for concurrent processing	
4. Express communication protocol in Haskell C	

Mapping of course outcomes with program outcomes

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12
C01	⊕	⊕	⊕	⊕		⊕			⊕	⊕	⊕	⊕
C02	⊕	⊕	⊕	⊕	⊕			⊕			⊕	
C03	⊕	⊕	⊕	⊕	⊕				⊕		⊕	
C04	⊕	⊕	⊕	⊕	⊕				⊕	⊕	⊕	
C05	⊕	⊕			⊕				⊕		⊕	
C06	⊕	⊕			⊕				⊕		⊕	

Assessment matrix

Sivier's Category	Continuous Assessment Tasks		End Semester Continuous Criteria
	Task 1 Practical	Task 2 Theoretical	
Remember	12	12	22
Understand	12	18	24
Apply	12	12	24
Analyse	6	6	12
Evaluate			
Create			

mark distribution

Total Marks	C1:		Discussion
	Written	Written	
100	50	50	8 hours

Continuous Internal Evaluation Test Items

Attendance	20 marks
Continuous Assessment Test 1 (Term 1), Test 2 (Term 2)	20 marks
Continuous Assessment Test 2 (Term 3, annual examination, Test 3)	20 marks

Internal Examination Test Items: These will be two parts, Term 1 and Term 2. Term 1 contains 3 questions with 2 questions from each module (22 modules = 2 × 11), having 2 marks for each question. Students should answer all questions. Term 2 also contains 3 questions with 2 questions from each module (22 modules = 2 × 11), of which a student should answer any one. The questions should not have sub-questions and each one carries 2 marks.

Final Semester Examination Test Items: There will be two parts, Term 3 and Term 4. Term 3 contains 10 questions with 2 questions from each module, having 2 marks for each question. Students should answer all questions. Term 4 contains 2 questions from each module of which a student should answer either 1 or 2. Each question can have maximum sub-questions and carry 2 marks.

Sample Course and Assessment Questions

Course Outcome 1 (CO1): Write an algorithm to check whether a range of 2 natural numbers is prime or not. Also, draw a flowchart for solving the same problem.

Course Outcome 2 (CO2): Write a program to read C program to process a set of natural numbers and to find the largest even number and smallest odd number from the given set of numbers. The program should not use division and modulus operators.

Course Outcome 3 (CO3): Write C program to read C program to process data obtained from students of a class and compute their overall percentage of the marks obtained. There are 3 subjects for which exam results are conducted and the third subject is an elective where a student is allowed to skip any one of the three courses offered.

Course Outcome 4 (CO4): Write an easy to read C program to find the value of a mathematical function $f(x)$ is defined as follows: $f(0) = 0$, $f(n) = \text{sum of factors of } n$, if n is not prime and $f(n) = n$, if n is prime.

Course Outcome 5 (CO5): Write an easy to read C program to read a set of n integers and to find the number of unique numbers and the number of repeated numbers in the given set of numbers. Use a function which takes an integer array of n elements, sorts the array using the Bubble Sorting Technique and returns the number of unique numbers and the number of repeated numbers in the given array.

Course Outcome 6 (CO6): Write an easy to read C program to compute a text file and to sort the alphanumeric words in the output file.

Name: _____

Regd. No. _____

**MR. ABDUL REHMAN TECHNOLOGIES UNIVERSITY MYSORE DEPARTMENT OF BACHELOR OF SCIENCE EXAMINATION
MARCH & APRIL**

Course Code: MPT14C

Course Name: Programming in C (Common to all programs)

Max Marks: 100

Duration: 3 hours

PART A

Answer all Questions. Each question carries 2 Marks.

1. Define pointer, its properties and memory in a computer.
2. What are the different between compiled and interpreted languages? Give example for both.
3. Write a C program to read a decimal number through keyboard and to display the reverse of the given number, for example, If "34567" is given as input, the output will show is "76543".
4. Explain about the scope of variables in a program (local and global).
5. Explain the different ways in which you can declare & initialize a single dimensional array.
6. Write a program to read a string through keyboard and to display the count of vowels present in the given sentence.
7. What are the advantages of using functions in a program?
8. Write a simple command program, with main and function of variables in it.
9. Write a function in C which takes the address of a single dimensional array (including a few sequences of numbers) and the number of numbers stored in the array as arguments and places the numbers in the same array in reverse order. Use pointers to access the elements of the array.
10. With an example, explain the different modes of opening a file. (100x3=30)

Part B

Answer any one Question from each module. Each question carries 10 Marks.

11. (a) Given a flow chart to find the position of an element in a given sequence. Using linear searching technique. With an example explain how the Bisection finds the position of a given element. (30)
(b) Write a pseudo code for recording the flowchart for linear searching. (30)

12. (a) With the help of a flowchart, explain the bubble sort algorithm. (Illustrate with an example). (iii) Write an algorithm representing the flowchart for bubble sort. (ii)
13. (a) Write a program in visual basic which takes a string as input and displays whether the given string is in uppercase or lowercase. (ii)
(b) Explain how one can use the built-in function `isalpha` to get the code values of different characters. Also, explain, using examples how one can use the `islower` function in C without any formality. (ii)
- (29)
14. (a) Write a program in C which accepts a 2-dimensional array forming a matrix of numbers and the order of the matrix (number of rows and columns) as arguments and displays the sum of the elements stored in each row. (ii)
(b) Write a program to check whether a given matrix is a diagonal matrix. (ii)
- (29)
15. (a) Without using any built-in sorting procedure, write a program which will sort a group of names in alphabetical order.
(b) Write a C program to perform bubble sort. (ii)
16. (a) Write a function named `myFactorial` that finds the factorial of a given number. (i)
Write a function in C named `myGCD` which accepts two positive integer parameters, `m` and `n` and returns the value of their greatest common divisor. (ii) (b) The function `GCD` is implemented make use of the recursive function `myFactorial`. (ii)
(c) Write a recursive C function example. (ii)
- (29)
17. (a) With a suitable example, explain the difference between a structure and a union in C. (ii)
(b) Consider a structure named `student` representing the details of a student, having `name`, `rollNo`, `class` of a student. Then, write a program in C to find the average mark obtained by the students in a class for the subject Programming in C (using the `float mark[50];`). (ii) (c) Write a program to store the required data. (ii)
18. (a) With a suitable example, explain the concept of pointer reference. (ii)
(b) With a suitable example, explain how pointers are used in changing the contents of a single, dimensionally, array present as an argument to a function in C. (ii)
- (29)
19. (a) Define function overloading. (ii) (b) State its advantages. (ii)

(a) Using the prototypes explain the functionality provided by the following structures. (10 marks)

i. Stack

ii. Set

iii. Queue

iv. Doubly linked list

(10x4=40)

MODULES

Programming in C (Kotlin) as Disciplined

Module 1

Basics of Computer hardware and software

Basics of computer Architecture, processor, memory, word, byte address

Execution of program, Assembly language, compilers, interpreters, high level and low level languages
translation as structural approach to programming. Flow chart, Pseudocode, Pseudo code, Structured flowchart, Heuristic and pseudocode

Module 2

Program Basics

Data structure of C programs: Characters and Tokens, Identifiers in C, Variables and Data Types, Constants, Comments in C, Operators, print statement

Operations and Expressions: Expressions and Intrinsic Operators, Relational and Logical Operators, Conditional operator, use of operators, Assignment operators, and Arithmetic Operators, Operator precedence

Control flow statements: if statements, nested branches, unconditional branching, else and statements, while loop, do while loop, for loop, break and continue statements, Simple programs containing control flow

Module 3

Pointers and strings

Pointers Declaration and initialisation, 1 Dimensional Array, 2 Dimensional Array

String processing: – Built in String handling Functions (strlen, strcpy, strcat and strcmp), user defined functions, Linear search program, Bubble sort program, simple programs containing arrays and strings

Module 4

Working with functions

Introduction to modular programming, writing functions, formal parameters, actual parameters, Pass by Value, Recursive, Anonymous Function, Declaration structure, user, Storage Classes, Scope and lifetime of variables, simple programs using functions

Module 2

Prerequisites

Basics of Python, including syntax, accessing data through variables, basic string manipulation using print(), os module reference, etc.

No prerequisites from other modules.

Required access and reading material: This module includes readings from the textbook (Module 2), staff, faculty, research, and academic papers/policies and links.

Text Books

1. Software Design, 2nd Ed., Philip Wadler (Ed.), Programming with C
2. R. Baget Bozzo, "High-level Programming in C/C++"
3. John R. Vandevoorde, "Practical Programming in C"
4. Arne Grim, "Design Computer Components"

Reference Books

1. Arne Grim and Guy Lohig, "System Design Fundamentals and Programming in C"
2. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language"
3. Haraldson & Finn, "Computer Basics and Programming in C"
4. Technical P. Koenig, IBM Publications, yes.ca

Course Contents and lecture Schedule

Module 2: Basics of Computer Hardware and Software		(18 hours)
2.1	Basics of Computer Architecture: Processor, Memory, Input/Output devices	2 hours
2.2	Application Software & System software: compilers, interpreters, high level and low level programming, etc.	2 hours
2.3	Introduction to structured approach to programming: flowchart	2 hours
2.4	Algorithms, Pseudo code, Structure chart, Flow chart - algorithms and pseudocode	2 hours
Module 2: Lecture notes		18 hours
2.5	Basic structure of C program: Characteristics, tokens, comments in C, variables and Data Types, Constants, Preprocessor Directives, preprocessor	2 hours
2.6	Operations and Expressions: Operators and Arithmetic Expressions, Relational and Logical Expressions, Conditional operator, else operator, Assignment operators and Bitwise Operators: Condition Processing	2 hours

	Object-Model Statement: If statements, switch statements, unconditional branching using goto statement, While loop, Do-While loop, For loop, break, others and continue loops, push and pop stack operations involving pointers and float	
	Module 3: Arrays and strings	[8 hours]
3.1	Array initialisation and visualisation, 1-dimensional Array, 2-dimensional Array	2 hours
3.2	String processing: m-Sub string handling functions, strlen, strcpy and strncat, auto, static	2 hours
3.3	User defined programs, bubbles sort program, array, swap and searching arrays and strings	2 hours
	Module 4: Structuring with functions	[8 hours]
4.1	Introduction to module programming, writing functions, formal parameters, actual parameters	2 hours
4.2	Data by value, Data by reference, Unqualified Function Definition	2 hours
4.3	functions, return, integer, character and the role of variable, user-defined programs using functions	2 hours
	Module 5: Pointers and files	[8 hours]
5.1	Basis of pointer, working pointers, passing data through pointers, how programs can access using pointers, pass by reference option	2 hours
5.2	File Operations: open, read, read, write, seek	2 hours
5.3	Sequential access and random access to file, Inbuilt file handling functions (read(), read(), falloc(), falloc(), falloc(),), seeking, reposition, reading pointers and file	2 hours

Credit Allocation and practical work of EEE 102, Programming in C

Assessment Method: The credit allocation segment for the Programming lab should be done internally by the college. The assessment shall be made on 40 marks and the mark is divided as follows:
 Practical Assessments - 20 marks (internal by the college), Regular assignments - 8 marks (internal by the college), Final Practical Exam - 12 marks (internal by the college).

The mark obtained out of 40 will be converted into equivalent proportion out of 36 for credit allocation.

LIST OF LAB REQUIREMENTS

1. Initialization of members/variables of a class.
2. Initialization of class variables in constructor of child class.
3. Initialization of constants and accessing it.
 - i) static "hole word".
 - ii) Read characters, add them and display character.
 - iii) Read the value of a circle, calculate its area and display.
 - iv) Calculate arithmetic expression ($a - b / c * d + e + f$) and display the calculated value of the variables from the user through console.
4. Read 5 integer values and find the largest among them.
5. Take a Decimal Number and check whether the number is prime or not.
6. Read a Decimal Number and check whether the number is Armstrong number.
7. Read n integers, store them in an array and find their sum and average.
8. Given = integers, store them in an array and search for an element in the array using an algorithm. Use Linear Search.
9. Read n integers, store them in an array and print the elements in the array using bubble sort algorithm.
10. Read a string from console in an array and check whether it is a Palindrome word or not.
11. Read two strings from user, compare with a if symbol, sort them in reverse and concatenate them without using library function.
12. Read existing (having with 3 variable), store it in an array and count the number of words, consonants and vowels in it.
13. Read two input each representing the distance between two points in the Euclidean space, place these in separate variables and find the distance square.
14. Using structure, read and print data of an employee [Name, Profession and Salary].
15. Define a class containing 5 using variables (Name, house Name, ID, Name, Date and Profession) make code longer in C/C++ (use defines concept). Then, read and display the address of a person using a pointer of the class.
16. Use the formula of regular hexagonal numbers to generate and print hexagonal numbers.
17. Read a string word, convert it in array and reverse its reverse by using user-defined function.
18. Write a menu driven program for performing matrix addition, multiplication and finding the transpose. Use functions to (i) create matrix, (ii) find the sum of two matrices, (iii) perform product of two matrices, (iv) find the transpose of a matrix and (v) display a matrix.
19. Do the following using pointers.
 - i) add two numbers.
 - ii) swap two numbers using user defined function.
20. Initialize Multiple elements of an array using pointers.
21. Compute sum of the elements stored in an array using pointers and user defined function.
22. Create a file and perform the following.
 - i) Write data to file.
 - ii) Read the data in a given file & display the file contents on screen.
 - iii) Append new data and display on screen.
23. Open a text injury file and record number of characters, creates one file in it, and save the results in an output file.

ID: 129	Engineering Materials	CATEGORY	L	T	P	CREDIT	DATE OF INTRODUCTION
			100	1	0	1	

Aim: the aim of this course is to make the students gain practical knowledge in connection with the theoretical studies and to develop practical applications of engineering materials and use the principles in this light how to implement the modern technology.

Prerequisite: Higher secondary level Physics.

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

PO1	Observe and recall from material culture important parametric inputs for implementation of engineering materials
PO2	Understand the need for present measurement practices for base learning
PO3	understand the synthesis, analysis, working and evaluations of various techniques and conversion of materials into desired attributes
PO4	analyze the structures and ability associated with various materials based upon economy and processes
PO5	develop basic communication skills through working in teams in performing the lectures, assignments and implementing the module

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EO1	1				1		1	1			1	
EO2	1				1		1	1			1	
EO3	1			1			1	1			1	
EO4	1			1			1	1			1	
EO5	1			1			1	1			1	

Mark distribution

Total Marks	CG		SG Requirement
	Marks	Weight	
100	60	1	100%

Demonstrations/Practical Patterns:

Waves	10 minutes
Electrostatics	10 minutes
Thermal conduction (through a wall)	10 minutes

End Semester Examination Between Under Graduate Semester of one year

QUESTION

(SET OF EXPERIMENTS)

Set of experiments should be completed

1. DCO-Measurement of frequency and wavelength of wave form.
2. Measurement of strain using strain gauge and ultrasonic bridge.
3. LCR Bridge-Demand and supply harmonic oscillations.
4. ABS/Calorimeter-Measurement of Temperature in the bath water and long water rods.
5. Wavelength measurement of a monochromatic source of light using Newton's Ring method.
6. Determination of diameter of a thin wire or thickness of a thin coil of paper using air gauge method.
7. To measure the wavelength using a millimetre scale as a grating.
8. Measurements of wavelength of source of light using grating.
9. Determination of dispersion power and refracting power of a glass by normal grating.
10. Determination of the particle size of barium sulphate powder.
11. Determination of the wavelength of Hg-violet light by standard KBr ultra filter from 2000.
12. Calculate the numerical aperture and cause the losses that occur in optical fibers.
13. H characteristics of solar cell.
14. ICL Characteristics.
15. Uv-Vis spectrometer-Measuring band velocity measurements of absorption maxima in a liquid.
16. Deflection magnetooptical elements of a magnetic field A position.

Reference Books

1. S. L. Gupta and D. K. Kumar, "Practical Physics with Visa-vista", Prentice Hall India Publishers, Revised Edition, 2008.
2. M. N. Josephson, J. L. Jain and V. L. K. J., "Experiments in Engineering Physics", A. Chandrasekhar, 2008.
3. K. K. Raja, "Engineering optics in practice", McGraw-Hill Education Pvt. Ltd., 2012.
4. P. K. Pathaner "Practical Physics", PHI Ltd., 2002.

CR. 129	BIO-ASSAY/CHARTERHOUSE	CREDIT 302	CREDIT			
			1	2	3	4

possible to gain scientific approach and to familiarise with the commonalities and differences for research process in higher education.

Preliminary Experiments in chemistry involves analysis plus two levels in analysis.

Course outcomes: After the completion of the course the students will be able to

CO1	Understand and practice different techniques of quantitative chemical analysis to gain hands-on practical skills and apply those skills to various analyses
CO2	Develop skills required to separate organic substances and acquire the practical skill to use TLC for the identification of drugs
CO3	Develop the ability to understand and explain the use of modern spectroscopic techniques for analysing and interpreting the IR spectra and NMR spectra of some organic compounds
CO4	Acquire the ability to understand, explain and use instrumental techniques for chemical analysis
CO5	Learn to design and carry out scientific experiments as well as accurately record and analyse the results of such experiments
CO6	Function as a member of a team, communicate effectively and engage in further learning. Also, understand how chemicals address social, economic and environmental problems and why it is an integral part of curriculum

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2				2							2
CO2	2				2							2
CO3	2				2							2
CO4	2				2							2
CO5	2				2							2
CO6	2				2							2
CO7	2				2							2
CO8	2				2							2

Mark distribution

Total marks	Oral marks	Written marks	Duration/intervall
200	200	-	2 hour

Continuous Internal Evaluation Pattern:

Attendance	20 marks
Discipline/Adherence/Neatness	10 marks
Total Internal Assessment (Experiments) by college	20 marks
Total Semester Total mark on basis of primary objective (out of 100)	100 marks

RESULTS

LIST OF EXPERIMENTS (ASSESSMENT AND CREDITS)

1. Determination of total hardness of water (EDTA method)
2. Determination of copper.
3. Determination of oil content and colourimetric estimation.
4. Estimation of pH meter and determination of pH of a solution.
5. Estimation of chlorine in water.
6. Determination of titration of NaOH with HCl.
7. Determination of wavelength of absorption maximum and determine concentration of Cr^{+3} in solution.
8. Determination of molar absorptivity of a compound (KIO_3 , or any other soluble lead salt).
9. Preparation of polymer gel (Crosslinked polyacrylate) (A) Polymer formation and (B) Polymer formation rate.
10. Estimation of iron in ore.
11. Estimation of copper in brass.
12. Estimation of dissolved oxygen by Winkler's method.
13. (A) Analysis of Ozone (minimum 2 experiments), (B) Analysis of NO_2 (minimum 2 experiments).
14. Color photometric estimation of Cu^{+2} in first two trials only in same.
15. Determination of molar absorptivity of a organic sol.
16. Determination of concentration of a organic sol.

Reference Books

1. D. Gupta & Bhawna, "Topics in Qualitative Inorganic Analysis", Pearson, 2012.
2. R. K. Mukherjee, "Engineering Chemistry Lab Manual", TMH Learning, 2017.
3. V. Venkatesh, "Engineering Chemistry Lab Manual", Oxy publications, 2020.
4. Shanti, "Engineering Chemistry Lab Manual", Oxy Publications, 2010.
5. Rev. D. Ganguly, "Engineering Chemistry Lab Manual", Dr. Ganguly Publishers, 2012.
6. James P. Oberg, Don Lohr, Jeff, "Text Manual of Engineering Chemistry", L. Dhanpati, Company Pvt. Ltd., New Delhi, 2018.

Ref. 230	Skills required WORKSHOP	Description	L	T	P	Octave	YEAR OF IMPLEMENTATION
			0	0	0	3	2008

Possible: This course is designed to train the students to identify and manage the tools, materials and methods required to produce an engineering product. Students will be introduced to a team working environment where they develop the necessary skills for planning, organising and managing an engineering project.

To enable the student to fabricate various tools, measuring tools, fixtures and fixtures methods of manufacturing processes employed in industry for manufacturing components.

Prerequisites:

Course Outcome: Upon the completion of the course the students will be able to:

Course Outcome	Course Outcome Description
CO 1	Identify various tools and tools used for civil engineering measurements
CO 2	Explain the use of various tools and tools used for mechanical tool measurements
CO 3	Demonstrate the steps involved in basic building engineering activities like general measurements, setting out operations, calculating the material profiles like, plumbing and understanding simple construction tools
CO 4	Choose materials and methods required for basic civil engineering activities like field measurements, plumbing, leveling and surveying
CO 5	Compare different techniques and devices used in civil engineering measurements
CO 6	Identify basic mechanical workshop conditions in accordance with the national and state norms
CO 7	Identify common Tools and instruments with respect to the mechanical workshop
CO 8	Identify common safety measures with respect to the mechanical workshop tools

Mapping of course outcomes with learning outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2				2	2		2	2	2		
CO 2	2			2	2	2		2	2	2		2
CO 3	2		2	2	2	2		2	2	2	2	
CO 4	2	2	2	2	2	2		2	2	2	2	2
CO 5	2	2	2	2	2	2		2	2	2	2	2
CO 6	2							2	2	2		

EO 1	2							
EO 3	2							

Mark Distribution

Total Marks	CB	CE	CE Revision
100	50	50	Year

Assessment Procedure: Total time allocated for the course is 200 hours, of which is conducted for 120 hours and 80 for 20 marks. EO3 should be done for the mark allocated by the students and also the time taken for the work done in each practical session. EO2 will be evaluated by written examination of one hour duration conducted internally by the Institute.

Continuous Internal Evaluation Pattern:

Attendance	20 marks
Class work/ assignments/ quizzes	40 marks
Mid semester examination (externally by college)	20 marks

Final Semester Examination Pattern: Written Objective Examination of one hour

Objectives

PART I

LEVEL ACHIEVEMENT

- Scenario 1:** Calculate the area of a building space and a small garden of land. Use standard measuring tools and stated dimensions. Measuring devices
- Scenario 2:** (a) Use vernier caliper and mm scale to measure the diameter of a metal rod and thickness of a feather
 (b) Measure the total floor area of a room by a meter board
 (c) Draw a section view of a building from a given plan and measuring tape
- Scenario 3:** Give three levels differences between any four points using plumb line
- Scenario 4:** (a) Construct a $1\frac{1}{2}$ min. watch out of 20 cm height and 20 cm length using English tools. Using this tool to assess the fit of watch
 (b) Determine the number of different tools required to fit the components of a wall

- Outcome 6:** (a) introduce discussions regarding tools, different types of tools, type of connections, tools, values, forums and sentence fitting.
 (b) recall a small sentence regarding installation of the cables.

Reference Books:

1. Ghosh P.D, "Indian Practical Civil Engineering Handbook", Jaypee Publications.
2. Shukla S, "Surveying and levelling (Volume 2)", L.C. International Publishing House.
3. Airey GJ and Simpe EJ, "Building Construction", Chapman Hall Publications.
4. R.C. Bhargava, "Engineering Materials", Charotra Publishing house.

PART 3

Mechanical workshop

UNIT 01:

UNIT 01 - Introduction and Preparation Unit 01 & medium

UNIT 1- General : Introduction to working tools, tools available at the site, tool classification.

Study of mechanical tools, components and their applications in: Tools used during operations, like key, cutting pliers etc and accessories [X], storage, tools, O-rings, wrenches, hammers.

UNIT 2- Objective : Understanding of common tools

Minimum one week

1. T-Hex joint 2. Cross lag joint 3. Channel joint 4. Flanges joints

UNIT 3- Foundry : Understanding of foundry tools

Minimum one week

1. Casting holding 2. Core holding 3. Core making 4. Pattern making

UNIT 4- Sheet metal : Understanding of sheet metal working tools

Minimum one week

1. Circular shear

2. Sheet shear

3. Wire cut shears 4. Hole punch tool

UNIT 5- Metal : Understanding of tools used for fixing

Minimum one week

1. Drill and driver

2. Hammers

3. Hand and power driving

UNIT 6- Plumbing : Understanding of plumbing tools, equipment

With orientation on points of concern relating to minimum thickness of sections

UNIT 7- Safety : Understanding of tools used for safety

Demonstrating the fragility of different materials (H.C., C, Alucore and steel) in cold and hot states.

Discussing the qualities of different materials in terms of their suitability

Minimum and maximum sizes

1. Squat stem
2. Tapered pedestal
3. Tapered stem
4. Dished stem

UNIT 10 - Making: Understanding of making operations

Minimum and maximum working position

Making joints using screws per working base template is horizontal, vertical and cross head positions

UNIT 11 - Assembly (Interpretation only)

Describing and understanding of:

1. Components and part assembly
2. Self-assembly
3. Tools
4. Manufacturing methods

UNIT 12 - Technical comprehension and application of the following machines

Shaving and Reaming machine, Milling machine, Drilling machine, Mill, Drilling machine.

UNIT 13 - Modern manufacturing machines: Power tools, CNC machine tools, 3D printing, Glass cutting

Course Content and Lecture Schedule

No	Topic	No of lectures
INTRODUCTION		
1.0	Workshop practice, shop floor procedures, codes and rules and knowledge.	1
Components		
2.0	Analysis of material costs, conventions and their applications (i) Trivis, wave plates, spacers, filter bars, cutting plots etc and accessories (ii) bearings, seals O-rings, gaskets, keys etc.	1
Operations		
3.0	Understanding of assembly tasks and making minimum and major	1

	KNOWLEDGE	
9.1	Understanding of machinery tools and making minimum one model	1
	SUPERVISION	
10.1	Understanding of environmental working tools and making minimum one model	1
	MENTOR	
11.1	Understanding of three subject and making minimum one model	1
	PLANNING	
12.1	Understanding of job tasks are planning task and making minimum one model	1
	WORKER	
13.1	Understanding of quality, toolkits making minimum one model	1
	QUALITY	
14.1	Understanding of working equipments and making minimum one model	1
	SKILL	
15.1	Demonstration of assembly and dismantling of multiple parts	1
	ASSEMBLY	
16.1	Demonstration of various methods	1
	METHODS	
17.1	Maintain workshop clean and hygienic	1
	MAINTENANCE	
18.1	Demonstration of some tools, civic health tools, cleaning, Disinfecting	1
	DISINFECTING	

EEU.230	EDUCACIÓN EN ESTRUCTURAS Y MATERIALES	CATEGORÍA	I	II	EMERG.	TRABAJO INTERDISCIPLINARIO
		REC	2	2	2	200

Prerrequisito: General Electricity or knowledge to support skills to plan and carry out energy demand saving. It is essential for the practicing engineer to identify the basic practices and safety measures in electrical saving.

Prerequisites (ECE)

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

22.1	Determine safety measures against electric shock.
22.2	Identify the tools used for electrical saving, electrical assessments, wiring, safety, resources and certified methods.
22.3	Develop the connection diagram, identify the safety measures and resources necessary for using electric lighting circuitry for domestic buildings.
22.4	Identify and calculate various electrical components.
22.5	Demand assessment with ECU tools.
22.6	Domestic and industrial connection diagrams.
22.7	Working with good practices in saving.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
22.1	-	-	-	-	-	-	3	-	-	-	-	-	1
22.2	2	-	1	-	-	-	-	-	-	-	2	-	-
22.3	2	-	1	-	2	-	-	2	2	2	-	-	2
22.4	2	-	1	-	-	-	-	-	-	-	-	-	2
22.5	2	-	1	-	-	2	-	2	2	-	-	-	2
22.6	2	-	1	-	-	2	-	-	-	-	-	-	1
22.7	-	-	1	-	-	-	-	-	2	2	-	-	2

Mark distribution

Total marks	Ex	Ex	Ex Individual
200	+	+	+

Continuous material evaluation criteria:

Attendance	20 marks
Class work / Assessment / Worksheets	20 marks
Discontinuous assessment (internally or college)	20 marks

End Semester Examination Pattern: Written Objective Examination of one hour

Subject

Maths

Electrical

Lab experiments / Experiments

1. To determine the preliminary mechanical design of Electrical switch
absolutely different types of switch (voltage, resistance, timer, bus switch, micro, touch and NC/NO contacts).
2. Writing of simple logic circuit for controlling light for particular time interval.
3. Writing of logic level switching from one voltage to another (DC to DC switching).
4. Writing of Current sense lamp and logic control. DC writing power switch for controlling power device (IGBT switch).
5. Writing of power distribution arrangement using single phase AC/DC converter based with IGBT, microcontroller and frequency.
6. Identify all components of Inverter with their specifications.
Identify the Type and Rate Setting technique using Chakrabarti VLSI.

Maths

Electrical

Lab experiments / Experiments (Minimum of 4 mandatory):

1. Familiarization with basic of electronic components with application (Resistor, Ind, Pol, color coding, capacitor, switch, resistor, diode, IGBT, Peltier, Electrical, Electronics, Electro-mechanical, Wires, Capacitor, Components, Transistor, Diodes, Optocoupler, Transistor, Logic and etc.)

3. Drawing of electronic circuit diagrams using EWB/ EWB symbols and conversion to PCB mask (such as DIL, SOT23, surface mount devices components and PCB assembly and testing).
4. Specification/Explanation of testing documents and community case tools (e.g., Nios II, Xilinx generation Timer, ADC, DAC and [soldering iron, desoldering pump, fluxes,助剂, solder paste, solder fluxes, solder paste, solder paste, cleaning tool, rework soldering and reworking equipment]).
5. Testing of electronic components (Resistor, Capacitor, Diode, Transistor and JFET) using multimeter.
6. Measurement methods and soldering practice (Smart Iron, Soldering, Cleaning, Soldering types, evaluation of materials and safety procedures, soldering practice in common and general purpose PCBs, cleaning).
7. Printed circuit boards (PCB) Trace length, width, height, size, APG, Accounting numbers, Design and manufacture of a single-sided PCB from a single mask with manual drilling (drill/diamond) and drilling.
8. Assembly of electronic circuits using MELCO Fast Mount Technology (any two).
9. Assembly of electronic circuit system on general purpose PCB, test and show the functioning (Any two circuits).
10. High voltage construction with transformer (transformer design, resistor, filter, current limiter).
11. Transformer generation using EWB/ EWB in Class.
12. Transformer generation using EWB/ EWB in Class.
13. Microcontroller with transistor logic.

APLARUL KALAM
TECHNOLOGICAL
UNIVERSITY

SEMESTER III



MAT 103	DISCRETE MATHEMATICAL STRUCTURES	CATEGORY	L	T	P	CREDITS
			BSC	1	1	1

Possible:

The purpose of this course is to create awareness in students about the basic concepts used in advanced courses in Computer Science and develop rigorous logical thinking for solving different kinds of problems in Computer Science. This course helps the learner to apply the theory and applications of Elementary Counting Principles, Propositional Logic, Predicate Logic, Logical Quantifiers, Functions, Recurrence Relations and Algebraic Structures especially in practical applications.

Prerequisite: A sound background in higher secondary school Mathematics.

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

CO#	CO
CO1	Check the validity of predicates in Propositional and Quantified Propositional Logic using truth tables, induction reasoning and inference theory on Propositional Logic (Cognitive Knowledge Level: Apply)
CO2	Solve counting problems by applying the elementary counting techniques - Rule of Sum, Rule of Product, Permutation, Combination, Second Theorem, Principle Principle and Principle of Inclusion and Exclusion (Cognitive Knowledge Level: Apply)
CO3	Classify binary relations into various types and illustrate an application for each type of binary relation in Computer Science (Cognitive Knowledge Level: Understand)
CO4	Illustrate an application for Partially Ordered Sets and Complete Lattice, in Computer Science (Cognitive Knowledge Level: Apply)
CO5	Explain Generating Functions and solve First Order and Second Order Linear Recurrence Relations with Constant Coefficients (Cognitive Knowledge Level: Apply)
CO6	Illustrate the various algebraic systems - Semigroup, Monoids, Groups, Euclidean domains and homomorphisms of Monoids and Groups (Cognitive Knowledge Level: Understand)

Mapping of course objectives with program outcomes

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11
CO1	✓	✓	✓	✓							✓
CO2	✓	✓	✓	✓							✓
CO3	✓	✓	✓	✓		✓					✓
CO4	✓	✓	✓	✓		✓					✓
CO5	✓	✓	✓	✓							✓
CO6	✓	✓	✓	✓							✓
CO7	✓	✓	✓	✓							✓

Abilities POs映射到PABO的评估标准

POs	Based PO	POs	Based PO
PO1	Engineering Knowledge	PO1	Environment and Sustainability
PO2	Problem Analysis	PO6	Team
PO3	Design/Development of solutions	PO8	Individual and team work
PO4	Conduct investigations of complex problems	PO11	Communication
PO5	Modern tool usage	PO12	Project management and Finance
PO6	The Engineer and Society	PO13	Lifelong learning

Assessment Process

Eligible Capacity	Continuous Assessment Test		End Semester Examination Marks (%)
	Test 1 (%)	Test 2 (%)	
Low order	10	10	10
Universal	30	30	30
Applic.	40	40	40
Analyse			
Evaluate			
Create			

Mark Distribution:

Total Marks	CIT Marks	EEG Marks	ESR Duration
120	30	100	1

Continuous Internal Evaluation Pattern:

Attendance: 10 marks

Continuous Assessment Tests (Average of Scores Tests 1 & 2): 25 marks

Continuous Assessment Assignment: 15 marks

External Examination Pattern:

Each of the two internal examinations has to be conducted one of 30 marks. The second test should be preferably conducted after completing the first half of the syllabus and the second year test should be preferably conducted after completing remaining part of the syllabus. There will be two parts, Part A and Part B. Part A contains 7 questions (34 marks), 2 questions each from the conceptual modules and 1 question from the party conceptual modules, totaling 7 marks for each question taking up to 17 marks. In part A, Student should answer all questions from Part A. Part B contains 7 questions (preferably, 1 question each from the conceptual modules and 1 question from the party conceptual modules), each worth 7 marks. Out of the 7 questions, a student should answer any 5.

End Semester Examination Pattern:

There will be two parts, Part A and Part B. Part A contains 10 questions with 1 question from each module, totaling 5 marks for each question. Student should answer all questions. Part B contains 2 full questions from each module of which student should answer any one. Each question can bear maximum 2 half-credits and carries 14 marks.

Syllabus**Module - I (Fundamentals of Logic)**

Mathematical logic - Basic connectives and truth tables. Proposition, Logical Connective, Tautology, Contradiction, Logical Equivalence - The Laws of Logic, The Principle of duality, Substitution Rule, The implications - The Contrapositive, The converse, The inverse.

Logistic Implications - Rule of Inference: The use of Quantifiers - Open Statement, Quantified Logically Equivalent - Comparative, Contraries, Inverses, Logical equivalences and implications for quantified statements. Implications, Negation.

Module - 2 (Fundamentals of Counting Theory)

The Rule of Sum - Extension of Rule, Rule - The Rule of Product- Extension of Product Rule, Permutations, Combinations, The Binomial Theorem (without proof), Combination with Repetition, The Pigeon hole Principle, The Principle of Inclusion and Exclusion Theorem (Without Proof) - Generalization of the Principle, Descartes.

Module - 3 (Relations and Functions)

Cartesian Product - Binary Relation, Function - Injective, non-injective or one function, Injective, Surjective, Properties of Relations- Reflexivity Relation, Transitivity Relation, Symmetric Relation, Transitive relation, Anti-symmetric Relation, Partial Order relation, Equivalence Relation, Irreflexive relation.

Partially ordered set - Hasse Diagram, Minimal/Minimal Element, Least upper bound (lub), Greatest Lower Bound (glb) (Topological sorting Algorithm- studied); Equivalence Relation and Partition; Equivalence Class.

Lattices - Dual Lattice, Sub lattice, Properties of glb and lub, Properties of Lattice, Special Lattice, Complete Lattice, Bounded Lattice, Complete Lattice, Distributive Lattice

Module - 4 (Generating Functions and Recurrence Relations)

Generating Function - Definition and Examples, Calculation techniques, Exponential generating function, First order linear recurrence relations with constant coefficients - homogeneous, non-homogeneous solutions, Second order linear recurrence relations with constant coefficients, homogeneous, non-homogeneous solutions.

Module - 5 (Algebraic Structures)

Algebraic system properties- Homomorphism and Isomorphism, Semi group and monoid - cyclic monoid, sub semi group and sub monoid, Monomorphism and Isomorphism of semi group and monoid. Group- Elementary properties, subgroup, maximal group on three symbols, The direct product of two groups, Group Homomorphism, Isomorphism of groups, Cyclic group Rightinverses - Leftinverses, Lagrange's Theorem

Text Books:

- Discrete and Combinatorial Mathematics (An Applied Approach), Ralph P. Grimaldi, 5th Edition, Pearson

References Books:

- Kenneth H. Rosen, *Discrete Mathematics and Its Applications with Combinatorics and Graph Theory*, Seventh Edition, MHF 2011.
- Tremblay J.P and Manocha R, "Discrete Mathematical Structures with Applications to Computer Sciences", Tata McGraw Hill Pub. Co. Ltd., New Delhi, 2001.
- Bassanji Kolese, Robert C. Seely, Steven Carter Ross, "Discrete Mathematical Structures", Pearson Education Pvt. Ltd., New Delhi, 2005.
- Kenneth H. Rosen, "Discrete Mathematics and its Applications", 7/e, Tata McGraw Hill Pub. Co. Ltd. New Delhi 2010.
- Keshav Krishnamoorthy, "Discrete Mathematics", 1/e, Pearson Education Asia, New Delhi, 2002.
- Joe L. Mee, Alfonso Eusebio, Theodore P. Baker, "Discrete Mathematics for Computer Scientists and Mathematicians", 2/e, Prentice-Hall India, 2008.

Course Level Assessment Questions:**Course Outcome 1 (CO1):**

- Show that $E(M_1 \times M_2)$, M_1, M_2 \in \mathbb{N} are countable (without using transfinite table).
- Express the following statement in symbolic form "The only city in Canada is Vancouver".

Course Outcome 3 (CO3):

- Show all possible arrangements, such that the letters in MASSASSAOUA is placed in $A = \{a, s, o\}$ together.
- Find the number of integers between 1 and 1000 inclusive, which are not divisible by 3, 4 or 5.

Course Outcome 4 (CO4):

- $R(A) = \{(1, 1), (1, 4), (4, 1)\}$, give an example of a relation R that is reflexive and symmetric but not transitive.
- Let \mathbb{Z} be the set of integers. \mathbb{Z} is a relation called "Congruence Modulo 5" defined by $R = \{(x, y) | x - y \text{ is divisible by } 5\}$. Show that R is an equivalence relation.

Course Outcome 4 (CO4):

- Assume $A = \{a, b, c, d\}$. Let $R(A)$ be its power set and ' \subseteq ' be the subset relation on the power set. Show the Hasse diagram of $(P(A), \subseteq)$.
- What is meant by Extended Lattice? Give an example.

Course Outcome 5 (CO5):

- Show $2^k - 12_6, -42_{10} = 3^k$ using Generating function method. Given $k \geq 1, 2_k \neq 1$.
- Find the preceding factors for the sequence 1, 3, 9, 27.....

Course Outcome 5 (CO5):

- Show that the group $\langle 1, i, j, k \rangle$ is cyclic with generator i and $-i$.
- Show and prove Lagrange's Theorem.

APPLIED MATHEMATICS AND DATA SCIENCE
Model Question Paper

QPCODE

Reg No. _____

Name : _____

PAGES : 3

AP/ABDEL KALAM TECHNOLOGICAL UNIVERSITY
THIRD SEMESTER B.TECH DEGREE EXAMINATION, MONTH & YEAR

Course Code: MAT 210

Course Name: Discrete Mathematical Structures

Max Marks : 100

Duration : 3 Hrs

PART A

Answer all Questions. Each question carries 3 Marks

1. Show the following implication without constructing the truth table: $(P \wedge Q) \rightarrow P \rightarrow Q$
2. Write the negation of the following statement: "If I drive, then I will not walk"
3. What is pigeon hole principle? Explain. If you select any two numbers from 1 to 5 then prove that at least two of them will add up to 6.
4. In how many ways can the letters of the word ALLAHABAD be arranged?
5. Show that the divisibility relation " \mid " is a partial ordering on the set \mathbb{Z}^+ .
6. Consider the function given by $f(x) = 3x^2$ and $g(x) = x^3$. Find $(g \circ f)$ and $(f \circ g)$.
7. What is meant by exponential generating functions? Explain.
8. Provide one example of linear homogeneous recurrence relation. Mention the degree also.
9. What is a vector? Explain.
10. Let $\{A_i\}$ be a group. Show that $(\bigcap A_i)^c = \bigcup A_i^c$

(10 x 3 = 30 Marks)

PART B

(Answer any two Questions from each Module. Each question carries 14 Marks)

1.

- (a) Show that $S \vee T$ is true logically implied by $(P \vee Q) \wedge (P \rightarrow R) \wedge (Q \rightarrow R)$

14 marks

- (b) Show that from

$$(i) (2x)(2y) + 2(x) = (y)(2x) + W(y)$$

$$(ii) 2x)(2y) + W(y) \text{ the conclusion } (i)(y)(x) - 2(x) \text{ follows.}$$

(3 marks)

OR

12.

- (a) Show that $x(P(x) + Q(x)) = (xP(x)) + (xQ(x))$ using induction method of proof
(3 marks)
- (b) Consider universal method of proof. Show that the following premises are inconsistent

- If Jack takes some classes through distance, then he fails high school.
- If Jack fails high school, then he is uneducated.
- If Jack reads a lot of books, then he is uneducated.
- If Jack misses many classes through distance and reads a lot of books.

(3 marks)

13.

- (a) Evaluate $\lim_{x \rightarrow 0} \frac{\sin x}{x}$. Determine the coefficient of x^{100} in the expansion of $(x^2+1)^{100}(x^3-1)^{100}$ using binomial theorem.
(3 marks)
- (b) How many 1 digit numbers can be formed from the digits 1,2,3,4,5 using the digits without repetition?
 (i) How many of them are even?
 (ii) How many are even and greater than 10,000?
(3 marks)

OR

14.

- (a) There are 5 papers in a party. Each paper brings a gift and receives another gift in return. No one is allowed to receive the gift they brought. How many ways are there to exchange the gifts?
(6 marks)
- (b) Six papers are set in an examination of which two are mathematical. Only one examination will be conducted in a day. In how many different orders can the papers be arranged in that?
 (i) Two mathematical papers are consecutive?
 (ii) Two mathematical papers are not consecutive?
(3 marks)

15.

16. Let $A = \{1, 2, 3, 4, \dots, 11, 12\}$ and let R be the equivalence relation on $A \times A$ defined by
 (a) $(x, y) \in R$ if and only if $x \equiv y \pmod{3}$. Prove that R is an equivalence relation and find the
 equivalence class of $(2, 5)$. (8 marks)
 (b) What is a *transitive*? Explain. Also show that every class is a transitive relation.
(6 marks)
- Q8.
- 17.
- (a) Suppose $f(x) = x^2 - 1$, $g(x) = x^2$, and $h(x) = 3x$ for $x \in \mathbb{R}$, where \mathbb{R} is the set of real numbers. Find $(f \circ g)$, $(f \circ h)$ and $(g \circ g)$. (8 marks)
- (b) Let R and S be two relations on a set A . If R and S are symmetric, Prove that $(R \cap S)$ is also symmetric. (8 marks)
- Q9.
- 18.
- (a) Solve the recurrence relation $a_1 - 7a_{n-1} + 10a_{n-2} = 0$ for $n \geq 2$, given $a_0 = 0$, $a_1 = 4$ using generating functions. (8 marks)
- (b) Solve the recurrence relation $a_1 - 4a_{n-1} + 4a_{n-2} = n^2$ using generating functions. (8 marks)
- Q10.
- 19.
- (a) Let $a_0 = 3a_{n-1} + 1$, $a_1 = 1$, $n \geq 1$, using generating functions.
(8 marks)
- (b) Use generating function to solve the following recurrence relation $a_n = 3a_{n-1} + 2^n$ with $a_0 = 2$.
(8 marks)
- Q11.
- 20.
- (a) Prove that the set \mathbb{Q} of rational numbers other than 1 forms a cyclic group with respect to the operation ' \wedge ' defined by $x \wedge y = x^2y^{-1}$. (8 Marks)
 (b) Show that the direct product of this group is a group.
(8 Marks)
- Q12.
- 21.
- (a) Show that the subgroup of a cyclic group is cyclic. (8 Marks)
 (b) Let $(G, *)$ be a group. Show that $(G, *)$ is an abelian group if and only if $a^m * b = b * a^m$ for all a and b in G . (8 Marks)

TEACHING PLAN

No	Content	No of Lecture Hrs
Module - 1 (Fundamentals of Logic) (8 hrs)		
1.1	Mathematical logic, Basic Connectives and Truth Table	1
1.2	Statements, Logical Connectives, Tautology, Contradiction	1
1.3	Logical Equivalence, The Laws of Logic	1
1.4	The Principle of duality, DeMorgan's Rule	1
1.5	The implication, The Converse, the Contrapositive, the Inverse	1
1.6	Logical Equivalence, Rules of Inference, Logical Implications	1
1.7	The use of Quantifiers, Open Statement, Quantifier Negation	1
1.8	Logical Equivalence, Correspondence, The Church, The Larmore	1
1.9	Logical Negations	1
Module - 2 (Fundamentals of Counting Theory) (8 hrs)		
2.1	The Pigeon-hole Principle	1
2.2	The Rule of Sum	1
2.3	Extinction of sum Rule	1
2.4	The Rule of Product	1
2.5	Extinction of Product Rule, Permutation	1
2.6	Combinations, Combinations with repetition	1
2.7	The Binomial Theorem	1
2.8	The Principle of Inclusion and Exclusion Theorem / Without Proof Generalization of the Principle	1
2.9	Distinguishability	1
Module - 3 (Relations and Functions) (8 hrs)		
3.1	Cartesian Product, Binary Relation, Function, Domain, Range, One-to-One Function, Inverse • Satisfaction	1
3.2	Properties, Reflexivity Relations, Reflexive Relations, Symmetric Relations, Transitive Relations, Anti-symmetric Relations	1

3.3	Partial Order Relations	1
3.4	Equivalence Relation, Inverse Relations	1
3.5	Partially ordered Set, Maxima Common	1
3.6	Minimum-Maximum Element, Least Upper bound, Greatest Lower Bound	1
3.7	Equivalence Relations and Partitions, Equivalence Class	1
3.8	Lattice-Dual Lattice, sub lattice, Properties of glb and lub	1
3.9	Properties of Lattice, Bounded Lattice, Complete Lattice, Bounded Lattice, Complete Lattice, Distributive Lattice	1
Module - 4 (Generating Functions and Recurrence Relations) (9 hrs)		
4.1	Generating Function: Definition and Examples	1
4.2	Exponential Generating Function	1
4.3	First Order Linear Recurrence Relation with Constant Coefficients (Lecture I)	1
4.4	First Order Linear Recurrence Relation with Constant Coefficients (Lecture II)	1
4.5	Homogeneous Solutions	1
4.6	Non homogeneous Solutions	1
4.7	Second order linear recurrence relations with constant coefficients	1
4.8	Homogeneous Solutions	1
4.9	Non homogeneous Solutions	1
Module - 5 (Algebraic Structure) (9 hrs)		
5.1	Algebraic System-Properties, Isomorphism and Homomorphism	1
5.2	Semi group, Monoid, Cyclic monoid	1

5.3	Subgroup and left coset	I
5.4	Isomorphism and Isomorphism of Subgroup, Mautis and Groups	I
5.5	Elementary Properties, Subgroup, Isomeric group or Group	I
5.6	The Direct Product of two Groups	I
5.7	Group Homomorphism, Isomorphism, Cyclic group	I
5.8	Right coset, Left coset	I
5.9	Lagrange's Theorem	I



COURSE	DATA STRUCTURES	CATEGORY	L	T	P	CREDIT	YEAR OF INTRODUCTION
							2008

Preamble: This course aims at enabling the learner to understand the various data structures, their organization and operations. The course helps the learners to know the applicability of different data structures and associated algorithms for solving real world problem which requires to compare and select appropriate data structures to solve the problem efficiently. The course introduces abstract concepts for data organization and manipulation using data structures such as stack, queue, linked list, binary tree, heap, and graph for designing their own data structures to solve practical application problems in various fields of Computer Science.

Prerequisite: Topics covered under the course Programming in C (EST 102).

CO1	Design an algorithm for a computational task and evaluate the time-space complexities of the algorithm (Cognitive Knowledge Level : Apply)
CO2	Identify the suitable data structure (array or linked list) to represent a data class required to be processed to solve a given computational problem and write an algorithm to find the solution of the computational problem (Cognitive Knowledge Level : Apply)
CO3	Write an algorithm to find the solution of a computational problem by selecting an appropriate data structure (linked list, graph) to represent a data class to be processed (Cognitive Knowledge Level : Apply)
CO4	Store a given dataset using an appropriate Data Structure to enable efficient access of data in the given set (Cognitive Knowledge Level : Apply)
CO5	Select appropriate sorting algorithms to be used in specific circumstances (Cognitive Knowledge Level : Analyse)
CO6	Design and implement Data Structures for solving real world problems efficiently (Cognitive Knowledge Level : Apply)

Mapping of course outcomes with program outcomes

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12
C01	☒	☒	☒	☒			☒					☒
C02	☒	☒	☒	☒			☒					☒
C03	☒	☒	☒	☒			☒					☒
C04	☒	☒	☒	☒			☒					☒
C05	☒	☒	☒	☒			☒					☒
C06	☒	☒	☒	☒			☒					☒

Mapping PES Outcomes to National Board of Accreditation

POs	Brief PO	POs	Brief PO
P01	Expanding Horizons	P02	Environment and Sustainability
P03	Riskless Analysis	P04	Ethics
P05	Design Development of solutions	P06	Individual and team work
P04	Conduct investigation of complex problems	P09	Communication
P08	Modern tool usage	P10	Project Management and Finance
P06	The Engineer and Society	P12	Lifelong learning

Assessment Pattern

Elaborate Category	Continuous Assessment Test		End Semester Examination Marks
	Test I (Percentage)	Test II (Percentage)	
Remember	30	30	30
Understand	30	30	30
Apply	40	40	40

Analysis			
Diagrams			
Quotations			

Mark Distribution

Total Marks	CIE Marks	ESK Marks	ESK Duration
250	90	130	3 hours

Continuous Internal Evaluation Pattern:

Attendance : 15 marks

Continuous Assessment Test : 15 marks

Continuous Assessment Assignment : 15 marks

Internal Examination Pattern:

Each of the two internal examinations has to be conducted over 75 mins.

First Internal Examination : shall be preferably conducted after completing the first half of the syllabus and the Second Internal Examination : shall be preferably conducted after completing remaining part of the syllabus.

There will be two parts: Part A and Part B. Part A contains 5 questions (preferably 2 questions each from the completed module and 1 question from the partly covered module), having 1 mark for each question taking up to 15 marks for part A. Student should answer all questions from Part A. Part B contains 7 questions (preferably 2 questions each from the completed modules and 1 question from the partly covered module), each with 1 mark. Out of the 7 questions in Part B, a student should answer any 5.

External Examination Pattern:

There will be two parts: Part A and Part B. Part A contains 10 questions with 2 questions from each module, having 1 mark for each question. Student should answer all questions. Part B contains 2 questions from each module of which a student should answer any one. Each question can have maximum 2 sub-questions, and carries 14 marks.

MODULES**Module 1****Basic Concepts of Data Structures**

System Life Cycle, Algorithms, Performance Analysis, Space Complexity, Time Complexity, Asymptotic Notation, Complexity Calculations of Simple Algorithms

Module 2**Arrays and Searching**

Polynomial representation using Arrays, Sparse Matrix, Stack, Queue-Circular Queue, Priority Queue, Double Ended Queue, Evaluation of Expressions

Linear Search and Binary Search

Module 3**Linked List and Memory Management**

Self Referential Structure, Dynamic Memory Allocation, Singly Linked List Operations on Linked List, Doubly Linked List, Circular Linked List, Stack and Queue using Linked List, Polynomial representation using Linked List

Memory allocation and de-allocation-Fixed, Stack and Thread allocation schemes

Module 4**Trees and Graphs**

Tree, Binary Tree Tree Operations, Binary Tree Representation, Tree Traversals, Binary Search Tree- Binary Search Tree Operations

Graphs, Representation of Graphs, Depth First Search and Breadth First Search on Graphs, Applications of Graphs

Module 5**Sorting and Merging**

Sorting Techniques - Selection Sort, Insertion Sort, Quick Sort, Merge Sort and Heap Sort, Merging- Merging Techniques, Collision Resolution, Overflow handling, Merging functions - Mid merge, Divide, Trailing Digit Analysis

Text Books

1. Ellis Horowitz, Sarvag定位 and Susan Anderson-Freed, **Fundamentals of Data Structures in C**

Reference Books:

1. Baswanta D., Class: Data Structures, Prentice Hall India.
2. Richard T. Möller, Balence A. Fernandes, Data Structures: A Practical Approach with C & C++ Programming.
3. Allo A. U., I. E. Kapur and J. D. Wilson, Data Structures and Algorithms, Pearson Education.
4. Trickey J. R and P. G. Sommerville, Introduction to Data Structures with Applications, Tata McGraw-Hill.
5. Peter Brass, Advanced Data Structures, Cambridge University Press.
6. Lipschutz S., Theory and Problems of Data Structures, Schaum's Series.
7. Wirth N., Algorithms + Data Structures = Programs, Prentice Hall.
8. Wagner J. K. and J. J. Malouf, A Practical Approach to Programming, PHT.
9. Martin Bertrand, Clifford Wagner, C And Data-Tools For Software Design, John Wiley.

Sample Course Level Assessment Questions:

Course Objective (001): Write an algorithm for matrix multiplication and calculate its time complexity.

Course Outcome 3 (003): How a linked list can be used to represent the polynomial $3x^2y^3 + 2xy^2 - 7xy^4 + 12x^3y^2 - 11x^2y^3$? Write an algorithm to add two Boolean polynomials represented using linked list.

Course Outcome 3 (003): Define a binary search tree with code representing the following sequence 14, 12, 4, 13, 8, 26, 20, 17, 1, 1, 2, 2 and perform insertion, pre-order and post-order traversal on the above tree and print the output.

Course Outcome 4 (004): The size of a hash table is 7. The index of the hash table ranges from 0 to 6. Consider the keys 19, 12, 45, 51, 17 in the order. Given that the keys are stored in the hash table using Linear probing.

Course Outcome 5(CO5): In what circumstances does Quick Sort perform worse than Merge sort.

Course Outcome 8(CO8): Design a reservation system for railway that includes waiting list. If the reservation is full "Display message like TKT" and put the passenger in the waiting list till given a booking like number. If a passenger cancels the ticket, then his seat should be automatically allocated to the next passenger in the waiting list.

Model Question Paper

Q9.2020

PAGE#?

Reg No: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY THIRD SEMESTER B.TECH
COMPUTER PROGRAMMING, MONTH: 1, YEAR:

Course Code: CAT 301

Course Name: DATA STRUCTURE

Max. Marks: 30

Session: 1 Hours

PART A

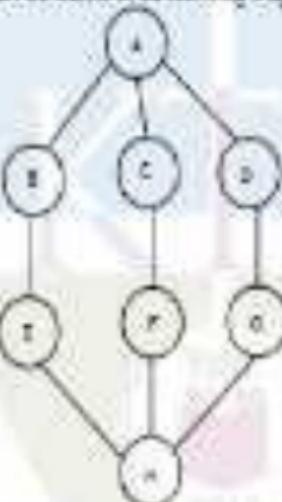
Answer all questions. Each question carries 2 marks.

- Calculate the Big-O complexity of the program $a = n^2$; in the following code segment:
 $\text{for } (j = 0; j < n; j++)$
 $\quad \text{for } (i = 0; i < n; i++)$
 $\quad \quad a = a + 1;$
- What is the relevance of reification to System Life Cycle?
- What is algorithm to insert an element in a particular position of an array?

4. Convert the expression $((A \setminus (B \cap C)) \setminus (D \cup E)) \setminus F$ to prefix form. Show each step in the conversion including the stack contents.
5. Write an algorithm to calculate number of occurrences of a character in a linked list (each node contains only one character).
6. Write an algorithm for best-fit method of memory allocation.
7. Draw the binary tree whose representation is given below:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
4	3	0	-	0	5	-	-	-	-	7	9	-	-	-

8. Find the Depth First Search of the following Graph



9. Write an algorithm to storage n numbers in consecutive order.
10. Let the size of a hash table is 19. The index of the hash table varies from 0 to 9. Assume the keys 75, 54, 11, 43, 28, 66, 37, 15, 41, 22, 40 are mapped using modulo operator. Show how the keys are distributed using chaining method.

Part B:

Answer any one Question from each module. Each question carries 14 Marks.

11. a) Explain the System Life Cycle in detail. (12)

b) How the performance of an algorithm is evaluated? (4)

OR

12. a) Write algorithms for Linear Search and Binary Search and Compare their time complexities. (12)

b) Between O(nlogn) and O(3^n), which one is better and why? (4)

13. a) Write algorithms to Insert and Delete elements from a Doubly ended queue. Discuss with example. (12)

b) Compare and contrast Circular Queue with Normal Queue. (4)

OR

14. a) Write an algorithm to insert and delete elements from a Priority Queue. (8)

b) Discuss an algorithm to convert an infix expression to a prefix expression. (6)

15. a) Write an algorithm to multiply two polynomials represented using linked list. (12)

b) How doubly linked list can be used to find palindromes? (4)

OR

16. a) Show a memory comparison (De-allocation) done in memory management? (4)

b) Discuss the advantages and disadvantages of Three-Block, Stack-Block and Three-Block Allocation schemes. (10)

17. a) List the properties of Binary Search Tree. Write an algorithm to search an element from a Binary Search Tree. (13)
- b) Write an iterative algorithm for in-order traversal of a Binary Tree. (4)
- OR
18. a) Give algorithms for DFS and BFS of a graph and explain with examples. (8)
- i) True graphs can be represented as a Complete? (4)
- OR
19. a) Write algorithms for Merge sort and Quick Sort. (13)
- i) Illustrate the working of Quick sort on the following input 23, 1, 5, 21, 42, -12, 58, 28, 42. (8)
- OR
18. d) With examples discuss the different hash functions used for hashing. (10)
- i) Apply the hash function $h(p) = p \% 7$ for linear probing on the data 2241, 4224, 2029, 456, 21, 397, 3820 and show the resulting hash table. (8)

Teaching Plan	
Module 1: Basic Concepts of Data Structures	
1.1	Syntax, Life Cycle.
1.2	Algorithms, Performance Analysis
1.3	Space Complexity, Time Complexity
1.4	Asymptotic Notation (Big O Notation)
1.5	Complexity Calculations of Simple Algorithms
Module 2: Arrays and Searching	
2.1	Polynomial representation using Arrays
2.2	Sparse matrix (Lecture 1)
2.3	Sparse matrix (Lecture 2)

2.4	Stacks	1 hour
2.5	Queues, Circular Queues	1 hour
2.6	Priority Queues	1 hour
2.7	Circular Doubly Linked Queue	1 hour
2.8	Conversion and Evaluation of Expressions (Lecture 1)	1 hour
2.9	Conversion And Evaluation of Expressions (Lecture 2)	1 hour
2.10	Linear Search and Binary Search	1 hour
Module 1 : Linked List and Memory Management		(12 hours)
3.1	Self Referential Structures	1 hour
3.2	Dynamic Memory Allocation	1 hour
3.3	Single Linked List-Operations on Linked List	1 hour
3.4	Doubly Linked List	1 hour
3.5	Circular Linked List	1 hour
3.6	Stacks using Linked List	1 hour
3.7	Queues using Linked List	1 hour
3.8	Polynomial representations using Linked List (Lecture 1)	1 hour
3.9	Polynomial representations using Linked List (Lecture 2)	1 hour
3.10	Memory Allocation	1 hour
3.11	Memory Allocation-malloc()	1 hour
3.12	Search and Write Operations on stacks	1 hour
Module 4 : Trees and Graphs		(5 hours)
4.1	Trees, Binary Trees	1 hour
4.2	Tree Operations, Binary Tree Representation	1 hour
4.3	Tree Traversals	1 hour
4.4	Binary Search Tree	1 hour
4.5	Binary Search Tree Operations	1 hour
4.6	Graphs, Representations of Graphs	1 hour

4.7	Depth First Search and Breadth First Search on Graphs	Done
4.8	Applications of Graphs	Done
Module 5 : Sorting and Searching		(WIPES)
5.1	Sorting Techniques - Selection Sort	Done
5.2	Inversion Sort	Done
5.3	Quick Sort	Done
5.4	Merge Sort	Done
5.5	Heap Sort	Done
5.6	Merging - Maximaug Techniques	Done
5.7	Efficient Parallelism	Done
5.8	Overflow Handling	Done
5.9	Searching Algorithms - Mid space and Dynamic methods	Done
5.10	Sorting and Digt Analysis methods	Done



CST 300	DIGITAL SYSTEM DESIGN	Category	L	T	P	Credit	Year of Introduction
		DGT	3	1	0	4	2010

Prerequisite: The objective of this course is to familiarize learners with the basic concepts of Boolean algebra and digital systems. This course covers the design of simple combinational and sequential logic circuits, representation and arithmetic operations for Binary, BCD (Binary Coded Decimal) and Floating point numbers which is very important in understanding operations & design of computer system and understanding how patterns of ones and zeros can be used to store information in computers, manipulating multimedia data.

Prerequisite: 700

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

CO#	CO
CO1	Convert decimal, binary, octal, hexadecimal and BCD number systems, perform conversions among them and do the operations - complementation, addition, subtraction, multiplication and division of binary numbers. (Cognitive Knowledge level: Understand)
CO2	Simplify a given Boolean Function and Design a combinational circuit to implement the simplified function using Digital Logic Gate. (Cognitive Knowledge level: Apply)
CO3	Design combinational circuit - Adder, Code Converters, Decoders, Multiplexers, Demultiplexers, Party Decoder/Encoder and design the Programmable Logic Device - ROM and PLA. (Cognitive Knowledge level: Apply)
CO4	Design sequential circuit - Registers, Counters and Shift Registers. (Cognitive Knowledge level: Apply)
CO5	Use algorithms to perform addition and subtraction on binary, BCD and floating point numbers (Cognitive Knowledge level: Understand)

Mapping of course outcomes with program outcomes

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11
O01	✓	✓									✓
O02	✓	✓	✓	✓	✓	✓					✓
O03	✓	✓	✓	✓	✓	✓					✓
O04	✓	✓	✓	✓	✓	✓					✓
O05	✓	✓	✓								✓

Program PO defined by National Board of Accreditation			
PO#	Broad PO	PO#	Broad PO
P01	Engineering Knowledge	P07	Sustainability and Professionalism
P02	Problem Analysis	P08	Ethics
P03	Design/Development of solutions	P09	Technical and non-technical
P04	Conduct investigations of complex problems	P010	Communication
P05	Motivation, usage	P011	Project Management and Finance
P09	The Engineer and Society	P012	Life long learning

Assessment Pattern:

Bloom's Category	Test 1 (%)	Test 2 (%)	End Semester Examination Marks (%)
Remember	20	20	20
Understand	20	20	20
Apply	40	40	40
Analyze			
Evaluate			
Create			

Mark Distribution:

Total Marks:	CIE Marks:	EIE Marks:	EST Duration:
159	58	100	3

Conducted Internal Evaluation Pattern:

Attendance	12 marks
Continuous Assessment Test	27 marks
Continuous Assessment Assignment	17 marks

Internal Examination Pattern:

Each of the two internal examinations has to be conducted out of 30 marks. The series test shall be partially conducted after completing the first half of the syllabus and the second series test shall be partially conducted after completing remaining part of the syllabus. There will be two parts - Part A and Part B. Part A contains 3 questions (qualifying), 2 questions each from the completed modules and 1 question from the partly completed modules, having 5 marks for each question adding up to 15 marks for part A. Student should answer all questions from Part A. Part B contains 2 questions (qualifying), 2 questions each from the completed modules and 1 question from the partly completed modules, each with 7 marks. One of the 7 questions, a student should answer any 5.

End Semester Examination Pattern:

There will be two parts, Part A and Part B. Part A contains 10 questions with 2 questions from each module, having 3 marks for each question. Student should answer all questions. Part B contains 2 questions from each module of which a student should answer any one. Each question can have maximum 2 sub-questions and carries 7 marks.

SYLLABUS**Module I****Number Systems, Operations & Codes:**

Decimal, Binary, Octal and - Hexadecimal Number Systems- Number Base Conversions- Addition, Subtraction, Multiplication and Division of binary numbers. Representation of negative numbers- Complements, Subtraction with complements. Addition and subtraction of BCD, Octal and Hexadecimal numbers. Binary codes- Decimal code, Excess-3 code, Reflected code, Character coding schemes - ASCII, EBCDIC.

Module II**Boolean Algebra:**

Postulates of Boolean Algebra. Basic theorems and Properties of Boolean Algebra. Boolean Functions - Canonical and Standard form. Simplification of Boolean Functions Using Karnaugh Map Method (pos. Inv. univ. Inv. Don't care conditions). Product of sums

Module III

Combinational Logic Circuits

Design Procedure & Implementation of combinational logic circuits: Binary adder and subtractor, Binary Parallel adder, Carry look ahead adder, BCD adder, Code converters, Magnitude comparators, Decoder, Demultiplexers, Encoder, Multiplexer, Parity generator/Checker.

Module IV

Synchronous Logic Circuits

Flip-flops: SR, JK, T and D. Triggering of flip-flops: Master slave flip-flops, Edge-triggered flip-flops. Transition table and characteristic equation. Registers: register with parallel load. Counter design: Asynchronous counter: Binary and BCD counters, Timing sequences and state diagrams. Synchronous counter: Binary Up down counter, BCD counter.

Module V

Shift registers

Shift registers - Serial In Serial Out, Serial In Parallel Out, Bidirectional Shift Register with Parallel load. Registers: Register counter-timing sequences and state diagrams.

Arithmetic algorithms

Algorithms for addition and subtraction of binary numbers in signed magnitude and 2's complement representation. Algorithms for addition and subtraction of BCD numbers. Representation of floating point numbers. Algorithms for division and extraction of floating point numbers.

Programmable Logic devices

ROM, Programmable Logic Array (PLA)-Implementation of simple circuits using PLA.

Text Books:

1. M. Morris Mano, Digital Logic & Computer Design, 4/e, Pearson Education, 2003.
2. Thomas L. Floyd, Digital Fundamentals, 11/e, Pearson Education, 1999.
3. M. Morris Mano, Computer System Architecture, 3/e, Pearson Education, 2007.

Reference Books:

1. M. Morris Mano, Michael D. Ciletti, Digital Design Using A Gate Delay Model, 3/e, Pearson Education, 2013.
2. David D. Givens, Digital Principles and Design, Prentice-Hall, 2001.

Sample Course-Level Assessment Questions

Course Outcome 1(CO1): Perform the following tasks of basic mathematics:
 a) (2M.E3),₁₀ to Monadic; b) (337), to Decimal

Course Outcome 1(CO1): Given a Boolean function F and don't care condition D , using Karnaugh map obtain the simplified expression in (i) SOP and (ii) POS.

$$F(A, B, C, D) = A'B'C'D + A'BC'D + ABC'D$$

$$D(A, B, C, D) = B'C'D + ABC + ABD$$

Course Outcome 5(CO5): Design a BCD-to-Essen-3-Dice Converter

Course Outcome 6(CO6): Design a 4-bit binary ripple counter

Course Outcome 5(CO5): Discuss the following search algorithms.



Reg No: _____
 Name: _____

**ADJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY THIRD SEMESTER B.TECH
 DEGREE EXAMINATION, MONTH & YEAR**

Course Code: C17303

Course Name: LOGIC SYSTEM DESIGN

Max Marks: 100

Duration: 3 Hours

PART-A

(Answer All Questions. Each question carries 3 marks)

- Express the decimal numbers (40)₁₀ and (50)₁₀ in binary and perform addition of these two binary numbers.
- Subtract (1000)₂ from (10000)₂ using (i) 2's complement and (ii) 1's complement methods.
- Find the dual and complement of the boolean function $F = AB' + A'B + AB$.
- Using K-map, reduce the expression $A'B + A'BC + ABC + BC$.
- Design a full adder with XNOR gate only.
- Design a combinational circuit that multiplies an input decimal digit by 5 represented in BCD. The output is also in BCD. Show that the output can be obtained from the input lines without using any logic gate.
- Difference between ripple counter and synchronous counter.
- Construct a flip-flop using XNOR gate. Also give its truth table.
- Explain how a shift register is used for serial to parallel converter?
- With diagram explain ROM.

PART-B

(Answer any one full question from each module)

(160-76)

11. (a) Perform the following operation using 2's complement arithmetic. (8)
 (i) $1101_2 + 1110_2$ (ii) $1101_2 + 1111_2$
- (b) Perform the following two conversions: (i) 1000011111₂ to decimal (ii) 10100010₂ to binary (iii) 111010₂ to binary (iv) 10011010₂ to binary
OR
12. (a) Find the 12 bit 2's complement representation of the following decimal numbers. (8)
 (i) -57 (ii) -124 (iii) -1975
- (b) Perform the following operations (8)
 (i) $(500_2 + 400_2)$ (ii) $(5000_2 - 1000_2)$
13. (a) Prove that $(A'B + AB' + BC) + B'C + C'D = B + AC$. (8)
 (b) Using K-map, simplify the Boolean function F as sum of products form using the given map conditions. (8)

$$\begin{aligned} F(x,y,z,w) &= \bar{x}\bar{y}z\bar{w} + xy\bar{z} + \bar{z}y\bar{w} + z\bar{y}w + x\bar{y}w + w \\ f(x,y,z,w) &= \bar{w}'(y'z + yz') + wz \end{aligned}$$

OR
14. (a) Simplify the following expression using Karnaugh map method. (8)
 (i) $F = \Sigma(0,2,4,6,8,10,11,13,17,21,23,27,29,31)$
 (ii) $F = \Sigma(0,2,3,7)$
- (b) Convert the following to the given standard form (8)
 (i) $F(x,y,z,w) = \sum Q(X)$
 (ii) $F(x,y,z,w) = D(x,y,z,w)$
 (iii) $F(A,B,C,D) = \Sigma(0,1,2,3,6,12)$
15. (a) Implement NOT gate circuit using XNOR gate only. (8)
 (b) Design a code converter for converting BCD to Decimal Form
OR
16. (a) With a neat diagram explain 4-bit carry look ahead adder. (8)

- (i) Design a Gray to Binary code converter using a 4x1 MUX. Draw the circuit diagram and explain. (5)
17. (a) Design a counter that counts the values 0,1,1,0,0, using T flip-flops. (5)
 (b) Write the characteristic equation, excitation table of SR, T and D flip-flops.
 OR
18. (a) Explain race-around condition and how it can be avoided. (5)
 (b) Design a synchronous Binary Up-Down Counter. (5)
19. (a) Write a state diagram of a sequential switch register. (5)
 (b) Explain Ripple Counter with timing diagram. (5)
 OR
20. (a) Write algorithms for floating point addition and subtraction. (5)
 (b) Implement the function $Y_1 = ABC' + A'BC + AB'C$ and $Y_2 = BC + AC$ using minimum gate Programmable Logic Array. (5)

Teaching Plan

Module 1: Number Systems, Operations & Codes (No. of sessions)		(T hours)
1.1	Number Systems: Decimal, Binary, Octal and Hexadecimal number systems. Number Base Conversion.	1 hour
1.2	Binary Arithmetic: Addition, Subtraction, Multiplication & Division of Binary Numbers (Lecture 1)	1 hour
1.3	Addition, Subtraction, Multiplication & Division of Binary Numbers (Lecture 2)	1 hour
1.4	Representation of Negative Numbers: Complements, conversion with complements.	1 hour
1.5	BCD Arithmetic: Addition and Subtraction of BCD Numbers	1 hour
1.6	Octal and Hexadecimal Arithmetic: Addition & Subtraction of Octal and Hexadecimal Numbers.	1 hour

Module 1: Boolean Algebra		
L1	Binary Code: Decimal Code, Ex-2 Active code, Reflected code, Charater Coding (ASCII, EBCDIC)	1 hour
Module 2: Boolean Algebra		
L2	Introduction to Boolean Algebra: Postulates of Boolean Algebra	1 hour
L3	Basic Theorems and Properties of Boolean Algebra	1 hour
L4	Boolean Functions: Canonical and Standard Forms	1 hour
L5	Simplification of Boolean Functions: Karnaugh Map Method (up to five variables), Don't care conditions (Lecture 1)	1 hour
L6	Simplification of Boolean Functions: Karnaugh Map Method (up to five variables), Don't care conditions (Lecture 2)	1 hour
L7	Product of sum simplification	1 hour
L8	DeMorgan's method	1 hour
L9	Digital Logic Gates: AND, OR, NOT, NAND, NOR, XOR, XNOR	1 hour
L10	Implementation of Boolean Functions using basic and universal gates (Section 1)	1 hour
L11	Digital Logic Gates: AND, OR, NOT, NAND, NOR, XOR, XNOR, Implementation of Boolean Functions using basic and universal gates (Section 2)	1 hour
Module 3: Combinational Logic Circuits		
L12	Design Procedure & Implementation of Combinational Circuits	1 hour
L13	Binary Adder:	1 hour
L14	Implementation of Full Adder, Full Subtractor	1 hour
L15	Implementation of Full Subtractor, Full Adder	1 hour
L16	Implementation of Binary Parallel Adder (Carry look ahead Adder, SCD Adder) (Lecture 1)	1 hour
L17	Implementation of Binary Parallel Adder (Carry look ahead Adder, SCD Adder) (Lecture 2)	1 hour

2.6	Implementation of Various Combinational Circuits: Code Converters, Magnitude Comparators	1 hour
2.7	Implementation of Decoder, Demultiplexer	1 hour
2.8	Implementation of Encoder, Multiplexer	1 hour
2.9	Implementation of Parity Generator/Circuits	1 hour
Module 4: Sequential logic circuits:		(8 hours)
4.1	Flip-Flops: SR, JK, T and D-Flip-Flops (Lecture 1)	1 hour
4.2	SR, JK, T and D-Flip-Flops (Lecture 2)	1 hour
4.3	Triggering of flip-flops- Master Slave Flip-Flop, Edge-triggered flip-flops (Lecture 1)	1 hour
4.4	Triggering of flip-flops- Master Slave flip-flop, Edge-triggered flip-flops (Lecture 2)	1 hour
4.5	Examination and characteristic equations of flip-flops	1 hour
4.6	Registers- Registers with parallel load	1 hour
Counter Design:		
4.7	Astrochronous counter- Binary and BCD counters- timing responses and state diagrams. (Lecture 1)	1 hour
4.8	Astrochronous counter- Binary and BCD counters- timing responses and state diagrams. (Lecture 2)	1 hour
4.9	Synchronous counter- Binary Up-down counter, BCD counter	1 hour
Module 5: Shift registers, Arithmetic algorithms & PLD's:		(II hours)
5.1	Shift Registers - Serial In Serial Out, Serial In Parallel Out	1 hour
5.2	Bidirectional D/A Register with Parallel load	1 hour

5.3	Shift register counters - Ring Counter, Johnson Counter: timing sequences and state diagrams	1 hour
5.4	Arithmetic Algorithms: Algorithms for addition and subtraction of binary numbers in signed magnitude and 2's complement representations (Lecture 1)	1 hour
5.5	Algorithm for addition and subtraction of binary numbers in signed magnitude and 1's complement representations (Lecture 2)	1 hour
5.6	Algorithm for addition and subtraction of BCD numbers	1 hour
5.7	Representation of Floating point numbers (IEEE Standard representation)	1 hour
5.8	Algorithm for Floating point addition and subtraction	1 hour
5.9	Programmable Logic devices - PLD	1 hour
5.10	PLA: Implementation of simple circuits using PLA (Lecture 1)	1 hour
5.11	PLA: Implementation of complex circuits using PLA (Lecture 2)	1 hour



CET 202	OBJECT ORIENTED PROGRAMMING USING JAVA	CATEGORY	L	T	P	CREDIT	YEAR OF INTRODUCTION
			POC	3	1	0	
							2019

Possible: The purpose of this course is to enable learners to solve problems by treating it down to object level while designing software and to implement it using Java. This course covers Object Oriented Principles, Object Oriented Programming in Java, inheritance, Exception handling, Event handling, multithreaded programming and working with windows-based graphics. This course help the learner to develop Desktop GUI Applications, Mobile applications, Enterprise Applications, Scientific Applications and Web based Applications.

Prerequisite: Topics covered under the course PROGRAMMING IN C (EST 102).

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

CO1	Write Java programs using the object oriented concepts - classes, objects, constructors, data hiding, inheritance and polymorphism. (Cognitive Knowledge Level: Apply)
CO2	Use data types, operators, control structures, built-in packages & interfaces, import, Output Streams and File I/O tools to develop programs. (Cognitive Knowledge Level: Apply)
CO3	Illustrate how certain programs can be written in Java using exception handling mechanism. (Cognitive Knowledge Level: Understand)
CO4	Write application programs in Java using multithreading and threads connectivity. (Cognitive Knowledge Level: Apply)
CO5	Write graphical User Interface based application programs by utilizing event handling feature and Swing in Java. (Cognitive Knowledge Level: Apply)

Mapping of course outcomes with program outcomes:

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11
C01	✓	✓	✓	✓							✓
C02	✓	✓	✓	✓							✓
C03	✓	✓	✓	✓							✓
C04	✓	✓	✓	✓							✓
C05	✓	✓	✓	✓							✓

Learning Outcomes Identified by Standard Board of Assessment:

PGP	Standard No.	PGP	Standard No.
P01	Engineering Knowledge	P07	Environment and Sustainability
P02	Problem Analysis	P08	Ethics
P03	Design/Development of Solutions	P09	Individual and team work
P04	Creditable interpretation of complex problems	P010	Communication
P05	Dimension and range	P011	Project Management and Teamwork
P06	Their Progress and Society	P012	Lifelong Learning

Assessment Pattern:

Blended Category	Continuous Assessment Score		End Semester Examination Marks (%)
	Test I (Marks: 40)	Test II (Marks: 40)	
Examiner	30	30	30
Understand	30	30	30
Apply	40	40	40
Analyze			
Evaluate			
Create			

Mark Distribution

Total Marks	CH Marks	ESL Marks	EIE Duration
120	30	30	8 hours

Coursework: Internal Examination Pattern

Aimless: 10 marks

Continuous Assessment Tests: 21 marks

Continuous Assessment Assignments: 11 marks

Internal Examination Pattern:

Each of the two internal examinations has to be conducted over 30 minutes.

First series test shall be partially conducted after completing the first half of the syllabus and the second series test shall be partially conducted after completing remaining part of the syllabus.

There will be two parts; Part A and Part B. Part A contains 7 questions (preferably); 3 questions each from the completed module and 1 question from the partly covered module, having 3 marks for each question adding up to 21 marks for part A. Student should answer all questions from Part A. Part B contains 7 questions (preferably); 3 questions each from the completed module and 1 question from the partly covered module, each with 3 marks. Out of the 7 questions in Part B, a student should answer only 5.

End Semester Examination Pattern: There will be two parts; Part A and Part B. Part A contains 10 questions with 2 questions from each module, having 3 marks for each question. Student should answer all questions. Part B contains 2 questions from each module of which a student should answer any one. Each question can have maximum 2 sub-questions and carry 1+ marks.

STELLARITY

Smart Growth Programming Guide Book

Method

Introduction

Approaches to Software Design - Partitioned Channel Design, Object Oriented Design, The Study of Automated Fire Alarm Systems

Object Modeling Using Unified Modeling Language (UML) – Basic Object Oriented concepts, UML diagrams, Use case model, Class diagram, Descriptive Diagrams, Activity Diagram, Statechart Diagram.

Introduction to Java - Java programming Environment and Runtime Environment, Development Platform - Standard, Enterprise, Java Virtual Machine (JVM), Java exception, Variables, Java arrays, Java Structures, Java program Structure, Classes, Generic Collection, Local Issues.

Module 9

Cross-Disciplinary:

Number Data types - Integer, Floating Point Types, Character, Boolean, Length, Type
Conversion and Casting Variables, Arrays, Records, Nested types.

**Opentext - Antivirus Opentext, Bitwise Opentext, Business Opentext, Business Logical
Opentext Assessment Opentext Protection Opentext Recovery Opentext Recovery Protection**

Credit Insurance : Selective Standard Rating Systems and Their Derivatives

Object-Oriented Programming in Java - Class, Constructors, Declaring Objects, Object References, Introduction to Methods, Construction, this Keyword, Method Overloading, Using Objects in Functions, Returning Objects, Scenarios, Access Control, Static Members, Final Members, Inner Classes, Anonymous Local Classes, Lambda Expressions.

Inheritance: Super Class, Sub Class, The Keyword super, protected Members, Calling Order of Constructors, Method Overriding, the Object class, Abstract Classes and Methods, using final with Inheritance.

W-1

More than one set

Package and Interfaces - Defining Packages, CLASSPATH, Access Privileges, Importing Packages, Declaring

Exception Handling - Checked Exceptions, Unchecked Exceptions, try Block and finally Clause, Multiple catch Clause, Nested try Statement, throws Clause and finally.

Import/Export - IO Basin, Nursing Council Import, Nursing Council Export, Stratiflow Class, Convair Skymaster and Convairstream Minnesota Flyer

Module 4**Advanced features of Java:**

Java Library - String Handling - String Constructors, String Length, Special String Operations - Character Extraction, String Comparison, Searching String, Modifying String, using `valueOf()`, Comparison of StringBuilder and String.

Collection framework - Collection interface, Collection Interface- Collection Iterators, List Iterators.

Collection Class - ArrayList class, Accessing a Collection via its Iterator.

Event Handling - Event Handling Mechanism, Delegation Event Model, Event Classes, Sources of Events, Event Listener Interface, Using the Delegation Model.

Multithreaded Programming - The Java Thread Model, The Main Thread, Creating Thread, Creating Multiple Threads, Synchronization, Synchronizing, Renaming and Stopping Thread.

Module 5**Graphical User Interface and Database support of Java:**

Swing Fundamentals - Swing Key Features, Model View Controller (MVC), Swing Components, Components and Container, Swing Packages, Event Handling in Swing, Swing Layout Manager, Scrolling Objects - Frame, Label, The Swing Buttons, JTextField.

Java Database Connectivity (JDBC) - JDBC overview, Creating and Executing Queries - `createTable`, `delete`, `insert`, `select`.

Text Books:

1. Herbert Schildt, *Java: The Complete Reference*, 8/e, Tata McGraw-Hill, 2011.
2. Sajid Mir, *Fundamentals of Software Engineering*, 4th edition, PHI, 2011.
3. Paul Deitel, Harvey Deitel, *Java How to Program: Early Objects*, 10th Edition, Pearson, 2010.

Reference Books:

1. T. Daniel Liang, *Introduction to Java Programming*, 7/e, Pearson, 2012.
2. Jagadeesan R., *Deep Java: An Integrative Approach*, DownloadTechPress, 2001.
3. Ferguson L., *Java in a Nutshell*, 7/e, O'Reilly, 2005.
4. Bertrand R., J. Somogyi, *Object Oriented Design with UML and Java*, Elsevier, 2004.
5. Scott K. Beale, Paul Judd, 2/e, O'Reilly, 2005.
6. Basappaanur E., *Programming Java*, 5/e, Pearson, 2014.

Sample Course Level Assessment Questions:

Course Outcome 3(CO3): For the following passage develop UML diagrams and then implement it as a Java program in accordance with your UML design.

Passage: College Office collects semester fee and college fee for each student. A check at the college office collects the fees from each student. The fees are categorized depending on the duration of the corresponding course from the college. The semester fee varies depending upon the semester as well as branch of each student. Students are supposed to pay the fees in R.L. Extramurally admitted students are eligible for 50% discount on semester fee. The consolidated fees receipt is issued to each student by the clerk, which contains the student name, admission number, semester and branch of studies along with details of fees collected. Student sitting in and plays the details of fees received and dues if any. The system allows student and their level login to the system. Clerk is able to view reports of each class showing status of fees payment of each student.

Course Outcome 3(CO3): Write a Java program to evaluate a postfix expression containing two operators and a single operator using stack. Stack should be implemented in a separate utility class to reflect OOP concepts.

Course Outcome 3(CO3): Write a program to calculate the sum, max, min and product in Derived class.

Course Outcome 4(CO4): Write a GUI based program with separate buttons to add, delete and modify student details i.e. course, student ID, current semester and branch of study based on student ID.

Course Outcome 5(CO5): Using swing create a JFrame with a JLabel and two JButton. Set the texts of JButton as "One" and "Two" respectively. If the JLabel's text is to the text of the button currently being pressed initially the JLabel's text is blank.

Model Question Paper**QP CODE:****PAGE NO.:**

Reg No: _____

Time: _____

APU ABDUL KALAM TECHNOLOGICAL UNIVERSITY**TRIEST SEMESTER & TERM EXAMINATIONS, NOVEMBER & DECEMBER****Course Code: CSE 201****Course Name: Object Oriented Programming using Java****Max Marks: 100****Duration: 3 Hours****PART A****Answer all Questions. Each question carries 3 Marks.**

1. Briefly explain the primitive, reference and interface features of Java.
2. Define the concepts of object and class with a suitable Java program.
3. Explain the concept of method overriding with an example.
4. What is the use of the keyword 'final' in Java?
5. Explain the concept of arrays.
6. Explain any two applications of Object oriented.
7. Distinguish the usage of "==" and equals() method when comparing String type?
8. What is Collection in Java? Explain any one Collection interface in Java.
9. Explain any two properties of String class in Java.
10. Explain Polymorphism. With suitable examples explain any two of its varieties.

PART B**Answer any one question completely from each module**

(1)

- (a) Describe in detail any three Object Oriented Programming principles. Illustrate with suitable examples.

(9)

- (b) What is Java Native Environment? What is the role of Java Virtual Machine in it?
(2)

Q8

11.

- (a) Compare and contrast Java standard edition and Java enterprise edition.
(2)
- (b) Why is Java considered to be platform independent? What is the role of Dynamic linking Java platform independent?
(3)

12.

- (a) Explain in detail the primitive data types in Java.
(2)
- (b) Explain reference type conversion in Java with an example. What are the two conditions required for it?
(3)

Q9

13.

- (a) Using a suitable Java program explain the difference between private and public members in the context of inheritance.
(3)
- (b) Is it possible to use final keyword together with the static modifier? Give justifications for your answer.
(2)

14.

- (a) Explain in detail about byte streams and character streams with suitable code examples.
(3)
- (b) Describe in detail about exception handling by finally and next clauses with the help of a suitable Java program.
(3)

Q10

15.

- (a) Explain object oriented in Java. Explain the role of Encapsulation mechanism with a suitable code example.
(3)
- (b) Explain static, volatile and finally constructs with the help of a Java program.
(3)

- (i) Describe in detail the creation of a thread using the Runnable interface and the Thread class with suitable examples. (10)
- (ii) Explain the Difference between any two approaches followed by its example. (4)
- OR
- 14.
- (i) Explain in detail the Diagrammatic representation for creating threads in Java. (7)
- (ii) Write a simple program by extending appropriate class to demonstrate the working of threads in Java. (7)
- 15.
- (i) Write a Java program to demonstrate the use of Table and Thread by writing them in Thread. (7)
- (ii) Explain step-by-step procedure of using Java Database Connectivity in Java programs. (7)
- OR
- 16.
- (i) Explain the class hierarchy of Java String components. (7)
- (ii) Write a Java Program to create a student object and to add student details to it using JDBC. (7)

Teaching Plan		
Module 1 : Introduction		(11 hours)
L.1	Approaches in Software Design- Functional Oriented Design, Object-Oriented Design, Case Study of Automobil Fire Alarm System.	1 hour
L.2	Object Modeling Using UML - Basic object oriented concepts	1 hour
L.3	Basic object oriented concepts	1 hour
L.4	UML Diagrams, Use case model	1 hour
L.5	Class Diagram, Sequence Diagram	1 hour
L.6	Activity Diagram, State chart diagram	1 hour
L.7	Java programming Environment and Runtime Environment, Development Platforms- Standard, Enterprise, JVM, Java compiler, Scenarios	1 hour
L.8	Java applet, Java Standard, Java program structure, Comments, Debugging Techniques, Localized Errors	1 hour
Module 2: Core Java Fundamentals:		(11 hours)
L.9	Core Java Fundamentals: Primitive Data types, Images, Floating Point Types, Characters, Boolean	1 hour
L.10	Loops, Type Conversion and Casting, Variables, Arrays, Strings, Vectors, Lists	1 hour
L.11	Operators: Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operator, Conditional (Ternary) Operator, Operator Precedence	1 hour
L.12	Control Structures: Selection Statement, Decision Structures and Nested Structures	1 hour
L.13	Object Oriented Programming in Java: Class Fundamentals, Creating Objects, Object Reference, Initialization of Members	1 hour
L.14	Constructors, this Keyword, Method Overloading, Using Objects as Parameters	1 hour
L.15	Scanning Objects, Recursion, Access Control, static Members	1 hour

2.8	Final Variables, Date Classes, Command-Line Arguments, Variable Length Arguments.	1 hour
2.9	Decorators - Super class, Sub class, the keyword super, protected Members.	1 hour
2.10	Using Order of Construction, Method Overriding, the Object class.	1 hour
2.11	Anonymous Classes and Methods, Using final and interface.	1 hour
Module 1: More Features of Java		(8 hours)
3.1	Package and Interfaces, Declaring Package, CLASSPATH, Access Protection, Importing Packages.	1 hour
3.2	Annotations	1 hour
3.3	Input / Output: IO Stream, Reading Console Input, Writing Console Output, PrintWriter Class	1 hour
3.4	Object Streams and Serialization	1 hour
3.5	Working with Files	1 hour
3.6	Exception Handling: Checked Exceptions, Unchecked Exceptions, try Block and next Class.	1 hour
3.7	Multiple Inheritance, Nested by Framework	1 hour
3.8	show, derive and finally	1 hour
Module 4: Advanced features of Java		(8 hours)
4.1	Text Library: String Handling – String Constructors, String Length, Special String Operations	1 hour
4.2	Character Extraction, String Compression, Overloading Strings, Identifying Strings: Using valueOf(), Comparisons of String Buffer and String	1 hour
4.3	Collection framework - Collections interface, Collections interface, Collection interface	1 hour
4.4	List Interface, Collection Class – ArrayList Class	1 hour
4.5	Accessing Collection interface Services	1 hour
4.6	Event handling: Event Handling Mechanism, Delegation Event Model	1 hour
4.7	Delegation Event Model, Event Classes	1 hour

4.5	Source of Errors, Error Listener Definition, Using the Delegator Model	Three
4.6	Multithreaded Programming: The New Thread Model, The Main Thread, Creating Threads	Three
4.10	Creating Multiple Threads, Synchronization, Suspending, Resuming and Stopping Threads	Three
Module 2: Graphical User Interface and Database support of Java (8 hours)		
5.1	Swing fundamentals, Using Key Features	Three
5.2	AWT, Swing Controls, Components and Containers	Three
5.3	Swing Packages, Event Handling in Swing	Three
5.4	Swing Layout Managers	Three
5.5	Exploring Swing – Thomas, Kishor, The Swing Demos, Dersfeld	Three
5.6	JDBC overview, Creating and Executing Queries – create table, insert, update, delete (Basic SQL), TRIGGER concept as a prequel to JDBC	Three
5.7	Creating and Executing Queries – (insertable, delete, insert, select)	Three
5.8	Creating and Executing Queries – create table, delete, insert, select	Three



CODE	DATA STRUCTURES LAB	CATEGORY	L	T	P	CREDIT	YEAR OF INTRODUCTION
			PDC	6	03	3	

Description: The aim of the Course is to give hands-on experience for Learner to create and using different Data Structures. Data Structures are used to process data and storage data in different formats for many applications. The most commonly performed operations on data structures are traversing, searching, inserting, deleting and few special operations like merging and sorting.

Prerequisite: Basic covered under the course Programming in C (EST 101)

CO1	Write a time space efficient program using singly/linked lists/tree/graph to provide necessary functionality among a given set of user requirements (Cognitive Knowledge Level: Analyse)
CO2	Write a time space efficient program to sort a list of records based on a given key = file record (Cognitive Knowledge Level: Apply)
CO3	Examine a given Data Structure to determine its space complexity and time complexity of operations on it (Cognitive Knowledge Level: Apply)
CO4	Design and implement an efficient data structure to represent given data (Cognitive Knowledge Level: Apply)
CO5	Write a time space efficient program to convert an arithmetic expression from one notation to another (Cognitive Knowledge Level: Apply)
CO6	Write a program using linked lists to simulate Memory Allocation and Garbage Collection (Cognitive Knowledge Level: Apply)

Mapping of course outcomes with program outcomes

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

Mapping of POGs-Authorized by National Board of Accreditation

POG	What POG	POG	What POG
PO1	Engineering Knowledge	PO2	Techniques and Tools
PO2	Problem Analysis	PO3	Design
PO3	Design/Development of solutions	PO4	Individual and Team Work
PO4	Contact investigations of complex problems	PO5	Communication
PO5	Modern tool usage	PO6	Project Management and Finance
PO6	The Engineer and Society	PO7	Lifelong Learning

Assessment Pattern:

Bloom's Category	Continuous Assessment Test (External Test) Percentage	End Semester Examination Percentage
Remember	20	20
Understand	20	20
Apply	30	30
Analyze		
Evaluate		
Create		

Mark Distribution:

Total Marks	CIE Marks	TME Marks	ESI Duration
100	50	50	3 hours

Continuous Internal Evaluation Pattern:

Attendance	12 marks
Continuous Evaluation in Lab	30 marks
Continuous Assessment Test	12 marks
Viva-Voce	12 marks

Internal Examination Pattern: The marks will be distributed as Algorithm 30 marks, Programs 30 marks, Output 30 marks and Viva 30 marks. Total 100 marks which will be converted into 12 marks calculating internal Evaluation marks.

End Semester Examination Pattern: The marks will be distributed in Algorithm 30 marks, Programs 30 marks, Output 30 marks and Viva 30 marks. Total 100 marks will be converted into 12 for End Semester Examination.

Operating System to Use in Lab	: Linux
Compiler Software to Use in Lab	: gcc
Programming Language to Use in Lab	: ANSI C
For Lab Record:	
All Students entering the Data Structures Lab should have a For Record . The for record needs to be produced in the University Lab Documentation. Every experiment conducted in the lab should be noted in the for record. For every experiment in the for record the right hand page should contain Experiment Number, Date of Experiment, Aim of Experiment, Data Structure used and the operations performed on them, Details of Experiment including algorithm and Result of Experiment. The left hand page should contain a print out of the code used for the experiment and sample output lines of the a set of input.	

SYLLABUS

1. Implementation of Polynomials and Sparse matrix using array**
2. Implementation of stack, Queue, Priority Queue, De Queue and Circular Queue using array**
3. Application problems using stacks. Conversion of expression from infix notation to postfix notation **
4. Implementation of various linked list operations. **
5. Implementation of stack, queue and their applications using linked list practice
6. Implementation of tree using linked list
7. Representation of polynomials using linked list, addition and multiplication of polynomials. **
8. Implementation of binary tree using linked list and array- creation, insertion, deletion and traversal. **
9. Implementation of binary search tree - insertion, deletion, search, print, search and
10. Any application program using tree.
11. Implementation of sorting algorithms - bubble, insertion, selection, quick, merge sort

and keep sort.”^{**}

12. Implementation of searching algorithms - linear search, binary search.^{**}
13. Implementation of graphs and computing various parameters (in degree, out degree etc.) of a given 3D edge-weight matrix.
14. Implementation of BFS and DFS for each graph representation.^{**}
15. Implementation of hash table using open hashing. Functions and closures, collisions and overflow handling techniques.^{**}
16. Discussion of Big-O, Big-OH and Worst-Case analysis.
17. Discussion of a basic memory allocator and garbage collector using doubly linked list.
^{**} condition

DATA STRUCTURES LAB - PRACTICE QUESTIONS

1. Write a program to read two polynomials and store them as an array. Calculate the sum of the two polynomials and display the first polynomial, second polynomial and the resultant polynomial.
2. C Write a program to enter two matrices in general form . Write a function to convert two matrices to tuple form and display it. Also find the transpose of the two matrices represented in tuple form and display it. Find the sum of the two matrices in tuple form and display the sum in tuple form.
3. Write a program to enter two matrices in normal form . Write a function to convert two matrices to tuple form and display it. Also find the transpose of the two matrices represented in tuple form and display it. Find the sum of the two matrices in tuple form and display the sum in tuple form.
4. Implemented a circular queue using arrays with the operations:
 - 4.1 Insert an element to the queue.
 - 4.2 Delete an elements from the queue.
 - 4.3 Display the contents of the queue after each operation.
5. Implemented a Queue using arrays with the operations.

5. Insert elements to the Queue.
 - 5.1 Delete elements from the Queue.
 - 5.2 Display the contents of the Queue after each operation.
6. Implemented a Stack using array with the operations:
 - 6.1 Pushing elements to the Stack.
 - 6.2 Popping elements from the Stack.
 - 6.3 Display the contents of the Stack after each operation.
7. Implemented a Priority Queue using arrays with the operations:
 - 7.1 Insert elements to the Priority Queue.
 - 7.2 Delete elements from the Priority Queue.
 - 7.3 Display the contents of the Priority Queue after each operation.
8. Implemented a Double Ended Queue (DEQUEUE) with the operations:
 - 8.1 Insert elements to the Front of the queue.
 - 8.2 Insert elements to the Rear of the queue.
 - 8.3 Delete elements from the Front of the queue.
 - 8.4 Delete elements from the Rear of the queue.
 - 8.5 Display the queue after each operation.
9. Using栈 construct to left expression to a postfix expression and evaluate the postfix expression.
10. Write a program to convert an infix expression to a postfix expression using stacks.
11. Convert an infix expression to a postfix expression without using a stack.
12. Write a menu driven program for performing the following operations on a linked List:
 - 12.1 Display.
 - 12.2 Insert at Beginning.
 - 12.3 Insert at End.
 - 12.4 Insert at a specified Position.
 - 12.5 Delete from Beginning.
 - 12.6 Delete from End.
 - 12.7 Delete from a specified Position.
13. Implemented a Stack using linked list with the operations:
 - 13.1 Push elements to the queue.
 - 13.2 Pop elements from the queue.
 - 13.3 Display the queue after each operation.
14. Implemented a Queue using linked list with the operations:

- 14.1 Insert an element to the queue.
- 14.2 Delete an element from the queue.
- 14.3 Display the queue after each operation.
15. Write a program to reverse the content of queue using stack.
16. Write a program to read two polynomials and store them using linked list. Calculate the sum of the two polynomials and display the first polynomial, second polynomial and the resultant polynomial.
17. Write a program to read two polynomials and store them using linked list. Find the product of two polynomials and store the result using linked list. Display the resultant polynomial.
18. Write a program for addition of polynomials containing two variables using linked list.
19. The details of students (name, marks, total marks) are to be stored in a linked list. Write functions for the following operations:
- 19.1. Insert
 - 19.2. Delete
 - 19.3. Search
 - 19.4. Sort the marks in reverse.
 - 19.5. Display the resultant list after every operation.
20. Create a Doubly Linked List from a string taking each character from the string. Check if the given string is palindromic or not without method.
21. Create a binary tree with the following operations:
- 21.1. Insert a new node.
 - 21.2. Inorder traversal.
 - 21.3. Preorder traversal.
 - 21.4. Postorder traversal.
 - 21.5. Delete a node.
22. Write a program to create a binary search tree and find the number of leaf nodes.
23. Create a binary search tree with the following operations:
- 23.1. Insert a new node.
 - 23.2. Inorder traversal.
 - 23.3. Preorder traversal.
 - 23.4. Postorder traversal.
 - 23.5. Delete a node.

24. Write a program to sort a set of numbers using a binary tree.
25. Represent any given graph and
- 25.1 Perform a depth first search.
 - 25.2 Perform a breadth first search.
26. Create a text file containing the names, height, weight of the students in a class. Perform Quick sort and Merge sort on this data and store the resultant data in two separate files. Also write the time taken by the two sorting methods into the respective files.
- | Sr. | Name | Height | Weight |
|-----|--------------|--------|--------|
| 1 | Tony Stark | 5'7 | 60 |
| 2 | Arun Kapoor | 5'7 | 55 |
| 3 | Rajesh Kumar | 5'1 | 70 |
27. Write a program to sort a set of numbers using Floyd warshall find a particular number from the sorted list using Binary Search.
28. Implement a Hash table using Chaining method. Let the size of hash table be 11 so that the index ranges from 0 to 10.
29. Implement a Hash table that uses Linear Probing for collision resolution.

CSL 202	OBJECT ORIENTED PROGRAMMING LAB (IV JAVA)	CATEGORY	L	T	P	CREDIT	YEAR OF INTRODUCTION
							2019

Preamble: The aim of the course is to provide hands-on experience to the learners on various object oriented concepts in Java Programming. This course helps the learners to enhance the capability to design and implement various Java applications for real world problems.

Prerequisite: Topics covered under Java Java Programming at CSEIT (II).

Course Outcome:

At the end of the course, the student should be able to:

CO1	Implemented the Object Oriented concepts – construction, inheritance, method overriding & overloading and polymorphism in Java (Cognitive Knowledge Level - Apply)
CO2	Implemented programs in Java using type, datatype, operators, control, statements, built-in packages & interfaces, Input/Output streams and File (Cognitive Knowledge Level- Apply)
CO3	Implemented robust application programs in Java using exception handling (Cognitive Knowledge Level- Apply)
CO4	Implemented application programs in Java using multithreading and database connectivity (Cognitive Knowledge Level- Apply)
CO5	Implemented Object-Oriented Data Structure based application programs by utilizing various building blocks and Design patterns (Cognitive Knowledge Level- Apply)

Mapping of course outcomes with program outcomes:

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12
CO1	Y	Y	Y	Y	Y			Y	Y	Y		Y
CO2	Y	Y	Y	Y	Y			Y	Y	Y		Y
CO3	Y	Y	Y	Y	Y			Y	Y	Y		Y
CO4	Y	Y	Y	Y	Y			Y	Y	Y		Y
CO5	Y	Y	Y	Y	Y			Y	Y	Y		Y

National Curriculum Framework for School Education			
Code	Broad PO	Code	Broad PO
PO1	Engineering Knowledge	PO7	Environment and Sustainability
PO2	Problem Analysis	PO8	Teamwork
PO3	Design/Development of solutions	PO9	Individual and team work
PO4	Conduct experiments and analysis of complex processes	PO10	Communication
PO5	Skills based competencies	PO11	Project Management and Finance
PO6	The Engineer and Society	PO12	Lifelong learning

Assessment Pattern

Bloom's Category	Curriculum Assessment Pre - Interval Times (Percentage)	End Semester Examination (Percentage)
Remember	20	20
Understand	20	20
Apply	40	40
Analyse		
Evaluate		
Create		

Mark Distribution

Total Marks	CIE Marks	ESV Marks	ESX Duration
100	50	75	2 hours

Continuous Internal Evaluation Process:

Abstraction	15 minutes
Continuous Evaluation in Lab	10 minutes
Continuous Assessment Test	15 minutes
Viva-voca	10 minutes

Internal Examination Pattern: The marks will be distributed as Algorithm 20 marks, Programs 20 marks, Output 20 marks and Viva 20 marks. Total 100 marks which will be converted out of 10 while calculating Internal Examination marks.

End Semester Examination Pattern: The marks will be distributed as Algorithm 30 marks, Programs 20 marks, Output 20 marks and Viva 20 marks. Total 100 marks will be converted out of 75 for End Semester Examination.

Operating Systems in the Lab : Linux

Compiler Software in the Lab : gcc, g++, jdk, java, Eclipse, NetBeans, MySQL, PostgreSQL

Programming Language in the Lab : Java

Fair Lab Record:

All Students attending the Object Oriented Programming Lab (as lab) should have a Fair Record. The Fair record should be submitted to the University Lab Examination. Every experiment conducted in the lab should be listed in the fair record. For every experiment in the fair record the eight head page should contain Experiment Number, Experiment Name, Date of Experiment, Aim of Experiment, Operations Performed, Details of Experiment including algorithm and Result of Experiment. The last head page should contain a print out of the code used for the experiment and sample output obtained for a set of input.

SYLLABUS

The syllabus contains ten sections (A, B, C, D, E, F). Each section consists of three computer-based exercises, out of which at least two questions are mandatory.

(a) Write programs using identifiers, operators, and control constructs in Java:

- 1) Write a Java program that checks whether a given string is a palindrome or not. Ex. MADAM is a palindrome. **
- 2) Write a Java Program to find the frequency of a given character in a string. **
- 3) Write a Java program to multiply two given integers. **

(B) Object Oriented Programming Concepts: Problem on the use of constructors, inheritance, method overriding & overloading, polymorphism and garbage collection:

- 4) Write a Java program which creates a class named Employee having the following members: Name, Age, Phone number. Address. Below it also has a method named printSalary() which prints the salary of the Employee. Two classes Officer and Manager inherit the Employee class. The Officer and Manager classes have data members: experience and department respectively. Name, designations, age, phone number, address and salary. Write a Java and a program by making an object of both of these classes and print the same. (Exercise to understand inheritance). **
- 5) Write a Java program to create an abstract class named Shape that contains an abstract method calculateAreaOfficer();. Precise Area, Square, triangle, Rectangle, Triangle and Hexagon note that each one of the classes extends the class Shape. Each one of the classes overrides only the method calculateAreaOfficer(); that stores the number of sides in the given procedural structure. (Exercise to understand polymorphism). **
- 6) Write a Java program to demonstrate the use of garbage collection.

(C) Handling different types of Exceptions and input and output management methods:

- 7) Write a file handling program in Java with reader and writer.
- 8) Write a Java program that read from a file and write to file by handling all the related exceptions. **
- 9) Write a Java program that reads a file of images, and then displays each image, and the sum of all the images (Use StringTokenizer class of java.util). **

(D) Exception handling and multi-threading applications:

- (b) Write Java program that shows the usage of try, catch, throws and finally. **
- (c) Write a Java program that implements a multi-threaded program which has three threads. First thread generates a random integer every 1 second. If the value is even, second thread computes the square of the number and prints. If the value is odd the third thread will print the value of cube of the number.
- (d) Write a Java program that shows linked synchronization. **

(E) Graphics Programming:

- (1) Write a Java program that works as a simple calculator. Accepts 2 numbers from the user and the + - * / operations property. Add a text field to display the result. Handle all possible exceptions like divide by zero. Use Java Swing. **
- (2) Write a Java program that simulates a traffic light. The program has the user select one of three lights red, yellow or green. When a radio button is selected, the light is turned on, and only one light can be on at a time. No light is on when the program starts. **
- (3) Write a Java program to display all records from a table using Java Database Connectivity (JDBC).

(F) Standard Searching and Sorting Algorithms using data structures and algorithms learned from course Data Structures (CST 101):

- (1) Write a Java program for the following. **
 - 1) Create a doubly linked list of elements.
 - 2) Delete a given element from the above list.
 - 3) Display the contents of the list after deletion.
- (2) Write a Java program that implements Quick sort algorithm for sorting a list of names in ascending order. **
- (3) Write a Java program that implements the binary search algorithm.

** Mandatory

PRACTICE QUESTIONS

- 1) Write a Java program to reverse an given string.
- 2) Write a Java program to display the transpose of a given matrix.
- 3) Write a Java program to find the second smallest element in an array.
- 4) Write a Java program to check whether a given number is prime or not.
- 5) Write a Java program to calculate the area of different shapes namely circle, rectangle and triangle using the concept of method overloading.
- 6) Write two Java classes Employee and Manager. Manager should inherit from Employee class. Employee class has two methods salary() and calculate(). Write a program to display the employee salary and to display from Employee class using a single object invocation (i.e., only one object creation is allowed).
 - * salary() will print the name of the class and then returns key value. Ex. "Name of class is Employee."
 - * calculate() in Employee displays "Salary of employee is 10000" and calculate() in Manager displays "Salary of employee is 20000."
- 7) Write a Java program to implement Iterator interface.
- 8) Write a Java program that allows user to create a user-defined exception.
- 9) Write a Java program to create two threads. One for displaying all odd numbers between 1 and 100 and second thread for displaying all even numbers between 1 and 100.
- 10) Write a Java program that shows final keyword.
- 11) Write a Java program that reads a file and displays the file as the output, with a line number before each line.
- 12) Write a Java program that displays the number of characters, lines and words in a text file.
- 13) Write a Java program for handling various errors.
- 14) Write a Java program for handling key events using Adapter classes (parent).
- 15) Write a Java program that allows the user to draw lines, rectangles and arcs.
- 16) Write a Java Swing program to print a tree form on the output screen.
- 17) Write a program to accept name, name, CGPA of "n" students and store the data in a database using JDBC connectivity. Display the list of students having CGPA greater than 7. (Use MySQL, PostgreSQL).
- 18) Write a Java program to implement Floyd sort algorithm using array.

ADILABDUL KALAM
TECHNOLOGICAL
UNIVERSITY

SEMESTER IV



MATH588	PROBABILITY AND STATISTICAL MODELLING	Category	I	T	P	Credit	Year of Introduc-
		ESC	1	1	0	4	2019

Prerequisite: Only if this course provides the learners a clear understanding of fundamental concepts in probability and statistics. This course covers the classical theory of probability and statistics, conjugate models of sampling, techniques of hypothesis testing and correlation & regression. The course helps the learners in their varied applications in engineering and science like quality control, process control and economic statistics.

Transactions of the Royal Society of Edinburgh

Version of record available at: <https://doi.org/10.1017/ntr.2019.001>

C01	Explain the concept, properties and important models of discrete random variables and use them to analyse binomial random processes (Cognitive Knowledge Level: Apply)
C02	Explain the properties and relevant models of continuous random variables and use them to analyse uniform random processes (Cognitive Knowledge Level: Apply)
C03	Make use of concepts of sampling and theory of estimation to solve application level problems (Cognitive Knowledge Level: Apply)
C04	Explain the basic concepts in hypothesis testing and employ decision procedures for the most frequently encountered testing problems (Cognitive Knowledge Level: Apply)
C05	Build statistical methods like covariance and regression analysis to interpret experimental data (Cognitive Knowledge Level: Apply)

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Abilities POs defined by National Board of Accreditation			
PO+	Broad PO	PO+	Broad PO
PO1	Engineering Knowledge	PO1	Environment and Sustainability
PO2	Problem Analysis	PO2	Ethics
PO3	Design/Development of solutions	PO3	Innovation and research
PO4	Understand complex problems	PO10	Communication
PO5	Modern tool usage	PO11	Project Management and Finance
PO6	De Engineer and Society	PO12	Life-long learning

Assessment Details

Blooms Category	Continuous Assessment (%)		End Semester Examination Marks (%)
	Test 1 (%)	Test 2 (%)	
Remember	30	30	30
Understand	30	30	30
Apply	40	40	40
Analyse			
Evaluate			
Create			

Mark Distribution:

Total Marks	CIE Marks	EIE Marks	EIE Duration
50	50	50	5

Continuous Internal Examination Pattern:

<u>Aptitude</u>	30 marks
<u>Continuous Assessment Test (average of Internal Test 1 & 2)</u>	15 marks
<u>Continuous Assessment Report</u>	15 marks

Internal Examination Pattern

Each of the two internal examinations has to be conducted out of 30 marks. The aptitude test shall be preferentially conducted after completing the first half of the syllabus and the second aptitude test shall be preferentially conducted after completing remaining part of the syllabus. There will be two parts, Part A and Part B. Part A contains 2 questions (preferably, 1 question each from the completed modules and 1 question from the partly completed module), having 3 marks for each question adding up to 12 marks for part A. Students should answer all questions from Part A. Part B contains 1 question (preferably, 1 question each from the completed modules and 1 question from the partly completed module), each with 7 marks. Out of the 7 questions, a student should answer any 5.

End Semester Examination Pattern:

There will be two parts, Part A and Part B. Part A contains 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 full questions from each module of which student should answer any one. Each question can have maximum 2 sub-questions and carries 17 marks.

Syllabus:**Module-1 (Shows probability distributions)**

Discrete random variables and their probability distributions, Expectation, mean and variance, Binomial distribution, Poisson distribution, Poisson approximation to the binomial distribution, Discrete uniform distribution, marginal distributions, Independent random variables, Expectation, multiple random variables.

Module - 2(Continuous probability distributions)

Continuous random variables and their probability distributions, Expectation, mean and variance, Uniform, exponential and normal distributions, Continuous bivariate distributions, marginal distributions, Independent random variables, Expectation, multiple random variables, univariate and bivariate normally distributed (1.1.2) random variables and Centralized theorem (Proof not required).

Module - 3(Sampling Techniques)

Sampling, Some Fundamental Definitions, Important Sampling Distributions, Sampling Theory, Fischer's Exact, Concept of Standard Error, Estimation, Estimating the Population Mean (A), Estimating Population Proportion, Sample Size and its Determination, Determination of

Sample Size through the Approach Based on Previous Rate and Confidence Level Determination of Sample Size through the Approach Based on Bayesian Posterior

Module - 4 (Testing of Hypothesis)

Hypotheses and Test Procedures. Test about a population mean. Test concerning a population proportion, p-value. Single factor ANOVA, F-test. Multiple comparisons in ANOVA. Two factor ANOVA.

Module - 5 (Correlation and Regression Analysis)

Simple Linear Regression Model, Examining causal pattern. Correlation, Non-Linear and multiple regression, Assessing Model Adequacy, Regressions with transformed values, Polynomials, Regression, Multiple Regression Analysis.

Text Books:

1. Jay L. Devore, Probability and Statistics for Engineering and the Sciences, 8th edition, Cengage, 2012.
2. Research Methodology: Methods and Techniques, C.R. Rao, New Age International Publishers.

Reference Books:

1. Mendenhall-2008, Introduction to Probability, Statistics and Random Processes, Kappa Science, 2014 [Also available online at www.probabilitycourse.com.]
2. Sheldon M. Ross, Introduction to probability and statistics for engineers and scientists, 4th edition, Elsevier, 2009.
3. T. Venugopal, Probability, Statistics and Random processes, Tata McGraw-Hill, 2008.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 34 Edn., 2013.
5. Deva R.L. and Robin D.L., Statistics for Management, 7th edition, Prentice Hall of India Pvt. Ltd., New Delhi, 2011.
6. Gummadi TK, Balaiah Zaga, Statistics for Managers, Tata McGraw Hill, 2010.
7. Arun Kumar, Statistics for Managers, Faculty Publishing House, Second Revised edition, 2008.
8. Gupta A.M., Gupta M.K. and Deshpande S. (2002) Fundamentals of Statistics, Vol. I & II, 10.5 Edition, The World Press, Kolhapur.
9. Miller, Irwin and Miller, Maryland (2004) John E. Freund's Mathematical Statistics with Applications, 7th Edition, Pearson Education, Inc.
10. Sampling of Populations: Methods and Applications (2007); Paul S. Levy , Stanley Lemeshow (Fourth Edition), John Wiley & Sons.

Course Level Assessment Questions**Course Outcome 1 (CO1):**

1. Digmarn is a company liciting ticket sales to a maximum of 74 tickets per customer. Let T be the number of tickets purchased by a random customer. Then the probability distribution of T :

Demand tickets	0	1	2	3	4
P(T)	0.1	0.2	0.2	0.2	0.1

Calculate the expected value of T .

1. X is a binomial random variable $B(n, p)$ with $n = 100$ and $p = 0.1$. Show that you approximate it by a Poisson random variable.
2. Three balls are drawn at random without replacement from a box containing 2 white and 4 black balls. Let X denotes the number of white balls drawn and Y denotes the number of red balls drawn. Find the joint probability distribution of (X, Y) .

Course Outcome 2 (CO2):

1. What can you say about $P(X = 0)$ for any real positive value X is a (i) discrete random variable? (ii) continuous random variable?
2. Let X be a random variable with PDF given by

$$f(x) = \begin{cases} cx^2 & x \geq 0 \\ 0 & \text{Otherwise} \end{cases}$$

- a. Find the constant c .
 - b. Find $E(X)$ and $V(X)$.
 - c. Find $P(X \geq 1)$.
2. A string, 1 meter long, is cut into two pieces at a random point between its ends. What is the probability that the length of one piece is at least twice the length of the other?

Course Outcome 3 (CO3):

1. In a random selection of 49 of the 2460 inhabitants in a small city, the mean number of motor accidents per year was 7.2 and the sample standard deviation was 0.3.
 - a. Make an estimate of the standard deviation of the population from the sample standard deviation.
 - b. Work out the standard error of mean for this finite population.
 - c. If the desired confidence level is 0.90, what will be the upper and lower limits of the confidence interval for the mean number of accidents per inhabitant per year?

- Suppose a certain blood component is measured as determining the percentage of the heart's gases, who stay for more than 7 days. The manufacturer wants to be 95% per cent confident that the percentage has been estimated to be within $\pm 2\%$ of the true value. What is the most conservative sample size needed for this protocol?
- 200 studies were selected at random out of a batch containing 1000 studies and 20 were found defective. How many defective studies would you reasonably expect to find in the whole batch?

Crucible Outcome 4 (CO4):

- A manufacturer of cylindrical containers used for fire protection is often challenged, claims that the true average cylinder-detonation temperature is 135°F. A sample of 200 cylinders, when tested, yields a sample average detonation temperature of 131.00°F. If the distribution of detonation times is normal with standard deviation 1.5°F, does the data contradict the manufacturer's claim at significance level $\alpha=0.017$?
- Let us denote the true average detonation by μ (degrees per liter). The value 1 pCIL is considered the dividing line between safe and unsafe times. Would you recommend testing $H_0: \mu = 135$ versus $H_1: \mu < 135$ or $H_0: \mu = 135$ versus $H_1: \mu > 135$? Explain your reasoning.
- Given a T^2 -statistic and significance levels, α , are given. For each pair, state whether the observed T^2 -value would lead to rejection of H_0 at the given significance level.
 - $T^2\text{-value} = 0.004$, $\alpha = 0.32$
 - $T^2\text{-value} = 0.005$, $\alpha = 0.005$

Crucible Outcome 5 (CO5):

- Calculate and interpret the covariance coefficient of the two variables below:

Distance	Speed	Height
A	17	120
B	12	125
C	18	149
D	14	135
E	22	112

- You are told that a 95% CI for reported land-locked river traffic flow is 13, based on a sample of 200 observations in (482.1, 137.7). Calculate a CI with confidence level 99% for expected land-locked river traffic flow in 11.
- A trucking company considered a multiple regression model for relating the dependent variable y travel time (travel time for one of its drivers) to the predictors x_1 distance travelled (miles) and x_2 the number of deliveries made. Suppose that the model equation is $y = 4.800 + 0.048x_1 + 0.900x_2$. What is the mean value of travel time when distance travelled is 50 miles and there are 40 deliveries made?

Model Question Paper**QF CODE:**

Reg No: _____

Name: _____

PAGES : 8

APV ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FOURTH SEMESTER B.TECH DEGREE EXAMINATION, MONTH & YEAR

Course Code: MAT253

Course Name: Probability and Statistical Modelling

Max Marks: 100

Duration: 3 Hours

PART A

Answer All Questions. Each Question Carries 5 Marks

- Let X denote the number that shows up when we roll a biased die. Two faces of the die are equally likely, while three faces are slightly as may other. Find the probability distribution, mean and variance of X .
- An equipment consists of 3 components each of which fails independently with probability 0.17. If the equipment is able to function properly when at least 2 of the components are operational, what is the probability that it functions properly?
- A certain machine has a normal distribution with standard deviation 10.27. The probability that it will take on a value less than 12.2 is 0.52, what is the probability that it will take on a value more than 23.2?
- X and Y are independent random variables with X following an exponential distribution with parameter λ and Y following an exponential distribution with parameter μ . Find $P(X+Y \leq 1)$.
- Discuss the difference between F-distribution and Chi-square distribution.
- From a random sample of 36 New Delhi and vicine personnel, the mean age and the standard deviation were found to be 40 years and 4.5 years.

- respectively. Construct a 95 per cent confidence interval for the mean age of child workers in New Delhi.
7. A sample of 20 houses used in a previous yields a sample mean distance of 15.87 km and a sample standard deviation of 3.4 km. The desired true average distance of such houses is 15.00 km. Does the data strongly suggest that the true average distance of such houses is something other than what is desired? Test using $\alpha=0.01$.
8. A random sample of 110 swimming lessons in a certain region resulted in a sample average rate cancellation of 0.11 per and a sample standard deviation of 0.04 per. Calculate a 99% (two-sided) confidence interval for the true average rate of cancellation, and interpret the resulting interval.
9. Let the real statistic T have a distribution with M_1 is true. Give the significance level for the following rejection M_1 , H_0 : H_1 rejection region $\{T \leq T_{\text{crit}}$.
10. Calculate the regression coefficient and sketch the lines of regression for the following data. (10 marks)
- | | | | | | | | | |
|---|---|---|----|----|----|----|----|----|
| X | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Y | 9 | 1 | 10 | 12 | 11 | 13 | 15 | 14 |
- Part B**
- (Answer any one question from each module. Each question carries 14 Marks)
11. (a) The probability mass function of a discrete random variable is $P(x) = kx$, $x = 1, 2, 3$ where k is positive constant. Find (i) the value of k (ii) $P(X > 2)$. (iii) $E(X)$ (iv) $\text{Var}(X)$
- (b) Find the mean and variance of a binomial random variable. (14)
- Q3:**
12. (a) An accident occurs at an intersection at a Poisson rate of 2 per day. What is the probability that there would be no accidents on a given day? What is the probability that in January (say) you will meet 7 days (not necessarily consecutive) without any accident? (14)
- (b) One fair die is rolled. Let X denote the number on the die and $V = 1$ or 1, according as the die shows an even number or odd number. Find (i) the joint probability distribution of X and V , (ii) the marginal distributions (iii) are X and V independent? (14)

12. (a) The IQ of an individual randomly selected from a population is a normal distribution with mean 120 and standard deviation 12. Find the probability that an individual has IQ (i) above 140; (ii) between 120 and 130. (7)
- (b) A continuous random variable X is uniformly distributed with mean 7 and variance 4. Find $P(X > 10)$. (7)

Q8.

14. (a) The joint density function of random variables X and Y is given by (7)

$$f(x, y) = \begin{cases} e^{-x-y}, & x>0, y>0 \\ 0 & \text{otherwise} \end{cases}$$

Find $P(X + Y \leq 1)$. Are X and Y independent? Justify.

- (b) The lifetime of a certain type of electric bulb may be considered to be exponentially random variable with mean 20 hours. Using central limit theorem, find the approximate probability that 100 of these electric bulbs will provide a total of more than 6000 hours of burning time. (7)
15. (a) A related research survey in which 99 consumers were contacted and more than 64 percent of all consumers, of course, purchase products associated with the product's advertising. Find the confidence limits for the proportion of consumers interested by advertising in the population, given a confidence level equal to 0.95. (7)
- (b) Determine the size of the sample for estimating the true weight of the zeroset passengers for the airplane with $N = 2000$ on the basis of the following information:
- the variance of the flight = 4 minutes on the basis of past records;
 - estimate should be within 0.5 minutes of the true average weight with 99% probability.

Q9.

16. (a) The Sherman & FANC mining company has estimated the average quantity of iron ore extracted to be 14.7 tons per shift, and the sample standard deviation to be 1.5 tons per shift, based upon a random selection of 4 shifts. Construct a 90 percent confidence interval around this estimate. (7)

- (b) What should be the size of the sample if a simple random sample from a population of 4000 items is to be drawn to estimate the percent defective within 2 per cent of the true value with 95.5 per cent probability? What would be the size of the sample if the population is assumed to be infinite in the process? (7)
- (c) The calibration of a scale is to be checked by weighing 17 kg test specimens 27 times. Suppose that the results of different weighings are independent of one another and that the weight on each trial is normally distributed with $\mu = 17.00\text{kg}$. Let λ denote the true average weight resting on the scale.
- What hypotheses should be tested? (7)
 - Suppose the scale is to be recalibrated if either $|17.00 - \bar{x}| > 0.200$ or $|\bar{x} - 17.00| > 0.200$. What is the probability that recalibration is forced out when it is actually unnecessary? (7)

OR

- (d) Lightbulbs of a certain type are advertised as having an average lifetime of 150 hours. The prove of these bulbs is very formidable, so a potential customer has decided to go ahead with a purchase if an expected value can be reasonably demonstrated that the true average lifetime is smaller than what is advertised. A random sample of 30 bulbs was selected, the lifetime of each bulb determined, and the appropriate hypotheses were tested using Mann-Whitney's test, resulting in the accompanying output.
- | Variable | N | Mean | SE Mean | Z | P-value |
|----------|----|--------|---------|-------|---------|
| Lifetime | 30 | 138.44 | 3.12 | -1.46 | 0.143 |
- What conclusion could be appropriate for a significance level of 0.01? A significance level of 0.01? What significance level and conclusion would you recommend? (7)
- (e) The recommended daily dietary allowance for iron among males older than age 10 years is 15 mg/day. The article "Nutrient Intake and Dietary Patterns of Older Americans: A National Study" reports the following summary data on intake for a sample of males ages 65–74 years: $n=112$, $\bar{x}=11.3$, and $s=6.42$. Does this data indicate that average daily iron intake in the population of all males ages 65–74 falls below the recommended allowance? (7)

- (f) The flow rate, (m^3/min) in a device used for air-quality measurement depends on the pressure drop (mmHg) across the device's filter. Suppose that for $n=10$ values between 5 and 20, the two variables are related according to the simple linear regression model with true regression line $y = -0.12 + 0.02x$.

- (a) What is the reported change in flow rate associated with a 1% increase in pressure drop? Explain. (1)
- (b) What change in flow rate can be expected when pressure drop decreases by 5%? (1)

Q8.

28. Suppose that in a certain chemical process the reaction time, y , (in hours) is related to the temperature ($^{\circ}\text{C}$) in the reactor, x , at which the reaction takes place according to the simple linear regression model with equation $y = 1.00 + 0.01x$ and $s_e = 0.07$.
- (a) What is the reported change in reaction time for a 1 $^{\circ}\text{C}$ increase and 10 $^{\circ}\text{C}$ increase in temperature? (1)
- (b) What is the expected reaction time when temperatures is 200 $^{\circ}\text{C}$ and 210 $^{\circ}\text{C}$? (1)

Teaching Plan

No.	Content	No. of Lecture Hours (at 45 min)
Module 1. (Discrete Probability distributions) (9 hours)		
1.1	Discrete random variables	1 hour
1.2	Probability Distributions	1 hour
1.3	Expectation, mean and variance	1 hour
1.4	Binomial distribution	1 hour
1.5	Poisson distribution	1 hour
1.6	Poisson approximation to binomial Distribution	1 hour
1.7	Discrete Uniform distribution	1 hour
1.8	Marginal distributions, Independent Events condition	1 hour
1.9	Experiment involving random variables	1 hour
Module 2 Continuous Probability distributions (8 hours)		
2.1	Continuous random variables and probability distributions	1 hour

1.1	Expectation, area and variance	1 hour
1.2	Uniform distribution	1 hour
1.4	Exponential Distribution	1 hour
1.5	Normal distribution	1 hour
1.6	Continuous Uniform distribution	1 hour
1.7	Marginal distribution, Disjoint Union variables	1 hour
1.8	Expectation-multiple random variables, Joint function variables	1 hour
1.9	Central limit theorem	1 hour
Module 3 (Sampling Techniques) (9 hours)		
3.1	Need for Sampling	1 hour
3.2	Some fundamental Definitions, Important Sampling Distributions	1 hour
3.3	Sampling Theory, Random's Action	1 hour
3.4	Concept of Standard Error, Estimation, Estimating the Population Mean(s)	1 hour
3.5	Estimating Population Proportion	1 hour
3.6	Sampling and its Distributions	1 hour
3.7	Determination of Sample Size through the Approach Based on Precision, Risk and Confidence Level	1 hour
3.8	Determination of Sample Size through the Approach Based on Bayesian Criterion	1 hour
3.9	Determination of Sample Size through the Approach Based on Bayesian Criterion (continued)	1 hour
Module 4 (Testing of Hypothesis) (9 hours)		
4.1	Null and alternate Hypotheses	1 hour
4.2	Test Procedure	1 hour
4.3	Test Two element population mean	1 hour
4.4	Test concerning a population proportion	1 hour
4.7	p-value	1 hour

4.6	Simple linear ANOVA	1 hour
4.7	F Test	1 hour
4.8	Multiple comparisons in ANOVA.	1 hour
4.9	The Factor ANOVA.	1 hour
Module 5 (Correlation and Regression Analysis) (9 hours)		
5.1	Simple Linear Regression Model(Lecture 1)	1 hour
5.2	Simple Linear Regression Model(Lecture 2)	1 hour
5.3	Assumptions of regression	1 hour
5.4	Correlation	1 hour
5.5	Non Linear and multiple regression	1 hour
5.6	Assessing Model Adequacy	1 hour
5.7	Regression with ordinal values	1 hour
5.8	Polynomial Regression	1 hour
5.9	Multilevel Regression Analysis	1 hour



COURSE	COMPUTER ORGANISATION AND ARCHITECTURE	CATEGORY	1	T	P	CREDIT	YEAR OF INTRODUCTION
			PGC	3	1		

Principle:

The course is prepared with the view of enabling the learners capable of understanding the functional architecture of a digital computer. Study of Computer Organisation and Architecture is essential to understand the hardware behind the code that is executed at physical level by interacting with existing memory and I/O modules. It helps the learners to understand the fundamental steps involved in system design so that they can attend the process of design organisation to detect and solve problems occurring in computer architecture.

Prerequisite: Topics covered under the course Logic System Design (CST300).

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

CO1	CO
CO2	Recognise and explain the structure of basic components, I/O expansion and functioning of memory in a digital computer (Cognitive Knowledge Level)
CO3	Explain the types of memory systems and storage functions used in memory system (Cognitive Knowledge Level: Understand)
CO4	Develop the control signals required for the execution of a given instruction (Cognitive Knowledge Level: Apply)
CO5	Elaborate the usage of Arithmetic Logic Unit and explain the usage of registers in it (Cognitive Knowledge Level: Apply)
CO6	Explain the implementation aspects of arithmetic operations in a digital computer (Cognitive Knowledge Level: Apply)
CO7	Develop the control logic for a given arithmetic problem (Cognitive Knowledge Level: Apply)

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓	✓								✓
CO2	✓	✓	✓	✓	✓				✓			✓
CO3	✓	✓	✓	✓	✓				✓			✓
CO4	✓	✓	✓	✓	✓				✓			✓
CO5	✓	✓	✓	✓					✓			✓
CO6	✓	✓	✓	✓					✓			✓
CO7	✓	✓	✓	✓								✓

映射 POs 与课程评估标准

PO	Broad PO	PO	General PO
PO1	Technological Readiness	PO7	Environment and Sustainability
PO2	Problem Analysis	PO8	Ethics
PO3	Design/Development of solutions	PO9	Individual and Team work
PO4	Conduct investigations and complex problem	PO10	Communication
PO5	Modern tool usage	PO11	Project Management and Finance
PO6	The Engineer and Society	PO12	Life Long Learning

Assessment Patterns

Blooms's Category	Continuous Assessment Data		Total Semester Examination Marks (%)
	Test (%)	TA/T (%)	
Remember	20	20	30
Understand	40	40	30
Apply	40	40	40
Analyze			

Exams			
Date:			

Mark Distribution

Total Marks	CE Marks	CE Marks	EST Derrives
15	9	10	3 from

Continuous Internal Evaluation Pattern:

Students _____ 10 marks

Common Assessment Test _____ 10 marks

Continuous Assessment Assignments _____ 10 marks

Internal Examination Pattern:

Each of the two internal examinations has to be conducted out of 20 marks.

The first Internal Examination shall be predominantly conducted after completing the first half of the syllabus and the second Internal Examination shall be predominantly conducted after completing the remaining part of the syllabus.

There will be two parts Part A and Part B. Part A contains 5 questions (preferably 2 questions each from the completed modules and 1 question from the partly covered module), having 1 mark for each question adding up to 10 marks for part A. Students should answer all questions from Part A. Part B contains 7 questions (preferably; 2 questions each from the completed modules and 1 question from the partly covered module), each with 7 marks. Out of the 7 questions in Part B, a student should answer any 5.

End Semester Examination Pattern:

There will be two parts, Part A and Part B. Part A contains 20 questions with 2 questions from each module, having 3 marks for each question. Students should answer all 20 questions. Part B contains 7 questions from each module of which students should answer any one. Each question can have maximum 2 sub-questions and carries 14 marks.

Syllabus**Module 1**

Basic Structure of computers - Functional units - basic operational concepts - bus structures, memory location and address, memory operations, instructions and instruction sequencing, addressing modes.

Basic processing unit - functional modules - instruction cycle - execution of a complex instruction - single bus and multiple bus organization.

Module 2

Register transfer logic - core register transfer - arithmetic, logic and shift micro operations. **Processor logic design** - processor organization - Arithmetic logic unit - design of arithmetic circuit - design of logic element - Design of arithmetic logic unit - stack register - design of buffer - processor unit - design of controller.

Module 3

Arithmetic algorithms: Algorithms for multiplication and division (bitwise method) of binary numbers, Army multiplier, Booth's multiplication algorithm.

Pipeline: Basic principle, classification of pipeline processes, synchronous and asynchronous pipeline (Design example not required), hazard detection and resolution.

Module 4

Control Logic Design: Control organization - Hard-wired control/microprogrammed control - control of processor unit - Microprogram representation, programmed CPU organization - horizontal and vertical micro instructions.

Module 5

I/O organization: overview of I/O devices - interrupt, interrupt handling, Direct memory access.

Memory system: basic concepts – semiconductor RAMs; memory system considerations – SDRAM; Cache: interleaved memory; cache organization - mapping functions

Text Books:

1. Hennessy J., D. Patterson: Computer Organization 3/e, McGraw-Hill, 2011.
2. Mano M.M., Digital Logic & Computer Design, Prentice Hall, 2004.
3. Hwang, F., P. Alay Brigg, Computer architecture and parallel processing, McGraw-Hill, 1994.

Reference Books:

1. Mano M.M., Digital Logic & Computer Design, 3/e, Prentice Hall, 2011.
2. Patterson G.A. and J.L. Hennessy, Computer Organization and Design, 3/e, Morgan Kaufmann Publishers, 2011.
3. William Dally, Computer Organization and Architecture: Designing for Performance, Pearson, Pg, 2013.
4. Gulledge R., Computer Organization and Design, 2/e, Prentice Hall, 2009.
5. Rajwar R. and T. Radhakrishnan, Computer Organization and Architectures, Prentice Hall, 2011.

Sample Course Level Assessment Questions:

Course Outcome 1(CO1): Which are the registers contained in a memory access operation and how are they involved in it?

Course Outcome 2(CO2): Explain the organization of the system to handle 1) write miss condition inside the cache memory

Course Outcome 3(CO3): Describe the sequence of control signals required for the execution of the instruction $M[D1:X1]$ in a流水线 processor.

Course Outcome 4(CO4): Design a 4-bit combinational logic shifter with 2 control signals: MS and MI that perform the following operations:

H1	H2	Operations
0	1	Transfer 1's to all right bits
0	0	No shift operation
1	0	Shift left
1	1	Shift right

Course Outcome 5(CO5): Explain the rounding algorithm for binary division. Also prove the algorithm to divide (1001) $_2$ by (11).

Course Outcome 6(CO6): Design a voltage control logic based on microprogrammed control to perform the addition of 2 signed numbers represented in sign magnitude form.

Model Question Paper**QP NO:****PAGE NO:**

Reg No: _____

Time: _____

ANNADELLAVALAM TECHNOLOGICAL UNIVERSITY

THREE SEMESTER & TECH DEGREE EXAMINATIONS, MONTH & YEAR

Cource Code: CST 262

Course Name: Computer organization and architecture

Max Marks 30

Duration: 1 Hours

PART A

Answer any questions. Each question carries 2 marks.

1. Sketch the flow of instruction cycle.
2. Distinguish between big endian and little endian systems. Also give the logic diagram of these systems.
3. Compare I/O mapped I/O and memory mapped I/O.
4. Give the importance of interrupt in I/O management.
5. Justify the significance of cache register.
6. How does the address mapping perform logical addresses to physical addresses?
7. Discuss divide operation with an example.
8. Write notes on arithmetic pipelines.
9. Briefly explain the role of bus in program execution.
10. Differentiate between sequential and parallel access instructions.

Part B

Answer any one Question from each module. Each question carries 14 marks.

11.

11.(a) What is the significance of addressing modes in computer architecture.

(9)

11.(b) Write the control sequence for the instruction $MOV R1,[R2]$ in r-type format.

(10)

OR

12. Explain the concept of a single bus organization with help of a diagram. Write the control sequence for the instruction $MUL [R1],[R2]$.

(10)

13. Explain microprogrammed logic.

(10)

OR

14.

14.(a) Design a 4 bit combinational logic circuit with 3 control signals M_1 and M_2 to perform the following operations (bit values given in parentheses are the values of control variables M_1 and M_2 respectively). Transfer of Y's w.r.t. 000, 001, 010, 011, 100, 101, 110, 111.

(5)

14.(b) Design an ALU unit which will perform arithmetic and logic operation with a given binary code.

(5)

15.

15.(a) Draw the logic used behind Booth's multiplication algorithm.

(6)

15.(b) Identify the appropriate algorithm available under the system to perform the multiplication between -14 and -9. Also draw the algorithm for the same step.

(10)

OR

16.

16.(a) List and explain the different pipeline hazards and their possible solutions.

(10)

- 16.(b) Design a combinational circuit for 3x2 multiplication. (6)
17. Design a hardware control unit used to perform addition/subtraction of 2 numbers represented in sign magnitude form. (14)
18. Give the structure of the micro program sequencer and its role in sequencing the micro instructions. (14)
- 19.(a) Explain the different ways in which parallel shift registers can be implemented. (12)
- 19.(b) Give the structure of SRAM cell. (6)
20. (a) Explain the various modeling functions available in Spice simulator. (9)
- 20.(b) Draw an op-amp circuit without feedback. (2)

TEACHING PLAN		
No.	Classical	No of Lecture Hrs
Module 1 : (Basic Structure of computer) (8 hours)		
1.1	Positional, non binary quantitative representation structures (introduction)	1
1.2	Memory location and addresses, memory operations	1
1.3	Instructions and instruction fetches	1
1.4	Addressing modes	1
1.5	Fundamental concepts of computer organization, Iteration cycle	1
1.6	Execution of sequential instruction - sequential organization (Lesson 1)	1
1.7	Execution of a complete instruction - single bus organization (Lesson 2)	1
1.8	Execution of a complete instruction - multiple bus organization (Lesson 3)	1
1.9	Execution of a complete instruction - multiprocessor organization (Lesson 4)	1
Module 2 : (Register transfer logic and Processor logic design) (10 hours)		
2.1	Two register transfer - arithmetic and logic operations	1
2.2	Two register transfer - logic and shift logic operations	1
2.3	Register organization	1
2.4	Design of arithmetic circuit	1
2.5	Design of logic circuit	1
2.6	Design of arithmetic logic unit	1
2.7	Design of shifter register	1
2.8	Design of decoder - processor unit	1

3.1	Design of converters (Lesson 1)	1
3.2	Design of converters (Lesson 2)	1
Module 3 : Arithmetic algorithms and Pipelining (3 hours)		
3.3	Algorithm for multiplying two numbers in binary notation	1
3.4	Algorithm for division (remainder included) in binary notation	1
3.5	Area, multiply	1
3.6	Booth's multiplication algorithm	1
3.7	Pipelining basic principle	1
3.8	Classification of pipeline processes (Lesson 1)	1
3.9	Classification of pipeline processes (Lesson 2)	1
3.10	Forwarding and write-back pipeline (Design example is encouraged)	1
3.11	Trapping detection and resolution	1
Module 4 : Control Logic Design (3 hours)		
4.1	General representation principle of hard-wired control logic (Lesson 1)	1
4.2	General representation principle of hard-wired control logic (Lesson 2)	1
4.3	General representation principle of hard-wired control logic (Lesson 3)	1
4.4	Design of microprogram, control logic processes (1st process and 2nd process) (Lesson 1)	1
4.5	Design of microprogram, control logic processes (1st process and 2nd process) (Lesson 2)	1
4.6	Design of microprogram, control logic processes (1st process and 2nd process) (Lesson 3)	1
4.7	Microprogram memory	1
4.8	Microprocessor CPU architecture	1
4.9	Microprocessor - Harvard and von Neumann architectures	1
Module 5 : Basic processor organization, IO and memory (3 hours)		
5.1	Handling of I/O devices - interface	1
5.2	Memory hierarchy	1

3.3.	Time memory test	1
3.4.	Memory system brain regions - hippocampus & amygdala	1
3.5.	Memory system brain regions - hippocampus & amygdala	1
4.4.	Cognitive addressed memory	1
5.7.	Cyclic memory - mapping Schemas (Lecture 3)	1
5.8.	Cyclic memory - mapping Schemas (Lecture 3)	1



CSE 13A	DATABASE MANAGEMENT SYSTEMS	CATEGORY	L	T	P	CREDIT	YEAR OF INTRODUCTION
			POC	01	08		

Prerequisite: This course provide a clear understanding of fundamental principles of Database Management Systems (DBMS) with special focus on relational database to the learners. The topics covered in this course are basic concepts of DBMS, Entity Relationship (ER) model, Relational Database principles, Relational Algebra, Structured Query Language (SQL), Physical Data Organization, Normalization and Transaction Processing Concepts. The course also gives a glimpse of the distributed data management model, NoSQL. This course helps the learners to manage data efficiently by identifying suitable structures to maintain data across various organizations and to develop applications that utilize database technologies.

Prerequisite Topics covered under the course Data Structures (CSE 204), Exposure to a High Level Language like C/C++.

Course Objectives: After the completion of this course the students will be able to

C01	Demonstrate and exemplify fundamental, nature and characteristics of database systems (Cognitive Knowledge Level: Understood)
C02	Understand real world scenarios given as relational examples using Entity Relationship diagrams. (Cognitive Knowledge Level: Apply)
C03	Model and design solutions for efficiently representing and querying data using relational model (Cognitive Knowledge Level: Analyse)
C04	Demonstrate the features of storing and retrieving in database applications (Cognitive Knowledge Level: Apply)
C05	Describe and compare the aspects of Concurrency Control and Recovery in Database systems (Cognitive Knowledge Level: Apply)
C06	Explain various types of NoSQL databases (Cognitive Knowledge Level: Understood)

Mapping of course outcomes with program outcomes

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12
O01	✓	✓	✓									✓
O02	✓	✓	✓	✓								✓
O03	✓	✓	✓	✓	✓							✓
O04	✓	✓	✓	✓						✓		✓
O05	✓	✓	✓	✓					✓			✓
O06	✓	✓	✓	✓		✓			✓			✓

Mapped POs Reflected in National Board of Accreditation

POs	Broad PO	POs	Broad PO
P01	Engineering Knowledge	P07	Environment and Sustainability
P02	Problem Analysis	P08	Team
P03	Design/Development of solutions	P09	Individual and team work
P04	Complex investigation of complex problems	P010	Communication
P05	Modern tool usage	P011	Project Management and Finance
P06	The Engineer and Society	P012	Lifelong learning

Assessment Pattern

Blanks Category	Continuous Assessment Test		End Semester Final Exams Marks (%)
	Test1 (%)	Test2 (%)	
Remember	30	30	10
Understand	40	40	40
Apply	30	30	30

Analysis			
Evaluation			
Overall			

Mark Distribution:

Test Marks	CIE Marks	ESE Marks	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern:

Attendance 10 marks

Common Assessment Task 17 marks

Common Assessment Assignment 17 marks

External Examination Pattern:

Each of the two internal examinations has to be conducted out of 30 marks.

First Internal Examination shall be preferably conducted after completing the first half of the syllabus and the Second Internal Examination shall be preferably conducted after completing remaining part of the syllabus.

There will be two parts Part A and Part B. Part A contains 3 questions (preferably 1 question each from the completed modules and 1 question from the partly covered modules), totaling 1 mark for each question adding up to 11 marks for part A. Students should answer all questions from Part A. Part B contains 7 questions (preferably, 3 questions each from the completed modules and 1 question from the partly covered module), each worth 1 mark. Out of the 7 questions in Part B, a student should answer any 5.

End Semester Examination Pattern:

There will be two parts, Part A and Part B. Part A contains 20 questions with 2 questions from each module, totaling 5 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which students should answer any one. Each question can have maximum 2 sub-questions and carries 14 marks.

Syllabus**Module 1: Introduction & Entity Relationship (ER) Model**

Concept & Overview of Database Management Systems (DBMS) - Characteristics of Database system, Database User, structure, user-defined and normalized data. Data Models and Schema - Three Relational entities: Database Language, Database relationships and classification.

ER model - Basic concepts, entity w/ its attributes, relations, Relationships and constraints, cardinality, participation, association, weak entities, relationships of degree 3.

Module 2: Relational Model

Structure of Relational Database - Integrity Constraints, Normalizing ER diagram to relational schema.

Introduction to Relational Algebra - select, project, various printed operations, etc.: Equijoins, nested joins, query examples, Introduction to Structured Query Language (SQL), Data Definition Language (DDL), Data definitions and operations - CREATE, DROP, ALTER, INSERT, DELETE, UPDATE.

Module 3: SQL DML (Data Manipulation Language), Physical Data Organization

SQL, DML (Data Manipulation Language) - SQL queries on single and multiple tables, Nested queries (correlated and non-correlated), Aggregates and grouping, Views, assertions, Triggers, SQL data types.

Physical Data Organization - Review of terms: physical and logical records. Hacking from physical and conceptual representation. Map file, Indexing, Songs and letters, numerical examples. Multilevel indices, numerical examples, 2-Trees & B-Trees (structure only; algorithms not required). External & Hashing, Indexing on multiple keys - grid files.

Module 4: Normalization

Different methods in designing a database. The role of normalization. Functional dependence. Armstrong's Axioms (proofs not required). Closure and their computation. Expressions of Functional Dependencies (FD). Minimal Cover (proofs not required). First Normal Form (1NF), Second Normal Form (2NF), Third Normal Form (3NF), Boyce-Codd Normal Form (BCNF). Lossless join and dependency preserving decomposition, algorithms for checking Lossless Join (LJ) and Dependency Preserving (DP) properties.

Module 5: Transactions, Consistency and Recovery, Event Logics

Transaction Processing Concepts - overview of consistency model, Transaction Model, Significance of consistency Control & Recovery, Transaction State, System Log, Durability Properties of transactions.

Serial schedules, Consensus and Serializable Schedules, Conflict equivalence and conflict serializability, Recoverable and cascada-free schedules, Logging, Two-phase locking and transactions, Log-based recovery, Deferred deletion resolution, checkpoints

Introduction to NoSQL, Document, Map-reduce and Key-value DB (examples from Stack Overflow). Document DB (examples from Stack Overflow).

Map-reduce and Graph DB (examples from Stack Overflow).

Text Books:

1. Elmasri R. and B. Navrati, *Database Systems: Models, Languages, Design and Applications*, Pearson Education, 2013.
2. Silberschatz A., H. F. Korth and S. Sudarshan, *Database System Concepts*, 8th McGraw Hill, 2013.

Reference Books:

1. Adam拌ryles, *NoSQL for Dummies*, John Wiley & Sons, 2017.
2. NoSQL Data Models: Trends and Challenges (Computer Engineering: Databases and Big Data), Wiley, 2015.
3. Web Resource: <http://www.no-sql-database.com/>.
4. Web Resource: <https://www.mongodb.com/quick-start>.
5. Web Resource: <https://www.mongodb.com/tutorials>.
6. Web Resource: <https://www.mongodb.com/learn>.

Sample Course Level Assessment Questions

Course Outcome (CO)

1. List out any three value ranges of *entity systems*, which distinguishes them from *file systems*.
2. Give one example each for logical and physical file independence.

Course Outcome (COOC)

1. What form shows the relationship between entities EMPLOYEE and PROJECT as conveyed by the following ER diagram?



1. Design an ER diagram for the following scenario:

There is a set of teams, each team has an ID (team identifier), name, main color, and to which city this team belongs. Each team has many players, and each player belongs to one team. Each player has a number (unique team level), name, DOB, and year, and their number that he uses. These play numbers, in each match there is a home team and a guest team.

Course Outcome (COOC)

1. For the SQL query, `SELECT A,B FROM P WHERE P-'apple' AND C = 'orange'` in the table T(A, B, C, D), where A is a key, write any three equivalent relational algebra expressions.
2. Given the FDs $P \rightarrow Q$, $P \rightarrow R$, $QR \rightarrow S$, $Q \rightarrow T$, $QR \rightarrow U$, $PR \rightarrow V$. write the sequence of Armstrong's axioms needed to derive all the following FDs: (a) $P \rightarrow T$ (b) $PR \rightarrow S$ (c) $Q \rightarrow SU$
3. Consider a relation `PLAYER(PLAYER-NO, PLAYER-NAME, PLAYER-POKE, TEAM, TEAM-COLOR, COACH-NO, COACH-NAME, TEAM-CAPTAIN)`. Assume that `PLAYER-NO` is the only key of the relation and that the following dependencies hold:
 $\text{TEAM} -> (\text{TEAM-COLOR}, \text{COACH-NO}, \text{TEAM-CAPTAIN})$
 $\text{COACH-NO} -> \text{COACH-NAME}$
 - a. If the relation is 2NF, then decompose it to 3NF.
 - b. If the relation is 3NF, then decompose it to 2NF.

4. In the following tables foreign keys have the same name as primary keys, except **DIRECTED_BY**, which refers to the primary key **ACTED_IN**. Consider odder situations.

MONTAGE NUMBER, SCALE LENGTH, DIRECTED BY,

卷之三十一

ACTRESS ACTRESS ACTRESS

卷之三

Author's Note

Types of antibiotic resistance genes

- (a) Number and location (name) of mines/works used by "Zeta"
 - (b) Names of persons who have signed away with "Zeta"
 - (c) Details of financial guarantees.
 - (d) Name of banks and maximum loans.

Centre OnLine - ATC04

1. Consider an EMPLOYEE file with 10000 records where each record is of size 50 bytes. The file is sorted on employee number (15 bytes long), which is the primary key. Assuming sequential organization, block size of 112 bytes and block pointer size of 2 bytes. Compute the number of block accesses needed for retrieving all employees record based on employee number (2000). Take 3 and 10 addresses pointers when 3 is used.

Chancery Court - 5000

1. Determine if the following statement is correct. If the statement contains an "if" justify your answer (e.g., if $x > 0$, if $x < 0$, if $x \neq 0$, if $x = 0$, etc.).
 a) There always exists a unique solution to linear equations in two variables.
 b) Two lines intersect at most once.

2. Determine which of the following is a function. Justify.

Crucial Outcome Metrics:

- Q) Define any three salient features of MySQL database. Give example of a function in MySQL.

Model Question paper**(Q1-Q2)**

Reg No. _____

Name: _____

AFF ABBEY KADAM TECHNOLOGICAL UNIVERSITY**FOURTH SEMESTER B.TECH DEGREE EXAMINATION, NOV/DEC A YEAR**

Course Code: CNT 304

Course Name: Database Management Systems

Max Marks: 30

Duration: 3 Hours

PART A

Answer all Questions. Each question carries 3 Marks.

1. List out any three salient features of a database system.
2. What is multivalued composite attribute used in ER modelling?
3. For the SQL query `SELECT a, b FROM S WHERE P = app-a AND C = 'orange'` from the table R(a, b, C, D), where D is a key, write any two equivalent relational algebra expressions.
4. Define the concept of denormalization.
5. How is the purpose of view class is different from that of having classes?
6. What is the use of a trigger?
7. What do you say that a relation is serial (SOF)?
8. Given the FDs P → Q, P → R, QR → S, Q → T, QS → C, PR → U, write the sequences of Armstrong's Axioms needed to derive at a P → T + PR → S
9. What is meant by file lock option protocol?
10. What is meant by deadlock prevention?

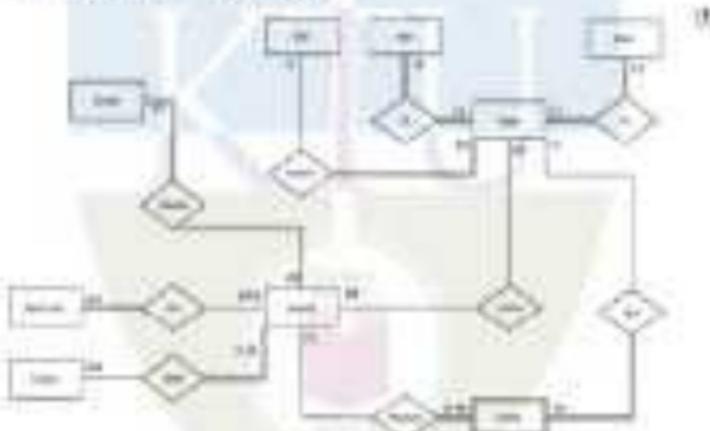
PART B:

Answer any one Question from each model. Each question carries 14 Marks.

11. a. Design an ER diagram for the following scenario: There is a set of teams; each team has an ID (unique identifier), name, state, stadium, and to which city the team belongs. Each team has many players, and each player belongs to one team. Each player has a member (unique identifier), name, DOB, past year, and their mentor that he uses. There is play matches, in each match there is a home team and a guest team. The match takes place in the stadium of the home team. For each match we need to keep track of the following: The date on which the game is played, The final result of the match, The players participated in the match. For each player, how many goals he scored, whether or not he made a yellow card, and whether or not he received a red card. During the match, one player may substitute another player. We want to capture this information and the time at which it took place. Each match has exactly three referees. For each referee we have an ID (unique identifier), name, DOB, years of experience. One referee is the main referee and the other two are assistant referees.

OR

12. a. Interpret the the following ER diagram.



- b. Distinguish between physical data independence and logical data independence with suitable examples.

- iii) EMPLOYEE(ENO, NAME, ADDRESS, DOB, AGE, GENDER, SALARY, DEPTNO, SUPERENO)
 DEPARTMENT(DEPTNO, DNAME, DLOCATION, DPHONE, BUDGET)
 PROJECT(PROJNO, PNAME, PLOCATION, PCOST, CDENO)

DEPTNO is a foreign key that connects the department to which an employee belongs. SUPERENO is a foreign key identifying the employee who manages the department. CDENO is a foreign key identifying the department that controls the project. SUPERENO is a foreign key identifying the supervisor of each employee.

Write additional algebra expressions for the following queries -

- (i) Names of female employees whose salary is more than 20000
- (ii) Salaries of employees from 'Accounts' Department
- (iii) Names of employees along with his/her supervisor's name
- (iv) For each employee names, name of the employee along with the department name and the names of projects in which he/she is involved
- (v) Names of employees working in all the departments

Q8

- iv) Write SQL DDL statements for the the following (Answers should be limited to 100 words)

- i. Create the table STUDENT(ROLLNO, NAME, CLASS, SEM, ACTIVER, FACULTY_ID, NAME, SALARY, DEPT). Assume that ACTIVER is a foreign key referring FACULTY table.
- ii. Delete department with name 'CE' and all employees of the department.
- iii. Increase salary of every faculty by 10%.

v) Discuss on foreign key constraint with a typical example.

100

12. For the relation schema below, give an expression in SQL for each of the queries that follows.

*employee(emplid, name, street, city)
 works(emplid, name, companyname, salary)
 company(companyname, city)
 manager(emplid, companyname, managername)*

- 1) Find the names, cities, states, and cities of residence for all employees who work for the Company 'ABC Inc' and earn more than \$10,000.
- 2) Find the names of all employees whose hire date is the same month as the compensation for which they work.
- 3) Find the names of all employees who do not work for 'XYZ Inc'. Assume that all people work for exactly one company.
- 4) Find the names of all employees who earn more than every employee of 'AB Corporation'. Assume that all people work for at most one company.
- 5) List out names of employees company-wise in the decreasing order of number of employees.

GR

13. a. Consider an EMPLOYEE file with 10000 records, where each record is of size 50 bytes. The file is sorted on employee number (12 bytes long), which is the primary key. Assuming co-partitioned organization and block size of 212 bytes compute the number of block accesses needed for selecting records based on employee number 10.
- i. No index is used.
 - ii. Single level primary index is used.
 - iii. Multi-level primary index is used.
- Assume a block pointer size of 8 bytes.
- b. Illustrate correlated and non-correlated nested queries with real examples. (1)
- c. Illustrate RNF and BCNF with suitable real examples. (1)
- d. Given a relation R(A1A2A3A4A5) with functional dependencies A1→A2A4 and A3→A1, check if the decomposition R1(A1A2A3), R2(A4A5), R3(A2A3A5) is lossless. (1)
- GR
- e. Consider the un-normalized relation R(A, B, C, D, E, F, G) with the FDs: A→B, AC→G, AD→EF, EF→G, CDE→AB. Trace the normalization process to reach 3NF relations. (1)

8. Illustrate Linear Join Decomposition and Dependency-Preserving Decomposition with typical examples. (7)
9. a. Discuss the four ACID properties and their importance. (7)
- b. Determine if the following schedule is conflict serializable. Is the schedule nonserializable? In the material cascade-lock, justify your answer.
 $n(X), n(Z), n(Y), n(X), n(Y), n(X), n(Y), n(X), n(Y), n(Y), n(X), n(Y), n(Y), n(X), n(Y), n(Y)$
(7)
- (Note: $n(X) \neq n(Y)$; assume transaction 2: uses next/prev or uses X; or uses previous/next Y consistently.)
- Q8
10. a. Discuss the main characteristics of key values DB and Group DB. (7)
- b. Illustrate two-phase locking with a schedule containing three transactions. Argue that 2PL ensures serializability. Also argue that 2PL can lead to deadlocks. (7)



Teaching Plan

	Course Name	Hours (H)
	Module 1: Introduction & ER Model	1
1.1	Concept & Overview of DBMS, Classification of DB systems, Database Users.	1
1.2	Structural, semi-structural and unstructured data, Data Models and Schema	1
1.3	Data Schema architecture, Database Languages	1
1.4	Database architecture and classification	1
1.5	ER model: basic concepts, entity set & attributes, relationships	1
1.6	Relationships and constraints – cardinality, participation, anomalies	1
1.7	User entities, relationships of degree 3	1
1.8	ER diagram – exercises	1
	Module 2: Relational Model	7
2.1	Structure of relational Databases, Integrity Constraints	1
2.2	Translating ER Diagrams to relational schema, Transformation to relational algebra	1
2.3	Relational algebra: select project, Cartesian product operation	1
2.4	Relational Algebra: join – Equijoin, Natural join	1
2.5	Query examples	1
2.6	Introduction to SQL, Inherent data types	1
2.7	SQL: Data definitions and operations – CREATE, DROP, ALTER, INSERT, DELETE, UPDATE	1
	Module 3: SQL DML, Physical Data Organization	12
3.1	SQL DML: SQL queries to single and multiple tables	1
3.2	Normalisation (candidate and non-candidate)	1
3.3	Aggregation and grouping	1

	Course Name	Hours (H)
1.6	Views, constraints (with examples)	1
1.7	Triggers (with examples), SQL data types	1
1.8	Review of terms: physical and logical records, blocking, form positioned and sequential organization, Run, File, Relational	1
1.9	Single-level relations, numerical examples	1
1.10	Multi-level relations, numerical examples	1
1.11	3-Trees and 3*-Trees (structure only, algorithms not required)	1
1.12	Extensible Hierarchy	1
1.13	Joining on multiple attrs - grid files	1
	Module 4: Normalization	1
4.1	Different techniques in developing a database. The role of normalization	1
4.2	Functional dependency: Armstrong's Axioms (proofs not required)	1
4.3	Classes and their composition, Equivalence of FDs, various Closures (proofs not required)	1
4.4	3NF, 3NF	1
4.5	3NF, BCNF	1
4.6	Lossless join and Dependency preserving decomposition	1
4.7	Algorithms for checking Lossless Join and Dependency preserving properties (Lecture 1)	1
4.8	Algorithms for checking Lossless Join and Dependency preserving properties (Lecture 2)	1
	Module 5: Transactions, Concurrency and Recovery: Basic Topics	24
5.1	Transaction Processing Concepts, Transaction Model	1
5.2	Overview of concurrency control, Significance of consistency Control & Recovery	1
5.3	Transaction States, System Log	1

	Course Name	Score (M)
3.6	Distributive Properties of Transactions, Deadlock avoidance	1
3.7	Consistent and Serializable Schedules	1
3.8	Conflict equivalence and conflict serializability	1
3.9	Recoverable and cascade lock releases	1
3.10	Locking, Two-phase locking, serial CQL	1
3.11	Log-based recovery	1
3.12	Deferred database notifications (serial schedule, example)	1
3.13	Deferred database notifications (nonserial schedule, example, check-pointing)	1
3.14	Introduction to WebDB Databases	1
3.15	New characteristics of Embedded DB (examples from Redis, Document DB (examples from MongoDB); Initial study not expected)	1
3.16	New characteristics of DocumentDB DB (examples from Cassandra) and Graph DB (examples from Amazon-DDB) (Initial study not expected)	1

CST 306	OPERATING SYSTEMS	Category	L	T	P	Credit	Year of Introduc-
		POC	3	1	0	3	2018

Precourse: Study of operating systems is as essential to understand the overall working of computer system. Relation between performance and functionality and the division of jobs between hardware and software. This course introduces the concepts of memory management, device management, process management, file management and security & protection mechanism available in an operating system. The course helps the learner to understand the Environment's need any operating system design so that they can extract the features of operating systems to detect and solve many problems occurring in operating systems and to manage the computer resources appropriately.

Prerequisite: Topics covered in the course are Data Structures (CST 305) and Programming in C (CST 300).

Courses Objectives: After the completion of this course the student will be able to

-CO1	Explain the structure, structure and functions of Operating Systems in computing scenario. (Cognitive knowledge: Understood)
-CO2	Illustrate the concepts of process management and process scheduling mechanisms employed in Operating Systems. (Cognitive knowledge: Understood)
-CO3	Explain process synchronization in Operating Systems and discuss process synchronization mechanism using Shared Locks, Transactions and Monitors. (Cognitive knowledge: Understood)
-CO4	Explain the way we work for detection, prevention, avoidance and recovery for managing deadlock in Operating Systems. (Cognitive knowledge: Understood)
-CO5	Explain the memory management Algorithms in Operating Systems. (Cognitive knowledge: Understood)
-CO6	Explain the security aspects and algorithms for file and storage management in Operating Systems. (Cognitive knowledge: Understood)

Mapping of course outcomes with program outcomes

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12
CO1	●	●	●							●		●
CO2	●	●	●	●						●		●
CO3	●	●	●	●						●		●
CO4	●	●	●	●						●		●
CO5	●	●	●	●						●		●
CO6	●	●	●	●						●		●

Learning Outcomes mapped to Program Outcomes			
PO4	Broad PO	PO4	Broad PO
PO4	Beginning Knowledge	PO17	Requirements and Documentation
PO5	Business Analysis	PO12	Skills
PO6	Design Development of solutions	PO14	Individual and teamwork
PO8	Contextual intelligence of complex problems	PO16	Communication
PO9	Written communication	PO11	Project Management and Process
PO10	The Express and Story	PO15	Life long learning

Assessment Pattern:

Bloom's Category	Test 1 (Marks in percentage)	Test 2 (Marks in percentage)	End Semester Examination (Marks in percentage)
Remember	30	30	30
Understand	30	30	30
Apply	40	40	40
Analyze			
Evaluate			
Create			

Mark Distribution

Total Marks:	CIE Marks:	ESE Marks:	ESE Duration:
118	40	100	3

Continuous Internal Examination Papers:

Attendance : 10 marks

Continuous Assessment Test : 25 marks

Continuous Assessment Assignment : 17 marks

Internal Examination Papers:

Each of the two internal examinations has to be conducted over 30 marks. The two series will shall be individually conducted after completing the first half of the syllabus and the second series will shall be individually conducted after completing remaining part of the syllabus. There will be two parts; Part A and Part B. Part A contains 3 questions (problem), 3 questions each from the completed modules and 1 question from the partly completed modules; having 7 marks for each question adding up to 17 marks for part A. Student should answer all questions from Part A. Part B contains 7 questions (problem), 3 questions each from the completed modules and 1 question from the partly completed modules; each with 7 marks. Out of the 7 questions, a student should answer any 5.

End Semester Examination Papers:

There will be two parts, Part A and Part B. Part A contains 10 questions with 2 questions from each module, having 5 marks for each question. Student should answer all questions. Part B contains 2 questions from each module of which a student should answer any one. Each question can have maximum 2 sub-questions and carries 14 marks.

Syllabus:**Module I**

Introduction: Operating system overview – Operation, Functions, Services – System calls, Types – Operating System structure - Simple structure, Layered approach, Monolithic, Modular – System boot process.

Module II

Processess: Process roles, Process control block, threads, scheduling, Operations on processes - process creation and termination - Inter-process communication - shared memory systems, Message passing systems.

Process Scheduling - Basic concepts: Scheduling criteria; scheduling algorithms: First come First Served, Shortest Job First, Priority scheduling, Round robin scheduling.

Module III

Process synchronization - Deadlock - Critical section problem - Peterson's solution, Synchronization barriers, Mutual Exclusion, Deadlock - Deadlock detection problem - Process Communication: Dining Philosophers and Readers/Writers.

Deadlocks: Necessary conditions, Resource allocation graph, Deadlock prevention, Deadlock avoidance - Banker's algorithm, Deadlock detection, Recovery from deadlock.

Module IV

Memory Management: Concept of address space, Swapping, Contiguous memory allocation, fixed and variable partitions, Segmentation, Paging, Virtual memory, Demand paging, Page replacement algorithms.

Module V

File System: File concept - Attributes, Operations types, structures - Access methods: Sequential, File-system implementation, Directory representation, Allocation methods.

Storage Management: Magnetic disk, Solid-state disk, Disk Structure, Disk scheduling, Disk formatting.

Text Book:

Abrilene Schurzeneck, Rosemarie Gehrke, Greg Gagné, "Operating Systems Concepts", 9th Edition, Wiley India 2012.

Reference Books:

1. Andrew S Tanenbaum, "Modern Operating Systems", 4th Edition, Pearson Edn, 2012.
2. William Stallings, "Operating systems", 8th Edition, Pearson, Global Edition, 2011.
3. Gary Brock, Michael Chack, Sommabha Naogi, "Operating Systems", 3rd Edition, Pearson Education.
4. D.M.Dhamdhere, "Operating Systems", 1st Edition, Tata McGraw-Hill, 2011.
5. Silberschatz, Galvin, Gagne, "Operating Systems", Pearson Education.

Sample Course Level Assessment Questions

Course Outcome 1 (CO1): What is the main advantage of the more liberal approach to memory? How do user programs and system programs interact in a hierarchical architecture?

Course Outcome 2 (CO2): Define process. With the help of a user diagram, explain different states of process.

Course Outcome 3 (CO3): What do you mean by **memory management** and **concurrent computing**? With C, explain implementation of wait() and signal()

Course Outcome 4 (CO4): Describe producer consumer graph for the following. a) with a deadlock. b) with a cycle but no deadlock.

Course Outcome 5 (CO5): Consider the following page reference string 1, 1, 1, 4, 2, 1, 5, 6, 1, 1, 2, 7, 6, 3, 2, 1, 2, 3, 4. Find out the number of page faults (If there are 4 page frames, using the following page replacement algorithms (i) LRU (ii) FIFO (iii) Optimal).

Course Outcome 6 (CO6): Explain the different OS division methods with strengths and disadvantages.

Model Question Paper

QF CODE

MAX MARKS _____

Reg No. _____
Name _____

ARTHAKALAM TECHNOLOGICAL UNIVERSITY FOURTH SEMESTER B.TECH DEGREE EXAMINATION, MONTH & YEAR

Course Code: CST 204

Course Name : OPERATING SYSTEMS

Max Marks: 100

Duration: 2 Hours

PART-A

(Answer All Questions. Each question carries 2 marks)

1. Show how threads find the Operating System kernel after system shutdown?
2. What is the purpose of system call in operating system?
3. Why is context switching considered as an overhead to the system?

4. Does a user process communicate implement using shared memory?
5. Describe resource allocation graph for the following.
 - a) with a deadlock Without a deadlock.
6. What is critical section? What representation should be adopted by a solution to the critical section problem?
7. Consider the reference string 1, 2, 3, 4, 2, 1, 3, 6, 2, 1, 2, 1, 7, 5, 3, 2, 1, 2, 5, 8. How many page faults occur while using FCFS for the following cases.
 - a) frame=3 b) frame=5
8. Differentiate between static and dynamic fragmentation.
9. Compare sequential access and direct access methods of storage devices.
10. Define the terms (i) Disk bandwidth (ii) Seek time.

QUESTION PAPER (Answer any two questions from each module)

11. a) Explain the following concepts of operating systems (i) Monolithic systems
 (ii) Layered Systems (iii) Micro Kernel (iv) Modular approach. (12)
- b) Under what circumstances would it ever be better of using a time sharing system than a PC or a single user workstation? (5)
- OR
12. a) What is the main advantage of the micro kernel approach to system design? How do user programs and system programs interact in a microkernel architecture? (8)
- b) Describe the difference between symmetric and asymmetric multiprocessing! What are the advantages and disadvantages of multiprocessor systems? (8)
- OR
13. a) Define process. With the help of a neat diagram explain different states of process. (8)
 b) Explain how new processes can be created in Unix using fork() system call. (6)
- OR
14. a) Find the average waiting time and average turnaround time for the processes given in the table below using - (i) SJF scheduling algorithm; (ii) Priority scheduling algorithm. (8)

Process	Arrival Time (ms)	CPU Burst Time (ms)	Priority
P1	0	2	3
P2	2	4	1
P3	3	3	2
P4	1	1	4

- 8) What is a Process Control Block? Explain the fields used in a Process Control Block. (5)
- 10) Consider a system with five processes P₀ through P₄ and three resources of type A, B, C. Resource type A has 10 instances, B has 7 instances and C has 7 instances. Suppose at time t, following snapshot of the system has been taken.

Process	Allocation			Max.			Available		
	A	B	C	A	B	C	A	B	C
P ₀	0	1	0	7	5	3	3	3	2
P ₁	2	0	0	3	2	2			
P ₂	3	0	2	9	0	2			
P ₃	2	1	1	2	3	2			
P ₄	0	0	2	4	3	3			

- i) What will be the content of the Dead column? Is the system in a safe state? If Yes, then what is the safe sequence? (5)
- ii) What will happen if process P₃ acquires one additional instance of resource type A and two instances of resource type C? (5)

Q8

18. a) State dining philosopher's problem and give a solution using mutexes. (7)
- b) What do you mean by binary semaphores and counting semaphores? With C code, explain implementation of wait() and signal(). (7)

- QUESTION PAPER DESIGN FOR COMPUTER SYSTEMS**
17. a) Consider the following page reference using 1, 2, 3, 4, 2, 1, 1, 4, 2, 1, 2, 2, 1, 1, 6, 3, 2, 1. i) Find out the number of page faults if there are 4 page frames, using the following page replacement algorithms: (i) LRU (ii) FIFO (iii) Optimal. (8)
 b) Explain the steps involved in handling a page fault. (6)

(18)

18. a) With a diagram, explain how paging is done with TLB. (6)
 b) Memory partitions of size 200 kb, 300 kb, 200 kb, 300 kb, 600 kb are available, how would best-fit and first-fit algorithms place processes of size 210 kb, 417 kb, 112 kb, 412 kb in order Rank the algorithms in terms of how efficiently they use memory. (8)
- c) Suppose that a disk drive has 4000 cylinders, numbered 0 to 3999; the drive currently services a request at cylinder 240, and the previous request was at cylinder 123. the queue of pending request is FIFO order is 14, 1470, 915, 2774, 942, 1359, 3023, 1710, 173. Starting from the current position, what is the total distance (in cylinders) that the disk arm moves to satisfy all pending requests for each of the following algorithms:
 i) FCFS ii) SFT iii) SCAN iv) LOOK v) C-SCAN (10)
 d) What is the use of access control in protection mechanism? (6)

(18)

20. a) Explain the different file-allocation operations with an example and their meanings. (8)
 b) Explain the following: (i) file types (ii) file operation (iii) file methods (6)

Teaching Plan

	Module I - Introduction	5 Hours
1.1	Introduction to Operating Systems	1
1.2	Operating System operations, Functions, services	1
1.3	System calls, Types	1
1.4	Operating Systems Structure: Standalone, Layered, Microkernel, Modular	1
1.5	System Boot Process	1
	Module I - Processes and Threads: Scheduling	9 Hours
2.1	Process, Process states	1
2.2	Process Control Block, Thread	1

2.3	Deadlocking	1
2.4	Operations on processes: process creation and termination	1
2.5	Inter-process communication: Shared memory systems, Message Passing	1
2.6	Process Scheduling - Basic concepts, Scheduling Criteria	1
2.7	Scheduling algorithms - Basics	1
2.8	First come First Served, Shortest Job First	1
2.9	Priority scheduling, Round Robin Scheduling	1
Module 2 - Process synchronization and Deadlock		12 Hours
3.1	Process synchronization: Task conditions	1
3.2	Critical Section problem, Peterson's solution	1
3.3	Synchronization primitives, Mutex Locks	1
3.4	Semaphores	1
3.5	Mesures	1
3.6	Synchronization problem examples (Lecture 1)	1
3.7	Synchronization problem examples (Lecture 2)	1
3.8	Deadlock: Necessary conditions; Resources Allocation Graph	1
3.9	Deadlock prevention	1
3.10	Deadlock avoidance	1
3.11	Battini's algorithm	1
3.12	Deadlock detection	1
3.13	Deadlock recovery	1
Module 4 - Memory Management		9 Hours
4.1	Memory Management: Concepts of Address space	1
4.2	Swapping	1
4.3	Contiguous memory allocation: Fixed and variable partitions	1
4.4	Segmentation	1
4.5	Paging (Lecture 1)	1
4.6	Paging (Lecture 2)	1
4.7	Virtual memory: Demand Paging	1

4.8	Page replacement algorithms (Lecture 1)	1
4.9	Page replacement algorithms (Lecture 2)	1
Module 5 - File and Disk management		9 Hours
5.1	File concept, Attributes, Operations, types, structures	1
5.2	Access methods	1
5.3	Protection	1
5.4	File system implementation	1
5.5	Directory implementation	1
5.6	Allocation methods	1
5.7	Magnetic disks, Solid-state disks, Disk clusters	1
5.8	Disk scheduling	1
5.9	Disk formatting	1



ASL302	PYTHON AND STATISTICAL MODELLING LAB	Category	L	T	P	Credit	Year of introduction
			0	0	3	2	

Prerequisite: The Python and Statistical modelling course is intended to impart the elementary concepts of Python and apply various statistical techniques to a dataset of data. This course provides the learners with hands-on experience in Python and statistical processes like measures of central tendency, measures of dispersion, probability distributions, graphical analysis, correlation analysis and use of statistical analysis software. The course enables the students to get an exposure to Python programming and use proper methods to analyse and interpret data effectively.

Prerequisite: A basic knowledge of Probability and Statistical Modelling

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

CO#	Course Outcomes
CO1	Explain the concepts of dataset, function, string and list (Cognitive Knowledge Level: Apply)
CO2	Identify the importance of tuple, dictionary, nested dictionary methods, Sin and cos functions (Cognitive Knowledge Level: Apply)
CO3	Model graphical representation of data, measures of central tendency and measures of dispersion (Cognitive+Knowledge Level: Apply)
CO4	Solve problems based on Standard normality, Z-score, t-distribution, sampling and regression analysis (Cognitive Knowledge Level: Apply)
CO5	Under use of various computational and statistical analysis software (Cognitive Knowledge Level: Apply)

Mapping of course outcomes with program outcomes:

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

Abstract POs defined by National Board of Accreditation			
20e	Broad PO	20e	Broad PO
PO1	Expressing Knowledge	PO1	Environment and Inclusivity
PO2	Problem Analysis	PO4	Data
PO3	Design Development of solutions	PO8	Industrial and team work
PO4	Conduct investigations of complex problems	PO10	Communication
PO5	Work and society	PO11	Project Management and Thesis
PO6	The Engineer and Society	PO12	Living learning

Assessment Pattern

Elective Category	Continuous Assessment Test	Total Semester Evaluation (Percentage)
Twelve	20	30
Unclassed	20	30
App	40	60
Analyse		
Evaluates		
Cases		

Mark distribution

Total Marks:	GII Marks:	EE Marks:	EE Marks:
120	22	22	114 marks

Continuous Internal Evaluation Pattern:

Assessments	: 15 marks
Continuous Evaluation in Lab	: 30 marks
Continuous Assessment Test	: 15 marks
Viva Voce	: 15 marks

The marks will be distributed as Design Algorithm 20 marks, Implementation Program 20 marks, Output 20 marks and Visa 20 marks. Total 100 marks which will be converted out of 15 while calculating Grade of Evaluation marks.

End Semester Examination Papers

The marks will be distributed as Design Algorithm 20 marks, Implementation Program 20 marks, Output 20 marks and Visa 20 marks. Total 100 marks will be converted out of 15 for End Semester Examination.

Lab Book Record:

All students attending the Statistical Modelling Using Python Lab should have a fair record. The fair record should be produced in the Chemistry Lab Examination. Every experiment conducted in the lab should be noted in the fair record. For every experiment in the fair record, the right-hand page should contain Experiment Number, Experiment Number, Date of experiment, Aim of the experiment and the outcome performed on them, Details of experiment including algorithm and result of Experiment. The left-hand page should contain a print out of the code used for experiment and simple report statement for a set of input.

SYLLABUS

PYTHON AND STATISTICAL MODELLING LAB

1. Familiarisation of operations, conditional and iterative statements.
2. Problems on function and Function calls. **
3. String traversal and other important string methods. **
4. Lists and sets: questions. **
5. Tuple, dictionary traversal and dictionary methods. **
6. Problems based on files and questions. **
7. Problems on graphical representation of data. **
8. Problems based on measures of central tendency and measures of dispersion using raw data and grouped data. **
9. Application problems based on Financial and Finance Simulation. **
10. Spearman Correlation test for goodness of fit. **
11. Perform t-test for difference of means. **
12. Spearman Correlation test (Spearman correlation coefficient and Spearman rank correlation coefficient)
13. Detection of bias in process due to classification. **
14. Analysis of a one-way two-way ANOVA.
15. Problems on Linear regression, regression coefficients, angle between regression lines.
16. Familiarisation with statistical analysis software (SPSS or similar) **

**mandatory

PYTHON AND STATISTICAL MODELLING LAB - Practice Questions

1. Write a program to find the largest of three numbers.
2. Write a program to print the multiplication table of a number n.
3. Write a program to find the surface area and volume of a cylinder using function.
4. Write a program to replace a word by another word in a sentence.
5. Write a program to confirm the validity of an email id by verifying its format.
6. Write a program to remove every occurrence of a number from a list.
7. Write a program to add two matrices.
8. Write a program to read a tuple of numbers and print new tuple and odd tuple.
9. Create a dictionary with a set of book titles and corresponding week. Write a program to update the stock and to add or delete books.
10. A set of numbers are stored in a file. Write a program to print the prime numbers among them.
11. Write a program to count the number of words, sentences, upper case letters, lowercase letters and special symbols in a text stored in file.
12. Plot a graph, $y = \sin x$.
13. The sizes of the various continents of the world (in millions of square miles) are as follows: 31.7 for Africa, 10.4 for Asia, 1.9 for Europe, 9.4 for North America, 7.3 for South America, 7.9 for Australia. Draw a bar chart representing the given data.
14. Draw the histogram of the following data.

Height of students (in)	130 - 140	140 - 145	145 - 150	150 - 155
No. of students	4	13	16	8

15. Table contains population and murder rates (in terms of murders per 100,000 people per year) for different states. Compute the mean, median and variance for the populations.

State	Population	Murder
Akansas	4,779,736	5.1
Alaska	718,231	3.6
Arizona	6,945,007	4.7
Arkansas	2,813,623	5.6
California	37,259,938	4.4
Colorado	5,029,196	2.1
Connecticut	3,574,097	2.4
Dakota	897,906	1.3

16. Calculate the S.D. and coefficient of variation (C.V.) for the following data:

Class:	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency:	5	13	20	40	19	28	12	3

17. If Z is a binomially distributed with 6 trials and a probability of success equal to 0.25 at each attempt, what is the probability of
 a) exactly 4 successes b) less than 4 successes
18. If the random variable X follows a Poisson distribution with mean 14, find $P(X=6)$
19. A random sample of 127 people were surveyed and each person was asked to report the highest education level they attained. The data that resulted from the survey is summarized in the following table. Are gender and education level dependent at 5% level of significance?

	High School	Bachelor	Masters	Ph.D	Total
Female	55	34	46	41	216
Male	40	44	33	37	154
Total	95	78	79	78	360

20. Calculate the correlation coefficient of the two variables shown in the table below.

Person	Height	Weight
A	17	130
B	17	134
C	18	140
D	17	172
E	21	172

21. Suppose a sample of 10 light trucks is randomly selected off the assembly line. The trucks are driven 1000 miles and the fuel mileage (MPG) of each truck is recorded. It is found that the mean MPG is 21 with a SD equal to 3. The previous model of the light truck got 20 MPG. Conduct a t-test of the null hypothesis at $\alpha = 0.11$.
22. The mean productivity rating for all employees at a company was 1.5 on a five-point scale last year. This year you get ratings from a representative sample of 1000 employees from the Human Resource Management. Do the data from this sample provide evidence that employee productivity in the department of Human Resource Management is significantly higher than in the company as a whole? Write the null and alternative hypotheses for this problem. Use statistical analysis software to test the null hypothesis stated above.

21. Obtain the regression equation for predicting systolic blood pressure from job satisfaction with reference to the given data using statistical analysis software. If we know that a subject in the future has a score on job satisfaction of 15, what is their systolic blood pressure predicted to be? What is the standard error of estimate?

Job Satisfaction	Systolic BP
34	124
21	128
19	137
43	131
36	136
47	123
32	147
18	181
22	130
33	136

CSE114 OPERATING SYSTEMS LAB	CATEGORY	L	T	P	CREDIT	YEAR OF INTRODUCTION
						2019

Premark: The course aims to offer students a hands-on experience on Operating Systems through using a instructional approach and problem-oriented learning. Operating systems are the fundamental part of every computing device running any type of software.

Prerequisites: Topics covered in the courses no Data Structures (CST 101) and Programming in C (EST 102).

Course Objectives:

At the end of the course, the student should be able to

C01	Illustrate the use of system calls in Operating Systems. (Cognitive knowledge: Understand)
C02	Implement Process Creation and Dead Process Clean-up in Operating Systems. (Cognitive knowledge: Apply)
C03	Implement FCFS, Round Robin and Priority-based CPU Scheduling Algorithms. (Cognitive knowledge: Apply)
C04	Illustrate the performance of First In First Out, Least Recently Used and Least Frequently Used Page Replacement Algorithms. (Cognitive knowledge: Apply)
C05	Implement modules for Deadlock Detection and Deadlock Avoidance in Operating Systems. (Cognitive knowledge: Apply)
C06	Implement modules for Storage Management and Disk Scheduling in Operating Systems. (Cognitive knowledge: Apply)

Mapping of course outcomes with program outcomes:

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

Programme Outcomes by National Assessments

POID	Programme Outcome	POID	Programme Outcome
PO1	Engineering Knowledge	PO1	Environment and Sustainability
PO2	Problem Analysis	PO2	Design
PO3	Design/Development of solutions	PO3	Individual and team work
PO4	Cognition in recognition of emerging problems	PO4	Communication
PO5	Solution delivery	PO5	Project Management and Finance
PO6	The Professional Identity	PO6	Lifelong Learning

Assessment Factors:

Bloom's Category	Curriculum Assessment Test (School Exam) Marks in percentage	End Semester Examination Marks in percentage
Remember	20	20
Understand	20	20
Apply	30	30
Analyse		
Evaluate		
Create		

Mark Structure

Total Marks	CSE Marks	ECE Marks	ESL Duration
120	70	70	5 hours

Continuous Internal Examination Pattern:

Attendance	: 10 marks
Continuous Evaluation in Lab	: 30 marks
Continuous Assessment Test	: 10 marks
Viva Voce	: 10 marks

Internal Examination Pattern: The marks will be distributed as Algorithm 30 marks, Program 30 marks, Output 30 marks and Viva 10 marks. Total 100 marks which will be converted out of 100 marks involving Internal Examination marks.

First Semester Examination Pattern: The percentage of marks will be distributed as Algorithm 30 marks, Program 30 marks, Output 30 marks and Viva 10 marks. Total 100 marks.

Operating System to Use in Lab : Linux

Compiler Software to Use in Lab : gcc

Programming Language to Use in Lab : Java/C

Fair Lab Record

All Students attending the Operating Systems Lab should have a Fair Record. The fair record should be produced in the University Lab Examination. Every experiment conducted in the lab should be noted in the fair record. For every experiment in the fair record, the right-hand page should contain Experiment Number, Experiment Number, Date of experiment, Aim of the Experiment and the operations performed on them. Details of experiment involving algorithm and results of Experiment. The left hand page should contain a print out of the code used for experiment and sample output obtained for a set of input.

STELLARIS
OPERATOR'S MANUAL

• 2000

1. Basic Linux commands
 2. Shell programming
 - Command cycles
 - Write simple functions with basic tests, loops, processes
 3. System calls of Linux operating system*
 - fork, exec, getpid, getpid, read, close, stat, opendir, readdir
 4. Write programs using the C/C++ system calls of Linux operating system (open, read, write)
 5. Implement programs for Inter Process Communication using Shared Memory *
 6. Implement Scheduling*
 7. Implementation of CPU scheduling algorithms a) Round Robin b) SJF c) FCFS d) Priority *
 8. Implementation of the Memory Allocation Methods for fixed partition*
 - a) First Fit b) Third Fit c) Best Fit
 9. Implement page replacement algorithms a) FIFO b) LRU c) LIFO*
 10. Implement the header's algorithm for Doubly linked circular list *
 11. Implementation of Doubly linked insertion algorithm
 12. Disk file allocation strategies
 - a) Sequential b) Indexed c) Linked
 13. Simulate disk scheduling algorithms: *
 - a) FCFS NODIAN b) O/NODIAN

CREATE YOUR OWN SYSTEMS - PRAGMATIC SOFTWARE

1. Write a program to create a process in Linux.
 2. Write programs using the following system calls of Linux operating system:
fork, exec, perror, setuid, wait, close, read, write, readlink
 3. Write programs using the I/O system calls of Linux operating system (open, read, write)

4. Given the list of processes, their CPU burst times and arrival times, display using the Gantt chart for FCFS and SJF. For each of the scheduling policies, compute and print the average waiting time and average turnaround time.
5. Write a C program to simulate following non-preemptive CPU scheduling algorithms to find turnaround time and waiting time.
 - a) FCFS b) SJF c) Round Robin (processes/4) d) Priority
6. Write a C program to simulate following contiguous memory allocation techniques.
 - a) First-fit b) Best-fit c) First-fit
7. Write a C program to simulate paging technique of memory management.
8. Write a C program to simulate Traversy algorithm for the purpose of deadlock avoidance.
9. Write a C program to simulate disk scheduling algorithms a) FCFS b) SCAN c) C-SCAN
10. Write a C program to simulate page replacement algorithms a) FIFO b) LRU c) LFU
11. Write a C program to simulate producer consumer problem using semaphore.
12. Write a program for DSA analysis. It displays a DFA and dictionary to analyze.
13. Write a program to simulate algorithm the deadlock prevention.
14. Write a C program to simulate E-fairness file allocation strategies.
 - a) Sequential b) Indexed c) Linked

ADILABDUL KALAM
TECHNOLOGICAL
UNIVERSITY

SEMESTER IV

HONOURS



CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT	Year of Introduction
CSTH0	NUMBER THEORY	VAC	4	0	0	4	2018

Course Objective: This is the foundation course for semester 3. This course is Computer Science and Engineering with specialization in Security in Computing. The purpose of this course is to make students strong learners about the important areas of number theory used in computer science. This course covers Divisibility & Modular Arithmetic, Primes & Composites, Euler's Function, Quadratic Residues and Arithmetic Functions, sum of Squares and Continued fractions. Concepts in Number Theory help the learner to apply these eventually in practical applications in Computer organization & Security, Coding & Cryptography, Random number generation, Hash functions and Cryptos.

Prerequisite: Advanced knowledge in Higher Secondary Level Mathematics.

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

CO1	Illustrate primitive operations, methods and techniques (Cognitive Knowledge Level:Understand)
CO2	Use the methods - Reduction, Contraposition or Contradiction to verify the correctness of mathematical assertions (Cognitive Knowledge Level: Apply)
CO3	Understand theorems and results about prime numbers, congruence, quadratic residue and integer factorization for ensuring security in computing systems (Cognitive Knowledge Level: Analyse)
CO4	Illustrate uses of Chinese Remainder Theorem & Euclidean algorithm in Cryptography and Security (Cognitive Knowledge Level: Apply)
CO5	Explain applications of arithmetic functions in Computer Science (Cognitive Knowledge Level:Understand)
CO6	Implement Number Theoretic Algorithms using a programming language (Cognitive Knowledge Level: Apply)

Mapping of course outcomes with program outcomes

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

Abstract POs defined by National Board of Accreditation

PO#	Broad PO	PO#	Broad PO
PO1	Engineering Knowledge	PO1	Sustainability and Sustainability
PO2	Problem Analysis	PO2	Ethics
PO3	Design/Development of solutions	PO3	Individual and team work
PO4	Contemporary awareness of complex problems	PO4	Communication
PO5	Making judgments	PO5	Project Management and Finance
PO6	The Engineer and Society	PO6	Lifelong learning

Assessment Patterns:

Blown's Category	Continuous Assessment Test		End Semester Examination Marks (Percentage)
	Total (Percentage)	Total (Percentage)	
Remember	30	30	30
Understand	30	30	30
Apply	40	40	40
Analyse			
Evaluate			
Create			

Mark Distribution:

Total Marks	CIE Marks	TET Marks	TET Duration
120	50	100	3 hours

Continuous Internal Evaluation Pattern:

Attendance : 10 marks

Continuous Assessment Test : 20 marks

Continuous Assessment Assignment : 10 marks

Internal Examination Pattern:

Each of the two internal examinations has to be conducted out of 30 marks.

First Internal Examination shall be preferably conducted after completing the first half of the syllabus and the Second Internal Examination shall be preferably conducted after completing remaining part of the syllabus.

There will be two parts, Part A and Part B. Part A contains 7 questions (preferably), 2 questions each from the completed modules and 1 question from the partly covered modules, having 3 marks for each question adding up to 17 marks for part A. Student should answer all questions from Part A. Part B contains 7 questions (preferably, 1 question each from the completed modules and 1 question from the partly covered module), each with 7 marks. Out of the 7 questions in Part B, a student should answer any 5.

End Semester Examination Pattern:

There will be two parts, Part A and Part B. Part A contains 10 questions with 2 questions from each module having 3 marks for each question. Student should answer all questions. Part B contains 7 questions from each module of which a student should answer any one. Each question can have maximum 2 sub-questions and carries 7 marks.

UNIT I**Module 1****Distributivity and Modular Arithmetic:**

Primes - Primes, Range and Pairs.

Distributivity - Distributivity and Division Algorithm, VIM, ceiling Principle, Bezier's Identity.

Modular Arithmetic - Properties, Euclid's algorithm for the greatest common divisor, Extended Euclid's Algorithm, Least Common multiple, Solving Linear Diophantine Equations, Modular Division.

Module 2**Primes and Congruences:**

Public Key Cryptosystem - Number systems-conversion, Fermat and Mersenne primes, Primality testing and factorization.

Congruence Classes: congruences, Euclidean algorithm, Chinese Remainder Theorem, Fermat's Little Theorem, Wilson's theorem.

Module 2

Congruences with a Prime-Power Modulus Euler's Function:

Congruences with a Prime-Power Modulus: Chinese Arithmetic modulo p^n , Powers and Consecutive numbers, Triling congruences modulo prime powers.

Euler's Function-Euler's Totient function, Application of Euler's Totient function, Discrete Cryptosystems, Lattices.

The Group of units- The group \mathbb{Z}_n^* , Positive root, Existence of primitive roots. Application of primitive roots.

Module 3

Quadratic Residues & Arithmetic Functions:

Quadratic Residues- Quadratic Diophantine, The group of Quadratic residues, Legendre symbol, Jacobi symbol, Quadratic reciprocity.

Arithmetic Functions- Definitions and examples, Perfect numbers, Motzkin functions and its properties, Motzkin recurrence formula, The Double Product.

Module 4

Sums of Squares and Continued Fractions:

Sums of Squares: sum of two squares, The Gaussian integers, sum of three squares, sum of four squares.

Continued Fractions- Pure continued fractions, Infinite continued fractions, Ptolemy's Equation, Solution of Pell's equation by continued fractions.

Text Books

1. G.A. Jones & J.M. Jones, Elementary Number Theory, Springer UTM, 2001.

2. Joseph Silverman, A Friendly Introduction to Number Theory, Pearson Ed, 1999.

Reference Books:

1. William Stallings, Cryptography and Network Security: Principles and Practice, Pearson Ed.
2. Tush N. Agarwal, 'Introduction to Analytic Number Theory', Narosa Publishing House, Pre-1st, New Delhi, (1991).
3. Neal Koblitz, *Introductory Number Theory and Cryptography*, 2nd Edition, Springer, 2004.

Sample Course Level Assessment Questions:

Course Outcome 1 (CO1): Describe the properties of primitive subgroups and cyclic subgroups.

Course Outcome 2 (CO2): Prove that the equation $x^2 \equiv -1 \pmod{p}$ has real the integer solutions if and only if

Course Outcome 3 (CO3): State the law of reciprocity for Jacobi symbols and use it to determine whether 2017 is a quadratic residue or non-residue of the prime 1897.

Course Outcome 4 (CO4): Using Chinese remainder theorem, solve the system of congruence $x \equiv 2 \pmod{5}$, $x \equiv 3 \pmod{7}$, $x \equiv 2 \pmod{7}$.

Course Outcome 5 (CO5): State and prove Chinese remainder theorem.

Course Outcome 6 (CO6): Use extended Euclidean algorithm to solve Diophantine equations effectively. Show that numbers $a = 105$ and $b = 15$ the algorithm should return some x and y such that $ax + by = c$.

Model Question Paper

GPO/CEE

PWB/03

Page:

Date:

**AN ABDULKALAM TECHNOLOGICAL UNIVERSITY
FOURTH SEMESTER B.TECH (BACHELOR) DEGREE EXAMINATION, MONTH & YEAR**

Course Code CSE 292 Course
Name: Number Theory

Max Marks:100

Duration: 3 Hours

PART A

Answer all Questions. Each question carries 3 Marks (15x3=45)

1. State and prove Euclid's division principle.
2. Find gcd of $x = 222$ and $y = 111$ and express it as $x = ny + r$ where n and r are integers.
3. Solve the congruence equation $133 \equiv 2^x \pmod{243}$.
4. Use Fermat's Little theorem to show that 21 is not a prime.
5. If n is a prime number, show that $\phi(n) = n-1$.
6. Explain how public key cryptography can be used for sign of a general.
7. Define Chinese Remainder Theorem and prove Chinese remainder theorem is a many-to-one.
8. State and prove Chinese remainder theorem.
9. Show that every prime of the form $4k+1$ can be represented uniquely as the sum of two squares.
10. Find the continued fraction representation of the rational number $11/30$.

Part B

Answer any one Question from each module.

Each question carries 14 Marks

11. (a) Describe Euclidean algorithm and its application with an example. (7)
 (b) Find all the solutions of $24x + 14y = 5$. (7)
- OR**
12. (a) Describe the properties of residue arithmetic and modular operation. (7)
 (b) Explain Extended Euclidean algorithm. Using the algorithm find the

- multiplicative inverse of 117 mod 82
- (a) State and prove Wilson's theorem.
- (b) Explain Fermat's Little Theorem without and use it to factor 204097
- Q5.**
- (a) Using Chinese remainder theorem, solve the system of congruences.
 $x \equiv 2 \pmod{3}$, $x \equiv 3 \pmod{7}$, $x \equiv 1 \pmod{11}$
- (b) Define Fermat prime. Show that any two distinct Fermat numbers are relatively prime.
- Q6.**
- (a) Distinguish between primitive root and primitive by encryption techniques. Also point out the merits and demerits of both.
- (b) Define Carmichael number and show that a Carmichael number need not be the product of at least three distinct primes.
- Q7.**
- (a) Define a pseudo prime in a new and find all such prime less than 100 which is a pseudo prime.
- (b) Find an element of
 (i) order 3 modulo 11 (ii) order 4 modulo 13
 (iii) order 2 modulo 17 (iv) order 6 modulo 19
- Q8.**
- (a) Determine the quadratic residue and non residue modulo 17. Also determine whether 239 is a quadratic residue or non residue of the prime 119.
- (b) State the law of quadratic reciprocity. Determine those odd primes p for which 3 is a quadratic residue and those for which it is a non residue.
- Q9.**
- (a) State and prove properties of Legendre's criterion.
- (b) State the law of reciprocity for Jacobi symbol, and using it determine whether 513 is a quadratic residue or non residue of the prime 1009.
- Q10.**
- (a) Prove that the equation $y^2 + x^2 = 2$ has only the integer solutions $(0, \pm 1)$.

- (i) Define a Gaussian integer. Factorize the Gaussian integer $440 + 20i$. (7)
- OR
23. (i) If w , and v can be expressed as sum of four squares, then show that wv can also be expressed as sum of four squares. (7)
- (ii) Find all the solutions of the Diophantine equation $x^2 - 5y^2 = 4$. (7)

Teaching Plan

Module 1: Divisibility and Euclidean Algorithm		Weeks
1.1	Fundamental Groups and Rings	1 week
1.2	Fundamental - Fields	1 week
1.3	Divisibility and Division Algorithms, Well-ordering Principle	1 week
1.4	Division Algorithm of a positive integer, Greatest Common Divisor, Euclid's Theorem	1 week
1.5	Modular Arithmetic- Properties of congruences, Modular Arithmetic Cycles, Properties of Modular Arithmetic.	1 week
1.6	Euclid's algorithm for the greatest common divisor, Extended Euclid's Algorithm	1 week
1.7	Solving Linear Diophantine Equations	1 week
1.8	Linear Diophantine equations and Modular Arithmetic	1 week
1.9	Implementation of Euclid's algorithm, Extended Euclid's Algorithm and solution of Linear Diophantine Equations.	1 week
Module 2: Wilson and Congruences		Weeks
2.1	Some Numbered prime power factorizations	1 week
2.2	Euclid and Mersenne primes	1 week
2.3	Primality testing and Determination, Miller-Rabin Test for Primality	1 week
2.4	Pollard's Rho Method for Factorization, Pomer's Factorization	1 week

2.1	Linear congruences, Solving linear congruences.	1 hour
2.2	Chinese Remainder Theorem.	1 hour
2.3	Simplification of Chinese Remainder Theorem.	1 hour
2.4	Fermat's Little Theorem.	1 hour
2.5	Euler's Theorem.	1 hour
Module 3: Congruence with a Prime-Power Modulus: Euler's Function		8 hours
3.1	Congruence with a Prime-Power Modulus, Arithmetic modulo p.	1 hour
3.2	Power residues and Consecutive residues.	1 hour
3.3	Using congruence modulo prime powers.	1 hour
3.4	Definition of Euler Totient function, Examples and properties.	1 hour
3.5	Multiplicity of Euler's Totient function.	1 hour
3.6	Applications of Euler's Function, Euler's Theorem.	1 hour
3.7	Traditional Cryptosystems, Lattices, Public Key Cryptography.	1 hour
3.8	The Discrete Log, Random Walks.	1 hour
3.9	Existence of primitive roots for Primes. Applications of primitive roots.	1 hour
Module 4: Quadratic Residues and Arithmetic Progressions		8 hours
4.1	Quadratic congruences, The group of Quadratic Residues.	1 hour
4.2	Legendre symbol, Jacobi Symbol.	1 hour
4.3	Quadratic reciprocity.	1 hour
4.4	Quadratic residues for prime-power moduli.	1 hour
4.5	Arithmetic Progressions: Definitions and examples.	1 hour

4.1	Perfect numbers, Definition and properties.	1 hour
4.2	Nicomachus formula - application of the Nicomachus formula.	1 hour
4.3	Nicomachus formula and its properties.	1 hour
4.4	The Euclidean Method, Definition and proof.	1 hour
Module 5: Sums of Squares and Continued Fractions		8 hours
5.1	Sums of squares, Sums of two squares.	1 hour
5.2	The Gaussian Integers.	1 hour
5.3	Sums of three squares.	1 hour
5.4	Sums of four squares.	1 hour
5.5	Continued Fractions, Finite continued fractions.	1 hour
5.6	Continued Fractions, Finite continued fractions.	1 hour
5.7	Infinite continued fractions.	1 hour
5.8	Pell's Equation, Definition.	1 hour
5.9	Solution of Pell's equation by continued fractions.	1 hour

AIT204	COMPUTATIONAL FUNDAMENTALS FOR BIOINFORMATICS	Category	L T P	Credits	Year of Introduction
					2019

Possible Outcomes: It is interdisciplinary and has involves Computer Science, Molecular Biology, and Mathematics and allied area of Science. This course covers computational fundamentals of Bioinformatics and Computational Biology such as DNA, genes and proteins, transcript, mutations, sequence alignment, representation and basic Python programming required for handling Bioinformatics data. The learners will be able to solve Bioinformatics problems using python programming.

Prerequisite: Basic understanding of programming language.

Mapping of course outcomes with program outcomes:

CO1	Describe the basic concepts of Bioinformatics such as sequence, its biological macromolecules-DNA, RNA and Proteins and synthesis of Macromolecules. (Cognitive knowledge level : Understand)
CO2	Identify biological data formats and database, retrieve, compare and align bio-sequence to identify similarity, dynamic programming (Cognitive knowledge level : Apply)
CO3	Observe essential structure and transcript using programming tool (Cognitive knowledge level : Apply)
CO4	Decompose the concepts of Parsing FASTA and Sequence Analysis (Cognitive knowledge level : Apply)
CO5	Compute known, unknown of DNA sequences and Open reading frame (Cognitive knowledge level : Apply)

Mapping of course outcomes with program outcomes:

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

Learning Outcomes defined by National Board of Accreditation

PO#	Broad PO	PO#	Broad PO
PO1	Engineering Knowledge	PO1	Environmental Sustainability
PO2	Problem Analysis	PO4	Ethics
PO3	Design Development of solutions	PO6	Data related and basic work
PO4	Conduct investigation of complex problems	PO10	Communication
PO5	Moderation skills	PO11	Project Management and Finance
PO6	The Engineer and Society	PO12	Lifelong Learning

Assessment Pattern:

Theoretical Category	Continuous Assessment Test		Total Semester Evaluation
	Total (%)	Total (%)	
Knowledge	30	30	10
Understanding	30	30	10
Application	30	30	10
Analysis			
Evaluation			
Creativity			

Mark Descriptions:

Total Marks	GIZ Marks	TSE Marks	EE Marks
100	30	30	30

Continuous Internal Evaluation Pattern:

Attendance 10 marks

Continuous Assessment Test (Stringent) (Based Test 1 & 2) 10 marks

Continuous Assessment Assignment 10 marks

Internal Examination Pattern

Each of the two internal examinations has to be conducted out of 20 marks. First series test shall be predictably conducted after completing the first half of the syllabus and the second series test shall be predictably conducted after completing remaining part of the syllabus. There will be two parts; Part A and Part B. Part A contains 7 questions (predictably, 3 questions each from the completed modules and 1 question from the partly completed module), having 3 marks for each question adding up to 12 marks for part A. Students should answer all questions from Part A. Part B contains 7 questions (predictably, 3 questions each from the completed modules and 1 question from the partly completed module), each with 7 marks. One of the 7 questions, 1 student should answer any 1.

End Semester Examination Pattern:

There will be two parts; Part A and Part B. Part A contains 12 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 1 full question from each module of which student should answer any one. Each question can have maximum 2 sub-questions and carries 14 marks.

SYLLABUS**Module-1 (Introduction to Bioinformatics)**

Introduction to Bioinformatics, History & Scope of Bioinformatics, animal vs plant, Eukaryotes vs prokaryotes, Nucleic Acids, Chromosome, gene, DNA, RNA, acidic acids, and Proteins, The Central Dogma, Messenger RNA, mRNA, tRNA, Genetic code, Gene Structure, Transcription, translation.

Module-2 (Introduction to bio sequences and analysis)

Introduction to Biological Databases and their usage, NCBI, Genbank, Bio sequence Databases, Sequence Similarity Searching, BLAST, Sequence alignment, Scoring Matrices, Multiple Sequence Alignment, Dynamic programming

Module-3 (Processing Nucleotides)

Nucleotide Frequency, Counting the Nucleotides, Writing and Verifying a Script, Transcribing DNA into mRNA, Substring Prints, Reading and Writing files, Reverse Complement of DNA, String Manipulation, Iterating Over a Reversed String

Module-4 (Processing Nucleotides: GC Content and Hamming Distance)

Creating the Histogram Sequence, Writing, Traversing, and Benchmarking Algorithms, Generating FASTA Using Seqparser, Iterating the Sequence Using a for Loop, Parsing FASTA and Analyzing Sequences, Computing GC Content, Finding the Hamming Distance, Creating Point Mutation

Module 5 (Translating of DNA and subsequences)

Kumar and Cole, Translating Codon, Translating mRNA into Protein, Finding Subsequences of DNA, Find a Motif in DNA, Finding Overlapping Patterns Using Regular Expressions, Sequence Statistics, Finding the Shortest Sequence in a FASTA File, Extracting K-mers from a Sequence, Counting Frequencies of Kmers, Finding Open Reading Frames

Text Books:

1. Mount, D. W. Bioinformatics: Sequence and Genome Analysis. Santa Barbara Publishers & Distributors, 2002.
2. Tanguay-Cook, Rev. Mastering Python for Bioinformatics. United States: O'Reilly Media, 2021.

References:

1. Kelley, S.T. and Díaz de la Torre, C. Computational Biology: A Hypermedia. John Wiley & Sons, 2003.
2. Beaufort, Amrit, D. Gary D. Salz, and David S. Wilton; Bioinformatics. John Wiley & Sons, 2018.
3. Elkin, Nir; Niranjan, et.al. Essentials of Bioinformatics. Springer, 2009.
4. Elken, Nir; Niranjan, J. Medhić, and Andrija Šiljak. Applied bioinformatics: an introduction. Springer, 2018.
5. S.C. Rautogi, N. Mehta and P. Rautogi, Bioinformatics: Methods and Applications, CRC Learning Press Limited, New Delhi, 2012.
6. D.E. Erwin and M.L. Baym, Fundamental Concepts of Bioinformatics. Pearson Education, 2006.
7. Bonci, Sebastian. Python for Bioinformatics. United Kingdom: CRC Press, 2017.
8. Mount, Michael L. Bioinformatics Programming Using Python. United States: O'Reilly Media, 2000.
9. Arora, Tejas. Bioinformatics with Python. Chichester United Kingdom: Packt Publishing, 2017. Arora, Tejas. Bioinformatics with Python Cookbook: Learn how to Do Modern Python Bioinformatics: Libraries and Applications to Do Cutting-edge Research in Computational Biology, 1st Edition. United Kingdom: Packt Publishing, 2018.

Course Level Assessment Questions**Course Outcome 1 (CO1)**

1. Compare and contrast the DNA and RNA on the basis of structure and function.
2. Discussants with the help of a flow diagram the generation of protein using the transcription and translation process.

Course Outcome 2 (CO2):

1. Define the following qualities for GenBank and give their definitions: [ACDN], [ALL], [ALTDR], [PROK], [PRSV], [GENOME], [MOLC], [EVPAE]

- Find the sequence alignment between the following two sequences, locally and globally.
Sequence1: GATTCTATCTAACTA Sequence2: GTTCTATTGTAAC
- Extract the sequence of Severe acute respiratory syndrome coronavirus 2 and use BLAST to find the similar sequence.

Course Outcome 3 (CO3)

- Write a Python program/pseudocode to read the below given sequence to calculate the sequence and print the counts for each of the bases A, C, G and T.
Sequence: ACTGCAACGGGCAATTATGTTC
- Write a python pseudocode to transcribe the following DNA sequence to its mRNA sequence
Sequence: TGCAGACCGGCAATATGTTC

Course Outcome 4 (CO4)

- Show the process of generating the tRNA sequence using Python.
- Give a simple python program using a list to find the DNA string having the higher GC content, provided any 5 random DNA strings.

Course Outcome 5 (CO5)

- Illustrate with the help of an example how an RNA string is getting converted to a protein string.
- Write a python code to print the position and the number of times a subsequence is present in a given DNA string.

Model Question Paper**QP CODE:**

Reg No. _____

Name: _____

PAGES : 4

AMBIKALAM TECHNOLOGICAL UNIVERSITY**FOURTH SEMESTER B.TECH DEGREE (HONOURS) EXAMINATION, MONTH A
YEAR:**

Course Code: ADT134

Course Name: COMPUTATIONAL FUNDAMENTALS FOR BIOINFORMATICS

Max Marks: 300

Duration: 3 Hours

PART A

Answer All Questions. Each Question Carries 3 Marks

1. Differentiate DNA, Gene, promoter and transcription.
2. What do you mean by Gene expression?
3. Specify the functions of mRNA, tRNA and rRNA.
4. Differentiate local and global alignment.
5. Find the reverse complement of the following DNA given in 3'-5' orientation:
AAAAACGCGT
6. List any 3 major complications encountered in processing nucleotides.
7. Illustrate how mutation is implemented using a Python pseudocode.
8. What is GC content? Give the GC content of the DNA string "AGCTTATACT".
9. Explain the role of t-Ribosomes and codons in protein synthesis.
10. Define centromere DNA. Mention its importance in finding the centromeric sequence.

Part B

(Answer any one question from each module. Each question carries 14 Marks)

11. (a) Discuss the central dogma of molecular biology. (7)
 (b) How a 64 primary transcript produced by a polymerase II start can be processed by a eukaryotic cell? (7)
- OR
12. (a) Differentiate between Prokaryote and Eukaryote Cell. (7)
 (b) Describe with the help of a drawing the structure of DNA. (7)
13. (a) What is sequence alignment? Explain any three applications of sequence alignment in Bioinformatics. (7)
 (b) Discuss results of BLAST with its important output. (7)
- OR
14. (a) Explain the working principle of the Short-read BLAST with an example. (7)
 (b) Differentiate primary and secondary consensus in Bioinformatics. (7)
15. (a) How do you find the reverse complement of a DNA sequence? Write at least 2 different Python pseudocodes using different constructs to print the reverse complement of a given the 3'-5' end of a DNA sequence. (7)
 (b) Write a Python pseudocode to convert DNA sequence to RNA sequence by using the regular expression substitution. (7)
- OR
16. (a) What is the need for 'argparse' module in Python? How can we use this module in different ways to do a text-motif/sequence frequency count? (7)
 (b) Write a Python program pseudocode to read the below given sequence as command line argument and print the counts for each of the bases A, C, G, and T. (7)
17. (a) Generate a random DNA sequence using python and find its transcribed. (7)

DNA sequence of its reverse complement.

- (b) Write a python code using regular expression to find the DNA sequence having the highest GC content in a DNA sequence. (7)

Q5.

- Q5. (a) Define Hamming distance. Using hamming distance, find the percentage of similarity between the sequences AAAACCCCGGGTTT and AADCCCGGTTCAT with few sequences in line with other. (7)

- (b) Write a Python code using zip() function to find the Hamming distance between 2 sequences. (Note: comment no eval construct used in the code) (7)

- Q5. (c) Write a Python program using function and a list comprehension to translate RNA into protein. Discuss working of the program with an example RNA string. (8)

- (d) Illustrate with python pseudocode to show how the strfind() function can be used to find a substring and its position in an input sequence. (4)

Q6.

- Q5. (e) Discuss with the help of an example how an RNA string is going to converted to a protein string. (8)

- (f) Write notes on ORF. Write a python code to find the ORF using the str.findall() and str.partition() function. (8)

TEACHING PLAN

No.	Content	No of Lecture Hrs
Module-1 (Introduction to Bioinformatics) (12 hrs)		
1.1	Introduction to Bioinformatics	1
1.2	Sources & Scope of Bioinformatics	1
1.3	Animal & plant, Bacterium, protists	1
1.4	Human Chromosome, genes	1
1.5	DNA, RNA, and Proteins	1
1.6	The Central Dogma prediction	1
1.7	Messenger RNA, tRNA, rRNA	1
1.8	Genetic code	1
1.9	Gene Structure and Control	1
1.10	Transcription, Translation	1
Module-2 (Introduction to Bio-sequence and analysis) (10 hrs)		
2.1	Introduction to Biological Databases and data storage	1
2.2	NCBI, Genbank	1
2.3	SGDB, Genome Sequence retrieval	1
2.4	Bio-sequence formats	1
2.5	Database similarity Searching BLAST	1
2.6	BLAST Exercises	1
2.7	Sequence Alignment	1
2.8	Localizing Motifs	1
2.9	Multiple-Sequence Alignment	1
2.10	Introduction to Dynamic programming in DNA	1
Module-3 (Introduction to Protein Informatics) (8 hrs)		
3.1	Classifying the Nucleic acids, Writing and Visualizing a Sequence	1

3.1	Transcribing DNA into mRNA	1
3.3	Drawing the Input File	1
3.4	Mutating Strings	1
3.5	Writing and Reading Output Sequences	1
3.6	Reverse Complement of DNA	1
3.7	String Manipulation	1
3.8	Drawing One's Reverse Coding	1

Module 4 (Processing Nucleotide GC Content and Matching Distances) (8 hrs)

4.1	Drawing the Reverse Sequence	1
4.2	Writing, Testing, and Benchmarking Algorithms	1
4.3	Running TASTA Using Regular Expressions	1
4.4	Drawing TASTA and Analyzing Sequences	1
4.5	Computing GC Content	1
4.6	Finding the Matching Distance	1
4.7	Drawing the Characters of Two Strings	1
4.8	Drawing Point Mutations	1

Module 5 (Translation of DNA and Biosequences) (9 hrs)

5.1	Flowers and Cookies	1
5.2	Translating mRNA into Proteins	1
5.3	Finding Subsequences of DNA	1
5.4	Find a Motif in DNA	1
5.5	Finding Overlapping Patterns Using Regular Expressions	1
5.6	Sequence Similarity	1
5.7	Finding the Shortest Sequence in a FASTA File, Extracting K-mers from a Sequence	1
5.8	Counting Frequencies of K-mers	1
5.9	Finding Overlapping Proteins	1

AIT256	ADVANCED TOPICS IN COMPUTER GRAPHICS	CATEGORY	L	T	F	CREDITS
		TAC	3	1	0	4

Possible: This course helps the learners to make assessments about using theoretical concepts in computer graphics. It covers the three-dimensional environment representation in a computer, visualization of 2D/3D objects, basic mathematical techniques and algorithms used to build useful applications. The course enables the learners to develop the ability to create image processing frameworks for different domains and develops algorithms for emerging display technologies.

Brueckner: Annual Inventory of Mathematics and Computer Science Programmatic Assessments

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

ODN	OD
OD1	Describe the working principles of project selection (Cognitive Knowledge level: Understood)
OD2	Illustrate line drawing, circle drawing and polygon filling algorithms (Cognitive Knowledge level: Apply)
OD3	Demonstrate geometric representations and transformations on 2D & 3D objects (Cognitive Knowledge level: Apply)
OD4	Explain the necessity of reason skipping algorithms and problem skipping (Cognitive Knowledge level: Apply)
OD5	Demonstrate visible surface detection methods (Cognitive Knowledge level: Understood)
OD6	Explain the concept of visibility as a cause and its performance parameter (Cognitive Knowledge level: Understood)

Implementation of creative approaches to life processes assessment

Abstract POs defined by National Board of Accreditation:

PO#	Broad PO	PO#	Broad PO
PO6	Engineering Knowledge	PO7	Environment and Sustainability
PO3	Problem Analysis	PO8	Ethics
PO1	Design/Development of solutions	PO9	Individual and Team work
PO4	Decided investigation of complex problems	PO10	Communication
PO1	Methodological	PO11	Project Management and Tools
PO6	The Engineer and Society	PO12	Lifelong learning

Assessment Pattern:

Blooms' Category	Continuous Assessment Test		End Semester Exam Marks (%)
	Test 1 (%)	Test 2 (%)	
Remember	30	30	30
Understand	30	30	30
Apply	40	40	40
Analyse			
Evaluate			
Create			

Mark Distribution:

Test Marks	CIE Marks	ESL Marks	ESL Duration
170	70	100	1

Continuous Internal Evaluation Pattern:

Attitudes	10 marks
Continuous Assessment Test (Average of Semester 1 & 2)	25 marks
Continuous Assessment Assignment	25 marks

Internal Examination Pattern:

Each of the two internal examinations has to be conducted out of 30 marks. The first will be held after completing the first half of the syllabus and the second examination shall be preferably conducted after completing the remaining part of the syllabus. There will be two parts - Part A and Part B. Part A contains 7 questions (preferably, 3 questions each from the completed modules and 1 question from the partly completed module), having 3 marks for each question adding up to 12 marks for part A. Students should answer all questions from Part A. Part B contains 7 questions (preferably, 3 questions each from the completed modules and 1 question from the partly completed module), each with 1 mark. Out of the 7 questions, a student should answer any 5.

External Examination Pattern:

There will be two parts, Part A and Part B. Part A contains 27 questions with 7 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 7 full questions from each module of which students should answer any one full question. Each question can have maximum 2 mark questions and carries 14 marks.

SYLLABUS**Module - 1 (Line and Circle drawing algorithms)**

3

Basics of Computer Graphics and its applications: Video Display devices - Refresh Cathode Ray Tubes, Raster Scan Displays and systems, Frame scan displays and systems, Color CRT displays, Flat panel display and its integral line drawing algorithms - DDA, Bresenham's algorithm, Circle drawing algorithms - Midpoint Circle generation algorithm, Bresenham's algorithm.

Module - 2 (Filled Area Primitive and Two dimensional transformations)

Filled Area Primitives - Scan line polygon filling, Boundary filling and flood filling, Two dimensional transformations- Translation, Rotation, Scaling, Reflection and Shearing, Composite transformation, Matrix representation and homogeneous coordinates.

Module - 3 (Clipping and 3D transformations)

Window to viewport transformation, Cohen Sutherland and Midpoint methods for clipping algorithms, Trilateral Polygon and Wu's Area, Polygon Clipping algorithms, Three dimensional viewing pipeline, Basic 3D transformations.

Module - 4 (Projections and Visible Surface detection)

Projections- Parallel and Perspective projections, Visible surface detection algorithms- Back face detection, Depth buffering algorithm, Scan line algorithm, A-buffer algorithm.

Module - 5 (Radiosity and performance)

Radiosity - Illuminance shading, Shadows, Texture mapping, Bump mapping, Environment mapping, Transparency, Accumulation Buffer, Back Face Culling, Visibility Culling.

Text Books:

- Donald Hearn and M. Pauline Baker, Computer Graphics, PSL, 3e, 1994
- Alan Newell and M. Deyo , Introduction to VISUAL COMPUTING Core Concepts in Computer Vision, Graphics, and Image Processing, 2013.

References:

- William M. Newman and Robert T. Sproull, Principles of Interactive Computer Graphics, McGraw Hill, 2001
- Ziqiang Zhang and Ray Fatica, Computer Graphics (Volume 1: Volume Series), McGraw Hill, 2018
- David F. Rogers , Procedural Techniques for Computer Graphics, Tata McGraw Hill, 2001
- Donald Hearn, M. Pauline Baker and Warren Christian, Computer Graphics with OpenGL, PSL, 4e, 2013

Course Level Assessment Questions:**Course Outcome 1 (CO1):**

- Compare the working principle of raster scan systems and random scan systems.
- How much time is spent scanning across each row of pixels during screen refresh in a raster system with resolution of 1280×1024 and a refresh rate of 60 frames per second?

Course Outcome 2 (CO2):

- Examine the line work and points accepted from the user (2,2) and (3,3) using Bresenham's line drawing algorithm and implement it using any appropriate programming language. (Assignment)
- Illustrate how the 4-connected area filling approach differs from 8-connected area filling in boundary filling algorithm and implement it using any appropriate programming language. (Assignment)

Course Outcome 3 (CO3):

- Rotate a triangle ABC 45 degrees counter clockwise about the point p(1,1), where the position vector of the coordinates ABC is given as A(1,1), B(3,2) and C(4,3).
- Implement the above transformation using any appropriate programming language with user inputs. (Assignment)

Course Outcome 4 (CO4):

- Crop a clipping window A(20,20), B(40,20), C(30,40) and D(30,40). Using Cohen Sutherland algorithm, find the visible portion of the line segment joining the points P(40,30) and Q(120,30).
- Implement Cohen Sutherland clipping algorithm using any appropriate programming language with user inputs. (Assignment)

Course Outcome 5 (CO5):

- Explain scan line algorithm for detecting visible surfaces in an object.

Course Outcome 6 (CO6):

1. You are rendering a black and white checkered tiled floor using a single texture mapped polygon. The user is simulating a person running on the floor and looking at a point far away from him on the floor. (1) Antialiasing at the distant end of the floor can be used. How would you resolve these artifacts? (2) How can you explain why the method works, using the sampling theorem?
2. You are seeing an object which is either texture mapped, bump mapped or displacement mapped but you don't know which one. However, you have the liberty to move the light and the viewpoint of an object and see it from different angles and for different positions of the light. How will you figure out which technique was used?

Model Question Paper

QF CODE:

Reg No. _____

Name: _____

PAGES : 4

API ARIADMI KALAM TECHNOLOGICAL UNIVERSITY

FOURTH SEMESTER B.TECH DEGREE (MINI B.E.) EXAMINATION, MONTH A
YEAR

Course Code: ADTCS6

Course Name: Advanced Topics in Computer Graphics

Max. Marks: 180

Duration: 3 Hours

PART A

Answer All Questions. Each Question Carries 3 Marks.

1. Consider a raster system with a resolution of 1024×1024 . Compute the size of the raster needed to store 4 bits per pixel? How much storage is needed if 8 bits per pixel are to be stored?
2. How D'kov's symmetry of circle can be used for optimising circle drawing algorithm?
Write the symmetric points of (x, y) if a point on the circle with centre at origin.
3. Show that two successive reflections about either of the coordinate axes is equivalent to a single reflection about the coordinate origin.
4. Determine a sequence of basic transformations that are equivalent to the n -dimensional shearing motion.

5. Find the relation to transform a homogeneous transformation with vertices lower-left corner at $(1,1)$ and upper-right corner at $(2,3)$.
6. How does Cohen-Sutherland algorithm determine whether a line is visible, invisible or a candidate for clipping based on the region codes assigned to the end points of the line?
7. Define the terms (i) Clipping of polygons (ii) Principal clipping point.
8. Differences between the object space and image space method for the hidden surface removal of an image.
9. Describe the steps used to convert the general step to binary clipping.
10. One artifact of Gouraud shading is that it can cause specular highlights in the interior of the triangle. How can this be explained as an aliasing artifact? (10x3=30)

Part B

(Answer any two questions from each module. Each question carries 16 Marks.)

11. (a) Derive the initial distance parameter of Bresenham's line drawing algorithm and draw a line with endpoints $(2,2)$ and $(10,10)$. (8)
- (b) Draw the structure of tree in an display system and explain its working principle. (8)

OR

12. (a) Explain the working principle of a Raster's CRT monitor with suitable diagram. (7)
- (b) Write Mid-point circle drawing algorithm and plot a circle with radius=7 and center $(10,10)$ using the algorithm. (7)
13. (a) Differentiate between boundary fill and flood fill algorithms. (7)
- (b) Reflect a triangle ABC about the line $3x+4y+5=0$, where the position vector of the vertices ABC is given as A(4,1), B(1,2) and C(4,1). (8)

OR

14. (a) A diamond shaped polygon is formed at $P(-1,0)$, $Q(0,2)$, $R(1,0)$ and $S(0,2)$. Find the transformation matrix which would rotate the triangle by 90 degrees counter clockwise about the point Q. Using the transformation matrix, find the coordinates of the rotated polygon. (16)

- (b) Discuss the working principle of non-line polygon Clipping algorithm. (7)
11. (a) Discuss Miller - Ahrendt polygon Clipping algorithm. (8)
- (b) Explain Cohen-Sutherland line clipping algorithm. Use this algorithm to clip line P1 (90, 22) and P2(180,10) against a rectangle lower-left hand corner (20,10) and upper-right hand corner (30,16). (8)
- OR
14. (a) Describe the steps required for a general 3D clipping if the clipping plane is not parallel to any one of the principal axis. The clipping plane is defined by the points $P_1(x_1, y_1, z_1)$ and $P_2(x_2, y_2, z_2)$. Show the composite matrix representation. (8)
- (b) Describe Sutherland - Hodgman polygon clipping algorithm and list out its limitation. (8)
15. (a) Explain how visible surfaces can be determined using depth buffer algorithm. (7)
- (b) Define parallel projection. Describe orthographic and oblique parallel projection. (7)
- OR
16. (a) Illustrate the various methods used to track a surface database. (7)
- (b) Explain the steps involved in performing perspective projections. (7)
18. (a) Specify any three shading algorithms used in computer graphics. (8)
- (b) Explain the procedure of texture in object space mapping. (8)
- OR
20. (a) Explain the mapping schemes in which the effects of visual blinks on the outline of an object can be avoided without changing the number of pixels. (8)
- (b) Describe about object to viewer space mapping. (8)

TEACHING PLAN

No.	Content	No of Lecture Hrs:
Module - 1 (Line and Circle Drawing algorithms) (11 hrs)		
1.1	Basics of Computer Graphics and applications.	1
1.2	Karplus-Cardall Ray Tracing	1
1.3	Random and Scatter Scan Displays and systems.	1
1.4	Color CRT displays	1
1.5	Flat panel display and its categories.	1
1.6	DDA Line drawing algorithm	1
1.7	Bresenham's Line drawing algorithm	1
1.8	Midpoint Circle generation algorithm	1
1.9	Bresenham's Circle generation algorithm	1
1.10	Illustration of line and circle drawing algorithms.	1
Module - 2 (Filled Area Primitive and Two dimensional transformations) (9 hrs)		
2.1	Convex polygon filling	1
2.2	Boundary filling and flood filling	1
2.3	Basic 2D transformations Translation	1
2.4	Basic 2D transformations Rotation	1
2.5	Basic 2D transformations Scaling	1
2.6	Reflection and Shearing	1
2.7	Illustration of Basic 2D Transformations	1
2.8	Composite transformations	1
2.9	Matrix representations and homogeneous coordinates	1
Module - 3 (Clipping and 3D transformations) (8 hrs)		
3.1	Window to viewport transformation	1
3.2	Color Intensity Line clipping algorithm	1
3.3	Midpoint width wise Line clipping algorithm	1
3.4	Sutherland-Hodgeman Polygon clipping algorithm	1
3.5	Walker Asterix Polygon clipping algorithm	1
3.6	Three Dimensional viewing pipeline	1

Visual Perception and Data Structure

3.7	Basic 3D transformation- Translation and scaling	1
3.8	Basic 3D transformation- Rotation	1
Module - 4 (Projections and Visible Surface detection) (7 hrs)		
4.1	Projections- Parallel projection	1
4.2	Projections- Perspective projection	1
4.3	Illumination of projection methods	1
4.4	Visible surface detection algorithms- Back face detection	1
4.5	Depth buffering algorithm	1
4.6	Scan Line visible surface detection algorithm	1
4.7	Z buffer algorithm	1
Module - 5 (Rendition and performance) (18 hrs)		
5.1	Illumination	1
5.2	Scaling and Shadow	1
5.3	Texture mapping-Texture to object space mapping	1
5.4	Texture mapping-Object to screen space mapping and Mip Mapping	1
5.5	Shading mapping	1
5.6	Shading mapping-Illumination	1
5.7	Environment mapping and Transparency	1
5.8	Accumulation Buffer and Back face Culling	1
5.9	Visibility Culling	1
5.10	Visibility Culling	1

ANJANIE KALAM
TECHNOLOGICAL
UNIVERSITY

SEMESTER -3

COMMON COURSES S3 & S4



CORE SUSTAINABLE ENGINEERING	SUSTAINABLE ENGINEERING	CATEGORY	L	T	P	CREDIT
			1	0	0	20

Course Objectives: Objectives of this course is to enable the students to enhance the awareness of environmental issues and the global initiatives towards achieving sustainability. The student should realize the potential of technology in bringing up sustainable practices.

Prerequisites: 102

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

CO1	Understand the importance and the concept of sustainability and the global measures or risk factors.
CO2	Explain the different types of environmental pollution problems and their sustainable solutions.
CO3	Discuss the environmental regulations and standards.
CO4	Outline the strategies related to environmental and resource-related issues.
CO5	Demonstrate the broad perspective of sustainable products by utilizing appropriate resources and processes.

Mapping of course outcomes with program outcomes

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

Assessment Pattern

Mark Distribution

Marker's Category	Common Assessment Zone	End Semester Examination
Knowledge	2	2
Understanding	10	10
Application	10	10
Analysis	10	10
Evaluation	10	10
Creativity	10	10

Continuous Internal Examination Pattern

Attendance	1 marks
Continuous Assessment (out of 2 marks)	2 marks
Assignment/Quizzes/Project	11 marks

End Semester Examination Pattern: There will be two parts, Part A and Part B. Part A consists 10 questions with 2 options from each module, having 1 mark for each question. Students should answer all questions. Part B consists 10 questions from each module of which student should answer any one. Each question has maximum 2 marks/option and carry 10 marks.

Total Marks	CIE	ESE	CIE Revision
100	60	100	2 hours

Course Level Assessment Questions

Course Outcome 2 (CO2): Discuss the relevance and the necessity of sustainable and the global initiatives in this dimension.

1. Explain with an example a technology that has contributed positively to sustainable development.
2. Write a note on Millennium Development Goals.

Course Outcome 3 (CO3): Explain the different types of environmental pollution problems and their preventive techniques.

1. Explain the IS concept in waste management.
2. Write a note on any two environmental pollution problem and suggest a reasonable solution.
3. In the absence of green laws affecting surface transportation of earth moving equipment, what would you suggest for control of dust on roads? Comment on the statement.

Course Outcome 4 (CO4): Discuss the environmental regulations and standards.

1. Discuss Life Cycle Analysis with an example of your choice.
2. "There is no more successful designer and the most brilliant engineer that has ever walked". Discuss.

Course Outcome 4 (CO4): Define the concepts related to conventional and non-conventional energy.

1. Suggest a sustainable system to generate bio mass as a renewable fuel using biological process.
2. Discuss the impact of biomass energy on the environment.

Course Outcome 5 (CO5): Determine the total programme of sustainable practices by utilizing regressing methodology and principles.

1. Suggest suitable measures to meet the requirement facilities used by your institution sustainably.

Model Question paper**Part A**

(Answer all questions. Each question carries 2 marks each)

1. Define sustainable development.
2. Write a short note on Millennium Development Goals.
3. Describe water crisis.
4. Give an account of clean energy and its effect on environment.
5. Discuss biomass? Give two examples.
6. Explain the term strategy of Life Cycle Assessment.
7. Name four sustainable energy sources.

1. Mention some of the disadvantages of wind energy.
2. Define some of the features of sustainable tourism.
3. Explain green marketing.

Part B:

(Answer one question from each module. Each question carries 24 marks)

1. Discuss the evolution of the concept of sustainability. Comment on its relevance in the modern world.

Q1

2. Explain Green Development Modelism.

3. Explain the economic impacts of wind power can be beneficial effects.

Q2

4. Give an example of local green management in cities.

5. Explain the different steps involved in the conduct of Environmental Impact Assessment.

Q3

6. Suggest some actions to manage public environmental communication issues.

7. Comment on the statement, "Agriculture is among the most sustainable Business".

Q4

8. Value addition:

- a. Land Aggregation due to urbanising.

- b. Green regulation of cities.

9. Discuss the climate related sustainability challenges.

Q5

10. Discuss any three methods by which we can increase energy efficiency in buildings.

Objectives

Environmental, social and economic, technology and sustainable development, Natural resources and their pollution, Carbon credits, Zeta value concept, Life Cycle Analysis, Environmental Impact Assessment matrix, Sustainable habitat, Green buildings, green materials, Energy, Conventional and renewable sources, Sustainable urbanisation, Industrial Ecology.

Module 1:

Sustainability: Definition, concept, evolution of the concept, Green, environmental and economic sustainability, Ecological Footprint & Degradation, Green between Technology and Sustainable Development, Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs), Green Development Indicators (GDI).

Module 2:

Environmental Pollution: Air Pollution and its effects, Water pollution and its effects, Soil water balance and I.I.E. methods in site wise management, Greenhouse effect, Green building, Green energy, Green house effect, Carbon credits, carbon trading and carbon tax price, legal guidelines for environmental protection.

Module 3:

Environmental management systems ISO 14001: ISO 14001 certification, Stage one goal of Life Cycle Analysis (LCA), Circular economy, De-carbonising, Environmental Impact Assessment (EIA), Industrial ecology and industrial symbiosis.

Module 4:

Renewable and its utilization: Basic concept of Green energy and non-conventional energy, Centralized power source energy, Per capita, Wind energy, Small hydroplants, Nuclear, Energy derived from water and thermal energy.

Module 5:

Sustainable processes: Basic concept of sustainable design, Methods for increasing energy efficiency in buildings, Green Building, Sustainable Urbanization, Sustainable cities, Sustainable transport.

Reference Books

1. Alton, D. T. and Shrivastava, P. S., **Sustainable Engineering Concepts**, Prentice Hall, Prentice Hall.
2. Bradley, A.J., Miltzou, A.O., Mitra, T. **Engineering applications in sustainable design and management**, Springer Publishing.
3. Environmental Impact Assessment Guidelines, Government of Maharashtra, Mumbai, 2008.
4. Haskelidon, E.M. **Basic Concepts of Environmental Management**, Lulu Publications, London, 2012.
5. IEA-IEC 2007, **Science of Energy Efficiency, New- Old Name of Energy Efficiency Information Energy System, TR41 Definitions -2007-04-01-06-00-00**.
6. Lin Chang, **Systems Analysis for Sustainable Technology: Theory and Application**, McGraw-Hill, Underwood.
7. D'Alessio, J. W. and Wu, A. S., **Sustainable Energy Resources**, English Language Book Society (ELBS).
8. Pandit, R. S., **Green Technology - An approach for sustainable environment**, Agniwara Publication.

Course Content and Lecture Schedule

No.	Type	No. of Lectures
1.	Introduction	1
2.	Industrial energy consumption and its analysis	1
3.	Industrial energy efficiency improvement strategies	1
4.	Sustainable development, Green Energy, Technology, and Sustainable development	1
5.	Mission Directorate Work (R&D) and Sustainable Development Goals (SDGs)	1
6.	Green Development Mechanism (GDM)	1
7.	Environmental Pollution	1
8.	Air Pollution and its effects	1
9.	Water pollution and resources	1
10.	Green waste management and its challenges in solid waste management	1
11.	Greenhouse effect, Green building, Green Energy, Green life style	1
12.	Carbon credits, carbon trading and carbon tax rates	1
13.	Laws, governance for environmental processes	1
14.	Environmental management standards	1
15.	Environmental management systems	1
16.	ISO 14001: 2015 basic concepts and terms	1
17.	Integrated Risk of Life Cycle Analysis (LCA)	1
18.	Climate change, Green building	1
19.	Environmental Impact Assessment (EIA)	1
20.	Intercity Building, Industrial Symposia	1
21.	Sustainable social development	1
22.	Basic concepts of Conservation, and their various types	1
23.	General conservation of energy, Fuel cells	1
24.	Wind energy, Small hydro power, Biomass	1
25.	Energy Audit, Renewable and Sustainable energy	1
26.	Industrial Processes	1
27.	Basic concepts of sustainable business	1
28.	Methods for increasing energy efficiency of buildings	1
29.	Green Buildings	1
30.	Industrial Universities, Sustainable cities, Sustainable villages	1

CODE	COLUMN NAME	CATEGORICAL	L	T	P	CREDIT
			3	3	3	3
EST 206	DESIGN AND DIGITALIZING					

Preamble:

The purpose of this course is to:

- 1. introduce the undergraduate engineering students fundamental concepts of design engineering.
- 2. make them understand the steps involved in the design process and
- 3. familiarize them with the basic tools used and approaches in design.

Students are expected to apply design thinking in learning as well as while practicing engineering, which is very important and relevant for today. Case studies from various practical situations will help the students realize that design is not only concerned about the function but also many other factors like customer requirements, economics, reliability, etc. along with a variety of life cycle issues.

The course will help students to develop analytical, diagnostic and sustainable skills to work in design and assist students in transitioning areas while teaching.

Prerequisite:

With the course will be generic to all engineering disciplines and will not require specific preparation or prerequisites in any of the individual engineering disciplines.

Course Outcomes:

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

CO1	Explain the different concepts and principles involved in design engineering.
CO2	Apply design thinking while learning and practicing assignment.
CO3	Develop innovative, reliable, sustainable and economically viable designs incorporating knowledge in engineering.

Mapping of course outcomes with program outcome:

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

Assessment Pattern**Continuous Internal Evaluation (CIE) Pattern**

Attendance	10 marks
Continuous Assessment Test (CIE) numbers	25 marks
Assignment/Inclusive assessment	15 marks

2nd Semester Examination (2SE) Pattern: This will be two parts Part A and Part B.

Part A contains 20 questions with 2 questions from each module, having 2 marks for each question.

Students should answer all questions.

Part B contains 2 case study questions from each module of which student should answer any one. Each question carry 10 marks and can have maximum 2 sub questions.

Mark Allocation:

Total Marks	CB	SIE	SIE Duration
100	40	60	2 hours

Bloom's Category	Continuous Assessment (Marks)		2nd Semester Examination
	1	2	
Remember	1	1	10
Understand	10	10	10
Analyse	20	20	20
Evaluate	-	-	-
Create	-	-	-



Course Level Assessment Questions

Course Outcome 1 (CO1): Appreciate the different concepts and principles involved in design engineering.

1. State how engineering design is different from other kinds of design.
2. Use the different stages in the design process.
3. Explain design thinking.
4. Define the function of prototyping and prototyping in engineering design.
5. Write notes on the following concepts in connection with design engineering: (i) Modular Design, (ii) Life Cycle Design, (iii) Value Engineering, (iv) Costumer Engineering, and (v) Reverse Engineering.
6. Define design right.

Course Outcome 2 (CO2): Apply design thinking while learning and practicing engineering.

1. Discuss the iterative process for design thinking in developing simple products like a pen, umbrella, bag, etc.
2. Show with an example how design-thinking helps in generating alternative designs and then how to narrow down to the best design.
3. Explain how a problem-based learning helps in taking better design-thinking solutions.
4. Discuss as an engineer, how a customer drives his/her design.

Course Outcome 3 (CO3): Develop innovative, reliable, sustainable and economically viable designs incorporating different segments of knowledge in engineering.

1. Illustrate the development of any simple product by passing through the different stages of design thinking.
2. Show the graphical design communication with the help of detailed 2D or 3D drawings for any simple product.
3. Explain how to develop your designs for simple products through 2D or 3D.

Model Question paper

Page 1 of 2

Reg No. _____ Name. _____

**GP1 ANDREI NALAM TECHNICAL UNIVERSITY
THIRD/FOURTH SEMESTER B.TECH CROWN EXAMINATION****Course Code: CST 120****Course Name: DESIGN AND ENGINEERING****Max. Marks: 200|Duration: 3 Hours****PART A****Answer all questions, each question carries 4 marks****use only hand sketches**

- (1) Write about the basic design process.
- (2) Describe how to finalize the design objectives.
- (3) State the role of divergent-convergent questioning in design thinking.
- (4) Discuss how to perform design thinking in a team managing the conflicts.
- (5) Explain engineering sketches and drawings convey designs.
- (6) Explain the role of mathematics and physics in design engineering process.
- (7) Distinguish between problem-based learning and problem-case learning in design engineering.
- (8) Describe how concepts like value engineering, concurrent engineering and reverse engineering influence engineering designs?
- (9) Draw how designs are varied based on the aspects of construction methods. If a car, reliability and environment?
- (10) Explain how economics influence the engineering designs?

(10x4 marks = 40 marks)

Part B**Answer any ONE question from each module. Each question carry 14 marks****Module I**

- (1) Show the designing of a wiper wash going through the various stages of the design process. Use Hand sketches to illustrate the processes.
- (2) Find the customer requirements for designing a new car showroom. Show how the design objectives were finalized utilizing the design constraints.

B

Module 3

- (1) Examine the design thinking approach for designing a dog's cage. Elaborate Module 2 related subject. Describe each stage of the process and the respective documents involved. Use hand sketches to support your arguments.
 or
 (2) Construct a number of housing designs and then refine them to narrow down to the best design for a single family house in Nigeria. Show how the design fits in the existing building rules in the chosen. Provide your rationale for each step by using hand sketches only.

Module 3

- (3) Creatively communicate the design of a thermo flask used to keep hot coffee. Draw the detailed 2D drawings of the same with design-deciding, material selection, scale drawings, dimensions, tolerances, etc. Use only hand sketches
 or
 (4)Examine the role of mathematics thinking in design engineering. Show how mathematics and physics play a role in designing a lifting mechanism to raise 100 kg of weight to a floor at a height of 10 meters in a construction site.

Module 4

- (1) Draw the development of a nature inspired design for a solar covered bus shelter shed beside a highway. Adapt between two to one man-made designs. Use hand sketches to support your arguments.
 or
 (2)Draw the design of a simple site and then depict how the design changes when considering i) aesthetics and ii) ergonomics into consideration. Give hand sketches and explanations to justify the changes in design.

Module 5

- (1)Examine the changes in the design of a fuel car with constraints of i) production methods, ii) life span requirement, iii) reliability issues and iv) environmental factors. Use hand sketches and give critical rationing for the changes in design.
 or
 (2)Describe the how to assess the cost of a particular design using AMT of the following:
 i) a reactor, ii) the layout of a plant, iii) the elevation of a building, iv) analytical or automatic system in optical analysis
 These five economics will enhance the engineering design. Use hand sketches to support your arguments.

(Total marks: 70 marks)

Syllabus**Module 1**

Design Process - Introduction to Design and Engineering Design, Defining a Design Process, Defining Customer Requirements, Setting Design Objectives, Identifying Constraints, Examining Functions, Generating Design Alternatives and Choosing a Design.

Module 2

Design Thinking Approach: Introduction to Design Thinking, Design Design Thinking Process Stages, Empathise, Define, Ideate, Prototype and Test, Design Thinking in Disruptor-Changeover, Questioning Design Thinking is a Team Environment.

Module 3

Design Communication: Languages of Engineering Design-Communicating Design Originally, Communicating Design Clearly and in Writing, Mathematical Modelling in Design, Prototyping and Presenting the Design.

Module 4

Design Engineering Concepts: Project-based Learning and Problem-based Learning in Design, Modular Design and Life-Cycle Design Approaches, Application of Biophilic Aesthetics and Ergonomics in Design, Value Engineering, Concurrent Engineering, and Reverse Engineering in Design.

Module 5

Designing, Evaluating, and Optimising in Design, Engineering Design for Production, Use, and Sustainability, Engineering Economics in Design, Design Rights, Ethics in Design.

Text Books

- 1) Venkatesh, *Engineering Fundamentals*, James M. Gere, *Engineering Design Process*, Cengage Learning 2001, Third Edition, ISBN-13: 9781300311081.

- 2) Voland, G., *Engineering by Design*, Pearson India 2014, Second Edition, ISBN 9789332530350.

Reference Books

- 1) Philip Eberly, Robert Salas, William Liao, George Wiles, *Engineering Designing, Tools & Methods An Introduction to Engineering and Design*, Elsevier, First Edition, 2011, 4th Edition, ISBN: 9780123812400
- 2) Gary L. Davis, *Engineering Design: A Project-Based Introduction*, John Wiley & Sons, New York, 2004, Fourth Edition, ISBN-13: 978-1-118-02451-2
- 3) Nagel, Gross, *Design Thinking: Understanding How Designers Think and Work*, Wiley Publishing 2011, First Edition, ISBN: 978-1-118-33010-0
- 4) Rao, S., Ram, R., Poddar, J., Srivastava, K.M., *Engineering Design: A Systematic Approach*, Springer 2007, Third Edition, ISBN: 978-0-38725121-1

Course Contents and Lecture Schedule

No.	Topic	No. of lectures
1.	Module 1: Design Process	
1.1	Introduction to Design and Engineering Design: What does it mean to design something? How is engineering design different from other kinds of design? What and when do engineers design? What are the basic considerations in engineering design? How to start and do engineering design?	1
1.2	Defining a Design Problem: Defining Customer Requirements: How is an engineering design? Illustrate the process with an example. How to identify the customer requirements of design?	1
1.3	Defining a Design Problem- Setting Design Objectives, Identifying Constraints, Establishing Functions: How to finalize the design objectives? How to identify the design constraints? How to express the functions of design in engineering terms?	1
1.4	Defining a Design Problem - Generating Design Alternatives and Choosing a Design: How to generate or create feasible design alternatives? How to identify the 'best possible design'?	1
1.5	Case Studies- Stages of Design Process: Conduct exercises for designing simple products going through the different stages of design process.	1
1.	Module 2: Design Thinking Approach	
2.1	Introduction to Design Thinking: How does the design thinking approach help engineers to create innovative and efficient designs?	1
2.2	Design Thinking Three Stage: Empathize, Define, Iterate, Prototype and Test: How can the engineers arrive at better designs using the creative design thinking process for which knowledge acquired in the later stages can be applied back to the earlier stages?	1
2.3	Design Thinking in Different Contexts: Quantitative: Designers have to create a number of possible designs and then how to refine and narrow down to the best design.	1
2.4	Design Thinking in a Team Environment: How to perform design thinking as a team managing the workflow?	1
2.5	Case Studies: Design Thinking Approach: Conduct exercises using the design thinking approach for	1

	assigning and completing products within a limited time and budget.	
1	Module 2: Design Communication (Language of Engineering Design)	
1.1	Communicating Design Graphically How do engineering analysis and design affect design? Communicating Design Graphically and in Writing	1
1.2	How can a design be communicated through visual, presentative or technical reports effectively?	1
	First Semester Examinations:	
1.3	Mathematical Modeling in Design How do mathematics and physics become a part of the design process?	1
1.4	Prototyping and Printing the Design How is prototyping earlier the design will function well in real?	1
1.5	Case Studies: Communicating Design Graphically Conduct exercises for design communication through standard 2D or 3D drawings of simple products such as design detailing, material selection, scale drawings, dimensioning, annotations, etc.	1
2	Module 3: Design Thinking Concepts	
4.1	Project-based Learning and Problem-based Learning in Design How engineering students can work design engineering through projects? How students can take up problems to learn design engineering?	1
4.2	Modular Design and Life Cycle Design Approaches What is modular approach in design engineering? How it helps? How the life cycle design approach influences design decisions?	1
4.3	Application of Harmony, Aesthetics and Expressions in Design How do aesthetics and expressiveness change engineering designs? How do the intelligence in nature insights engineering designs? What are the common examples of harmony in engineering?	1
4.4	Vision Empowering, Consumer Empowering, and Service Empowering in Design How do concept like value engineering, concurrent engineering and service engineering influence engineering designs?	1
4.5	Case Studies: Bio-mimicry based Designs Conduct exercises to develop new designs for simple	1

	graduates using this material, and train students to bring out new, more creative designs.	
2	Module 5: Experience, Economics and Sustainability in Design Engineering	
5.1	Design for Production, Use, and Sustainability <i>How designs are finalized based on the aspects of production methods, life span, reliability and environment?</i>	1
5.2	Engineering Economics in Design <i>How to estimate the cost of a particular design and how will economic influence the engineering designs?</i>	1
5.3	Design Rights <i>What are design rights and how can an engineer protect his products?</i>	1
5.4	Ethics in Design <i>Why do ethics play a significant role in engineering design? Case Studies: Design for Production, Use, and Sustainability</i>	1
5.5	Conduct interviews using simple products to show how design changes in 4R's environment of production methods, life span requirements, reliability, cost and environmental factors.	

Final Year Examination

Code	Course Name	L	T	R	SLR	Grade
SEET 200	Professional Ethics	1	0	0	1	I

Promote: To enable students to create awareness on ethical issues in their roles.

Prerequisite: N/A

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

CO 1	Distinguish the core values that shape the ethical behaviour of a professional.
CO 2	Assess a given situation and reflect on ethical issues.
CO 3	Explain the role and responsibility of technology in development in bringing personal ethics and organisational ethics.
CO 4	Solve moral and ethical problems through application and assessment by established approaches.
CO 5	Apply the knowledge of human values and social pillars to strengthen ethical values and social causes.

Mapping of course outcomes with programme 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									3	1	2
CO 2									1		1	
CO 3									1		1	
CO 4									1		1	
CO 5									1		1	

Assessment Pattern

Elaborate category	Continuous Assessment Test	End Semester Exam
Semester	15	15
University	20	40
Appl.	15	35

Mark distribution

Total Marks	CGPA	SAC	SEM Summ
120	10	100	200

Coursework: Internal Examination Format:

Assignment	10 marks
Continuous Assessment Test (C AT)	25 marks
Assignment Quiz	15 marks

External Examination Format: There will be two parts Part A and Part B. Part A contains 10 questions with 1 question from each module, totaling 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which students should answer one question. Each question can have maximum 2 sub-questions and carry 14 marks.

Course Level Assessment Outcomes:**Course Outcome 1 (CO1):**

1. Define categories and prioritise ethical issues.
2. Describe the qualities required to live a peaceful life.
3. Explain the role of engineers in sustainable society.

Course Outcome 2 (CO2):

1. Describe the codes of ethics.
2. Differentiate consumers and customers.
3. Discuss the impact of ethics on organisational conflicts.

Course Outcome 3 (CO3):

1. Explain the role of professionals in terms of technological development.
2. Distinguish between self-interest and conflicts of interest.
3. Review an industrial conflict and legal status.

Course Outcome 4 (CO4):

1. Illustrate the role of engineers in organisations.
2. Interpret the term safety and risk.
3. Show how the organisational culture are resolved by keeping the rights of employees.

Course Outcome 5 (CO5):

1. Explain why the engineers do manage.
2. Investigate the causes and effects of lead free with a case study.
3. Explain the need of environmental effects in technological development.

Model Question paper

QP CODE:

Reg No: _____

PAGE NO.:

Date: _____

AN ABDUL KALAM TECHNOLOGICAL UNIVERSITY THIRD POINT SEMESTER, B.TECH DEGREE EXAMINATION, MONTH & YEAR

Course Code: IIIUT 200

Course Name: PROFESSIONAL ETHICS

Max. Marks: 100

Duration: 3 Hours

(2018-Scheme)

PART A

(Answer all questions, each question carries 3 marks)

- Define integrity and honesty.
- Identify six principles of social, values and ethics.
- Explain the two forms of self-respect.
- Give out the codes of professional ethics.
- Define the advantages of using standards.
- Point out the conditions required to define a code of conduct?
- Specify the conditions of success with an example?
- Define confidentiality.
- Classify the sources of Normative ethics.
- Please give three professional activities and their relevant regulations.

(10x3 = 30 marks)

PART B

(Answer one full question from each module, each question carries 16 marks)

MODULE I

- Q1. a) Classify the relationship between ethical values and law?
b) Compare honesty, integrity and ethics.

(12+4 = 16 marks)

Or

- Q2. a) Explain a comprehensive answer about integrity and respect for others.

8) Discuss about co-operation and consensus.

(3x4 = 12 marks)

MODULE II

13. a) Explain the three main levels of moral development, devised by Kohlberg.

b) Differentiate entre and optimal norms.

(3x4 = 12 marks)

Or

14. a) Explain the theory of right and wrong rules.

b) Discuss in detail the three types of responses in engineering ethics.

(3x4 = 12 marks)

MODULE III

15. a) Compare the following theories of morally responsible agents.

(i) Direct normative

(ii) Instrumental

b) Explain the rights of employees.

(3x4 = 12 marks)

Or

16. a) Explain the concept for Classroom teaching?

b) Discuss the methods in teaching methodology and lesson.

(3x4 = 12 marks)

MODULE IV

17. a) Discuss on collegiality with regard to communication, respect and co-operation.

b) Discuss the role of consensus with an example.

(3x4 = 12 marks)

Or

18. a) Explain in detail about preferred rights and employee rights.

b) During Q3, explain as manager.

MODULE V

19. a) Explain the terminology, morally and appropriate technology.

b) Explain status computer and human values.

(3x4 = 12 marks)

Or

20. a) Intraorganisational ethics and effects of conflicts with a case study.

b) Compare the features of consensus and humanistic values.

(3x4 = 12 marks)

Module 1**Module 1 – Human Values**

Moral, ethical and values – Integrity- Academic Integrity- Work Ethics- Gender Equality- Civic- Civic Rights for citizens- Living peacefully- Caring and Sharing- Honesty- courage- Co-operative consciousness- Integrity- Self Confidence- Social Responsibility.

Module 1 - Explaining Ethics & Professionalism

Issues of Engineering Ethics- Variety of moral issues- Types of Inquiry- Moral Discourse- Moral reasoning- Kohlberg's theory- Gilligan's theory- Contracts and Community- Profession and Professionalism- Models of professional values- Themes in engineering ethics- Business Ethics and Religious- Uses of Ethical Theory.

Module 1- Engineering as social Engineering

Engineering as Engineering- Engineering as responsible Engineering- Code of Ethics- Engineers- A historical analysis of law- Challenges in society- Biopolitical inquiry.

Module 1- Responsibilities and Rights

Collaboration and loyalty- Managing conflicts- Duties for students- Collective bargaining- Collective rights- Rights of shareholders- as moral categories- Conflicts of interests- Organizational ethics- Professional codes- Employment code- HR Dimensions.

Module 1- Global Ethical Issues

Unethical Practices- Environmental issues- Business Ethics- Computer Ethics- Role in Sustainable Development- Responses in Managers- Corporate Governance- Stakeholders- Stakeholder and interests- Shared leadership.

Text Books

1. M. Gorshkov, S. Srivastava and V. S. Senthil Kumar, Engineering Ethics, PHI Learning Private Ltd, New Delhi, 2012.
2. B. E. Neugarten, A text book on professional ethics and human values, New age international, P. Ltd, New Delhi, 2006.

Reference Books

1. Miles W. Martin and Robert Schencking, Ethics in Engineering 4th edition, Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi, 2014.
2. Charles D. Paliwoda, Engineering Ethics, Pearson Education, Prentice Hall, Noida, New Delhi, 2004.
3. Charles E. Harris, Michael J. Pritchard and Michael J. Robins, Engineering Ethics- Concepts and cases, University Thompson Learning, United States, 2003.
4. <http://www.ethicsreligion.org/Values.aspx?Category=values-and-Professional-values>

COURSE CALENDAR & SEMESTER SCHEDULE

SL.NO	Topic	NO. OF LECTURES
1	Module 1 - Human Values:	25
1.1	Motivs, Values and Ethics, Integrity, Academic Integrity, Work Ethics	3
1.2	Service Learning, Civic Virtues, Responses to Virtues, Living prudentially	2
1.3	Quality and Standard, Business, Concepts, Co-operative communication	2
1.4	Honesty, Self Confidence, Moral Progressivism	2
2	Module 2- Engineering Ethics & Professionalism:	
2.1	Source of Responsibility, Virtues, Theory of moral issues, Types of integrity	3
2.2	Moral Judgements, Moral Assessments, Leadership's Virtues	3
2.3	O'Rourke's theory, Economics and Community, Professions & Practice analysis, Matrix of professional roles, That is about right values	3
2.4	Self interests, Duties and Obligations, Case of Moral Theories	3
3	Module 3- Engineering as social Experiments:	
3.1	Engineering as Experimentation, Engineering as responsible Experimentation	3
3.2	Code of Ethics/Plagiarism, A balanced academic environment	3
3.3	Challenging case study, Biopolitical approach	2
4	Module 4- Keeping promises and Rights:	
4.1	Contractuality and Loyalty, Managing conflicts, Project Sustainability	3
4.2	Confidentiality in Engineering, Confidentiality, Role of confidentiality in moral integrity, Conflicts of interests	2
4.3	Displacement norms, Displacement rights, Negligence rights, Fair Distributionism	2
5	Module 5- Global Ethical Issues:	
5.1	Unethical business, Environmental Issues, Business Ethics, Corporate Ethics	2
5.2	Risks vs Technological Development, Moral learning	3
5.3	Engineers in Management, Consulting Engineers, Engineers as Economic entrepreneurs and soldiers	3

ANTARADH KALAM
TECHNOLOGICAL
UNIVERSITY

SEMESTER -4



CODE PACNSU	COURSE NAME CONSTITUTION OF INDIA	CATEGORY	L	T	P	CREDIT
			3	0	0	3.0

Principle:

The study of their own country constitution and studying the importance environment as well as understanding their own human rights help the students to concentrate on their day-to-day disciplines. It also gives the knowledge and strength to face the society and people.

Prerequisite: N/A

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

CO1	Explain the salient features of the present constitution of India and functions.
CO2	LO 16 The fundamental rights and duties.
CO3	Understand the working of the union executive, legislative and judiciary.
CO4	Understand the working of the state executive, legislature and judiciary
CO5	LO 17 THE LOCAL GOVERNMENT AND GRANT OF AUTONOMY
CO6	Show national integration and its expression as citizens of the country.

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
CO1					1	1	1		1		11	12
CO1					1	1	1		1		11	12
CO3					1	1	1		1		11	12
CO4					1	1	1		1		11	12
CO5					1	1	1		1		11	12
CO6					1	1	1		1		11	12

ASSESSMENT MATRIX:

Assessor's Category	Continuous Assessment		End Semester Examination
	1	2	
Remember	22	20	42
Understand	33	30	45
Apply	13	10	23
Analyze			

Evaluated		
Created:		

Mark distribution

Total Marks	CB	EEB	ESE Duration
100	80	100	3 hours

Continuous Internal Evaluation Pattern:

Attendance	10 marks
Continuous Assessment Test (2 numbers)	10 marks
Assignment/Quiz/Online project	10 marks

First Semester Examination Pattern: There will be two parts; Part A and Part B. Part A contains 10 questions with 2 questions from each module, having 2 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 subdivisions and 14 signs.

Course Level Assessment Questions:**Course Outcome 1 (CO1):**

- 1 Discuss the historical background of the Indian constitution.
- 2 Explain the salient features of the Indian constitution.
- 3 Discuss the importance of preamble in the implementation of constitution.

Course Outcome 2 (CO2):

- 1 What are fundamental rights? Examine each of them.
- 2 Examine the scope of freedom of speech and expression underlying the constitution.
- 3 The fundamental right to freedom of speech and expression against the welfare of citizens does not mean violation of the rights under Art 20(3) of the constitution. Examine

Course Outcome 3 (CO3):

- 1 Explain the powers of the President to suspend the fundamental rights during emergency.

- 1 Explain the salient features of agenda by special session.
- 2 List the constitutional powers of President.

Course Outcome 4 (CO4):

- 1 Discuss the constitutional powers of Governor.
- 2 Examine the writ jurisdiction of High court.
- 3 Discuss the qualification and disqualification of members of state legislature.

Course Outcome 5 (CO5):

- 1 Discuss the duties and powers of controller of arbitrage board.
- 2 Discuss the programme of air piggy.
- 3 A state levied tax on motor vehicles used in the state, for the purpose of maintaining roads in the state. It challenges the levy of the tax on the ground that it violates the freedom of Interstate commerce guaranteed under Art 351. Decide.

Course Outcome 6 (CO6):

- 1 Define the advantages of GSTNEDO.
- 2 List the important principles contained in the drafting programme of GSTN.
- 3 Discuss the various accounts contained in the programme of the constitution.

Model Question paper

PART A

(Answer questions. Each question carries 2 marks)

- 1 Define and explain the term constitution.
- 2 Explain the need and importance of Preamble.
- 3 What is executive protocol of state policy?
- 4 Define the TADA.
- 5 List the fundamental statutory departments.

- 6 Explain the tenure power of Supreme court.
- 7 List the qualifications of Governor.
- 8 Explain the term and removal of judges in High court.
- 9 Explain the powers of public service commission.
- 10 List three types of emergency under Indian constitution.

(Q104-Q106)

PART B

EXPLANATION BASED ON EACH MODULE. EACH QUESTION IS TWO OR THREE MARKS.

Module 1

- 11 Discuss the various methods of acquiring citizen ship.
- 12 Examine the salient features of the Indian constitution.

Module 2

- 13 A high court issues a writ petition against X. It directed to file a writ petition in the supreme court under Article 133 around that the defendant violated his fundamental rights. Decide whether he can do so.
- 14 Decide made by striking principles of 2004 on 1973 Act the structure.

Module 3

- 15 Describe the procedure of election and removal of the President of India.
- 16 Supreme court may it to consider grant special leave to appeal. Examine the situation.

Module 4

- 17 Discuss the powers of Governor.
- 18 X filed a writ petition under Art 226 in which was dismissed. Subsequently, he filed a writ petition under Art 132 of the constitution, seeking the same remedy. The Government argued that the writ petition should be dismissed, on the ground of res judicata. Decide.

Module 5

- 19 Examines the scope of the financial relations between the Union and the states.
- 20 Discuss the effects of proclamation of emergency.

(200+100=300)

Syndicate

Module 1 Definition, historical background, features, preamble, territories, documents.

Module 2 State, Fundamental rights, Directive principles, duties.

Module 3 The machinery of the union government.

Module 4 Constitutional practices in the states

MODULE 5 THE NATIONAL CAPITAL TERRITORY OF DELHI, PRACTICE QUESTIONS

Text Books

- 1 D D Basu, *Introduction to the Constitution of India*, Lexis-Nexis, New Delhi, 3rd Ed., 2008
- 2 M V Shrivastava, *The constitution of India*, Universal Law, 1st Ed., 2013

Reference Books

- 1 Ministry of law and justice, *The constitution of India*, Govt of India, New Delhi, 2013.
- 2 J H Pender, *The constitutional law of India*, Central Law Agency, Allahabad, 20th, 2009
- 3 M V Pyne, *India's Constitution*, S Chand and company, New Delhi, 1st Ed., 2008.

Course Contents and Lecture Schedule

No.	Topic	No. of Lectures
Module 1		
1.1	Definition of constitution, Preamble, background, salient Features of the constitution.	1
1.2	Preamble of the constitution, union and its territory.	1
1.3	Meaning of citizenship, types, termination of citizenship.	1
Module 2		
2.1	Definition of state, fundamental rights, general nature, classification, right to equality, right to freedom, right against exploitation.	2

1.2	Right to freedom of religion, cultural and associational rights, right to constitutional remedies. Procedure in respect of conviction for offence.	2
1.8	Directive principles of state policy, classification of statutes, classification of courts.	2
Module 3		
2.1	The Union executive, the President, the Vice President, the Council of ministers, the Prime minister, Attorney-General; functions.	2
2.2	The parliament, composition, Parliamentary, Lok Sabha, qualification and disqualification of members, functions of parliament.	2
2.3	Union judiciary, the supreme court, jurisdiction, access by smaller states.	2
Module 4		
4.1	The State executive, the Governor, the council of ministers, the Chief minister, legislative assembly, Union Territories.	2
4.2	The State legislature, i.e., composition, qualification and disqualification of members, functions.	2
4.3	The state judiciary, the high court, jurisdiction, writs (jurisdiction).	2
Module 5		
5.1	Relations between the Union and the States, legislative relation, executive relation, financial relations, inter-State council, Finance commission.	2
5.2	Emergency provision, Freedom of trade, commerce and inter-state trade, foreign trade and public generally interest, Public Services, Public authority corporation, administrative tribunals.	2
5.3	Official language, motions, special provisions relating to certain clauses, amendment of the Constitution.	2

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
			3	0	0	
EST 206	DESIGN AND DIGITALIZING					3

Preamble:

The purpose of this course is to:

- 1. introduce the undergraduate engineering students fundamental concepts of design engineering.
- 2. make them understand the steps involved in the design process and
- 3. familiarize them with the basic tools used and approaches in design.

Students are expected to apply design thinking in learning as well as while practicing engineering, which is very important and relevant for today. Case studies from various practical situations will help the students realize that design is not only concerned about the function but also many other factors like customer requirements, economics, reliability, etc. along with a variety of life cycle issues.

The course will help students to develop analytical, diagnostic and systematic skills to work in design and assist students in transitioning areas with ease.

Prerequisite:

With the course will be generic to all engineering disciplines and will not require technical preparation or prerequisites in any of the individual engineering disciplines.

Course Outcomes:

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

CO1	Explain the different concepts and principles involved in design engineering.										
CO2	Apply design thinking while learning and practicing engineering.										
CO3	Develop innovative, reliable, sustainable and economically viable designs incorporating knowledge in engineering.										

Mapping of course outcomes with program outcomes:

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

Assessment Pattern**Continuous Internal Evaluation (CIE) Pattern**

Attendance	10 marks
Continuous Assessment Test (CIE) numbers	25 marks
Assignment/Inclusive assessment	15 marks

2nd Semester Examination (2SE) Pattern: This will be two parts Part A and Part B.

Part A contains 20 questions with 2 questions from each module, having 2 marks for each question.

Students should answer all questions.

Part B contains 2 case study questions from each module of which student should answer any one. Each question carry 10 marks and can have maximum 2 sub questions.

Mark Allocation:

Total Marks	CB	SIE	SIE Duration
100	40	60	2 hours

Bloom's Category	Continuous Assessment (Marks)		2nd Semester Examination
	1	2	
Remember	1	1	10
Understand	10	10	10
Analyse	20	20	20
Evaluate	-	-	-
Create	-	-	-



Course Level Assessment Questions

Course Outcome 1 (CO1): Appreciate the different concepts and principles involved in design engineering.

1. State how engineering design is different from other kinds of design.
2. Use the different stages in the design process.
3. Explain design thinking.
4. Define the function of prototyping and prototyping in engineering design.
5. Write notes on the following concepts in connection with design engineering: (i) Modular Design, (ii) Life Cycle Design, (iii) Value Engineering, (iv) Costumer Engineering, and (v) Reverse Engineering.
6. Define design right.

Course Outcome 2 (CO2): Apply design thinking while learning and practicing engineering.

1. Discuss the iterative process for design thinking in developing simple products like a pen, umbrella, bag, etc.
2. Show with an example how design-thinking helps in generating alternative designs and then how to narrow down to the best design.
3. Explain how a problem-based learning helps in taking better design-thinking solutions.
4. Discuss as an engineer, how a customer drives his/her design.

Course Outcome 3 (CO3): Develop innovative, reliable, sustainable and economically viable designs incorporating different segments of knowledge in engineering.

1. Illustrate the development of any simple product by passing through the different stages of design thinking.
2. Show the graphical design communication with the help of detailed 2D or 3D drawings for any simple product.
3. Explain how to develop your designs for simple products through 2D or 3D.

Model Question paper

Page 1 of 2

Reg No. _____ Name. _____

GP1 ANDREI NALAM TECHNICAL COLLEGE, UNIVERSITY
THIRD/FOURTH SEMESTER B.TECH CROWN EXAMINATION

Course Code: CST 120

Course Name: DESIGN AND ENGINEERING

Max. Marks: 200|Duration: 3 Hours

PART A

Answer all questions, each question carries 4 marks.

use only hand sketches

- (1) Write about the basic design process.
- (2) Describe how to finalize the design objectives.
- (3) State the role of divergent-convergent questioning in design thinking.
- (4) Discuss how to perform design thinking in a team managing the conflicts.
- (5) Explain engineering sketches and drawings convey designs.
- (6) Explain the role of mathematics and physics in design engineering process.
- (7) Distinguish between problem-based learning and problem-case learning in design engineering.
- (8) Describe how concepts like value engineering, concurrent engineering and reverse engineering influence engineering designs?
- (9) Draw how designs are varied based on the aspects of construction methods. If a car, reliability and environment?
- (10) Explain how economics influence the engineering designs.

(10x4 marks = 40 marks)

Part B

Answer any ONE question from each module. Each question carry 14 marks

Module 1

- (1) Show the designing of a wiper wash going through the various stages of the design process. Use Hand sketches to illustrate the processes.
- (2) Find the customer requirements for designing a new car showroom. Show how the design objectives were finalized utilizing the design constraints.

Module 3

- (1) Examine the design thinking approach for designing a dog's cage. Elaborate Module 2 related subject. Describe each stage of the process and the respective documents involved. Use hand sketches to support your arguments.
 or
 (2) Construct a number of housing designs and then refine them to narrow down to the best design for a single family house in Nigeria. Show how the design fits in the existing building rules in the chosen. Provide your rationale for each step by using hand sketches only.

Module 3

- (3) Creatively communicate the design of a thermo flask used to keep hot coffee. Draw the detailed 2D drawings of the same with design-deciding, material selection, scale drawings, dimensions, tolerances, etc. Use only hand sketches
 or
 (4)Examine the role of mathematics thinking in design engineering. Show how mathematics and physics play a role in designing a lifting mechanism to raise 100 kg of weight to a floor at a height of 10 meters in a construction site.

Module 4

- (1) Draw the development of a nature inspired design for a solar covered bus shelter shed beside a highway. Adapt between two to one man-made designs. Use hand sketches to support your arguments.
 or
 (2)Draw the design of a simple site and then depict how the design changes when considering i) aesthetics and ii) ergonomics into consideration. Give hand sketches and explanations to justify the changes in design.

Module 5

- (1)Examine the changes in the design of a fuel car with constraints of i) production methods, ii) life span requirement, iii) reliability issues and iv) environmental factors. Use hand sketches and give critical rationing for the changes in design.
 or
 (2)Describe the how to assess the cost of a particular design using AMT of the following:
 i) a reactor, ii) the layout of a plant, iii) the elevation of a building, iv) analytical or automatic system in optical analysis
 These five economics will enhance the engineering design. Use hand sketches to support your arguments.

(Total marks: 70 marks)

Syllabus**Module 1**

Design Process - Introduction to Design and Engineering Design, Defining a Design Process, Defining Customer Requirements, Setting Design Objectives, Identifying Constraints, Examining Functions, Generating Design Alternatives and Choosing a Design.

Module 2

Design Thinking Approach: Introduction to Design Thinking, Design Design Thinking Process Stages, Empathise, Define, Ideate, Prototype and Test, Design Thinking in Disruptor-Changeover, Questioning Design Thinking is a Team Environment.

Module 3

Design Communication: Languages of Engineering Design-Communicating Design Originally, Communicating Design Clearly and in Writing, Mathematical Modelling in Design, Prototyping and Presenting the Design.

Module 4

Design Engineering Concepts: Project-based Learning and Problem-based Learning in Design, Modular Design and Life-Cycle Design Approaches, Application of Biophilic Aesthetics and Ergonomics in Design, Value Engineering, Concurrent Engineering, and Reverse Engineering in Design.

Module 5

Designing, Evaluating, and Optimising in Design, Engineering Design for Production, Use, and Sustainability, Engineering Economics in Design, Design Rights, Ethics in Design.

Text Books

- 1) Venkatesh, *Engineering Fundamentals*, James M. Gere, *Engineering Design Process*, Cengage Learning 2001, Third Edition, ISBN-13: 9781300311081.

- 2) Voland, G., *Engineering by Design*, Pearson India 2014, Second Edition, ISBN 9789332530303.

Reference Books

- 1) Philip Eberly, Robert Salas, William Liao, George Wiles, *Engineering Designing*, Paulsen, An Introduction to Engineering and Design, *Answers from 12.1*, 6th Edition, ISBN: 978128412420
- 2) Gary L. Davis, *Engineering Design: A Project-Based Introduction*, John Wiley & Sons, New York, 2004, Fourth Edition, ISBN-13: 978-1-118-02451-2
- 3) Nagel, Gross, *Design Thinking: Understanding How Designers Think and Work*, Wiley Publishing 2011, First Edition, ISBN: 978-1-118-33010-0
- 4) Rao, S., Ram, R., Poddar, J., Srivastava, K.M., *Engineering Design: A Systematic Approach*, Springer 2007, Third Edition, ISBN: 978-0-38725-215-1

Course Contents and Lecture Schedule

No.	Topic	No. of lectures
1.	Module 1: Design Process	
1.1	Introduction to Design and Engineering Design: What does it mean to design something? How is engineering design different from other kinds of design? What and when do engineers design? What are the basic considerations in engineering design? How to start and do engineering design?	1
1.2	Defining a Design Problem: Defining Customer Requirements: How to do engineering design? Illustrate the process with an example. How to identify the customer requirements of design?	1
1.3	Defining a Design Problem- Setting Design Objectives, Identifying Constraints, Establishing Functions: How to finalize the design objectives? How to identify the design constraints? How to express the functions of design in engineering terms?	1
1.4	Defining a Design Problem - Generating Design Alternatives and Choosing a Design: How to generate or create feasible design alternatives? How to identify the 'best possible design'?	1
1.5	Case Studies- Stages of Design Process: Conduct exercises for designing simple products going through the different stages of design process.	1
1.	Module 2: Design Thinking Approach	
2.1	Introduction to Design Thinking: How does the design thinking approach help engineers to create innovative and efficient designs?	1
2.2	Design Thinking Three Stage: Empathize, Define, Create, Prototype and Test: How can the engineers arrive at better designs using the creative design thinking process for which knowledge acquired in the later stages can be applied back to the earlier stages?	1
2.3	Design Thinking in Different Contexts: Quantitative: Designers have to create a number of possible designs and then how to refine and narrow down to the best design.	1
2.4	Design Thinking in a Team Environment: How to perform design thinking as a team managing the workflow?	1
2.5	Case Studies: Design Thinking Approach: Conduct exercises using the design thinking approach for	1

	assigning and completing products within a limited time and budget.	
1	Module 2: Design Communication (Language of Engineering Design)	
4.1	Communicating Design Graphically How do engineering analysis and design affect design? Communicating Design Graphically and in Writing	1
4.2	How can a design be communicated through visual, presentative or technical reports effectively?	1
	First Semester Examinations:	
4.3	Mathematical Modeling in Design How do mathematics and physics become a part of the design process?	1
4.4	Prototyping and Printing the Design How is prototyping earlier the design will function well in real?	1
4.5	Case Studies: Communicating Design Graphically Conduct exercises for design communication through extended 2D or 3D drawings of simple products such as design detailing, material selection, scale drawings, dimensioning, annotations, etc.	1
4	Module 3: Design Thinking Concepts	
4.1	Project-based Learning and Problem-based Learning in Design How engineering students can work design engineering through projects? How students can take up problems to learn design engineering?	1
4.2	Modular Design and Life Cycle Design Approaches What is modular approach in design engineering? How it helps? How the life cycle design approach influences design decisions?	1
4.3	Application of Harmony, Aesthetics and Expressions in Design How do aesthetics and expressiveness change engineering designs? How do the intelligence in nature insights engineering designs? What are the common examples of harmony in engineering?	1
4.4	Vision Empowering, Communication Expressing, and Reference Registering in Design How do concept like value engineering, concurrent engineering and reverse engineering influence engineering designs?	1
4.5	Case Studies: Bio-mimicry based Design Conduct exercises to develop new designs for simple	1

	graduates using this material, and train students to bring out new, more creative designs.	
2	Module 5: Experience, Economics and Sustainability in Design Engineering	
5.1	Design for Production, Use, and Sustainability How designs are finalized based on the aspects of production methods, life span, reliability and environment?	1
5.2	Engineering Economics in Design How to estimate the cost of a particular design and how will economic influence the engineering designs?	1
5.3	Design Rights What are design rights and how can an engineer protect his products?	1
5.4	Ethics in Design Why do ethics play a significant role in engineering design? Cross Disciplines: Design for Production, Use, and Sustainability Conduct interviews using simple products to show how design changes in 4 dimensions of production methods, life span requirements, reliability, cost and environmental factors.	1

Final Year Examination

Code	Course Name	L	T	R	SLR	Grade
SEET 200	Professional Ethics	1	0	0	1	I

Promote: To enable students to create awareness on ethical issues in their roles.

Prerequisite: N/A

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

CO 1	Distinguish the core values that shape the ethical behaviour of a professional.
CO 2	Assess a given situation and reflect on ethical issues.
CO 3	Explain the role and responsibility of technology in development in keeping personal ethics and legal ethics.
CO 4	Solve moral and ethical problems through application and assessment by established approaches.
CO 5	Apply the knowledge of human values and social pillars in managing professional values and ethical issues.

Mapping of course outcomes with programme 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									3	1	2
CO 2									1		1	
CO 3									1		1	
CO 4									1		1	
CO 5									1		1	

Assessment Pattern

Elaborate category	Continuous Assessment Test	End Semester Exam
Semester	15	15
University	20	40
Appl.	15	35

Mark distribution

Total Marks	CGPA	SAC	SEM Summ
125	10	100	2500

Coursework: Internal Examination Format:

Assignment	10 marks
Continuous Assessment Test (CAT)	25 marks
Assignment Quiz	15 marks

External Examination Format: There will be two parts Part A and Part B. Part A contains 10 questions with 1 question from each module, totaling 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which students should answer one question. Each question can have maximum 2 sub-questions and carry 14 marks.

Course Level Assessment Outcomes:**Course Outcome 1 (CO1):**

1. Define categories and prioritise ethical issues.
2. Describe the qualities required to live a peaceful life.
3. Explain the role of engineers in sustainable society.

Course Outcome 2 (CO2):

1. Describe the nature of events.
2. Differentiate consumers and customers.
3. Discuss the impact of these characteristics on conflicts.

Course Outcome 3 (CO3):

1. Explain the role of professionals in urban and regional development.
2. Distinguish between self-interest and conflicts of interest.
3. Review an industrial conflict and legal action.

Course Outcome 4 (CO4):

1. Illustrate the role of engineers in stakeholders.
2. Interpret the terms safety and risk.
3. Show how the organizational culture can resolve by keeping the rights of employees.

Course Outcome 5 (CO5):

1. Explain why the engineers do manage.
2. Investigate the causes and effects of lead rain with a case study.
3. Explain the need of environmental effects in technological development.

Model Question paper

QP CODE:

Reg No: _____

PAGE NO.:

Date: _____

AN ABDUL KALAM TECHNOLOGICAL UNIVERSITY THIRD POINT SEMESTER, B.TECH DEGREE EXAMINATION, MONTH & YEAR

Course Code: IIIUT 200

Course Name: PROFESSIONAL ETHICS

Max. Marks: 100

Duration: 3 Hours

(2018-Scheme)

PART A

(Answer all questions, each question carries 3 marks)

- Define integrity and honesty.
- Identify six principles of social, values and ethics.
- Explain the two forms of self-respect.
- Give out the codes of professional ethics.
- Define the advantages of using standards.
- Point out the conditions required to define a code of conduct?
- Specify the conditions of success with an example?
- Define confidentiality.
- Classify the sources of Normative ethics.
- Please give three professional activities and their relevant regulations.

(10x3 = 30 marks)

PART B

(Answer one full question from each module, each question carries 16 marks)

MODULE I

- Q1. a) Classify the relationship between ethical values and law?
b) Compare honesty, integrity and ethics.

(12+4 = 16 marks)

Or

- Q2. a) Explain a comprehensive answer about honesty and respect for others.

8) Discuss about co-operation and consensus.

(3x4 = 12 marks)

MODULE II

13. a) Explain the three main levels of moral development, devised by Kohlberg.

b) Differentiate entre and optimal norms.

(3x4 = 12 marks)

Or

14. a) Explain the theory of right and wrong rules.

b) Discuss in detail the three types of responses in engineering ethics.

(3x4 = 12 marks)

MODULE III

15. a) Compare the following theories of morally responsible agents.

(i) Direct normative

(ii) Instrumental

b) Explain the rights of employees.

(3x4 = 12 marks)

Or

16. a) Explain the concept for Classroom teaching?

b) Discuss the methods in teaching methodology and lesson.

(3x4 = 12 marks)

MODULE IV

17. a) Discuss on collegiality with regard to communication, respect and co-operation.

b) Discuss the role of consensus with an example.

(3x4 = 12 marks)

Or

18. a) Explain in detail about preferred rights and employee rights.

b) During Q3, explain as manager.

MODULE V

19. a) Explain the terminology, morally and appropriate technology.

b) Explain status computer and human values.

(3x4 = 12 marks)

Or

20. a) Distinguish the status and effects of adults with a child and

b) Compare the features of assessment and humanistic values.

(3x4 = 12 marks)

Module 1**Module 1 – Human Values**

Moral, ethical and values – Integrity- Academic Integrity- Work Ethics- Gender Equality- Civic- Civic Rights for citizens- Living peacefully- Caring and Sharing- Honesty- courage- Co-operative consciousness- Integrity- Self Confidence- Social Responsibility.

Module 1 - Explaining Ethics & Professionalism

Issues of Engineering Ethics- Variety of moral issues- Types of Inquiry- Moral Sciences- Moral reasoning- Kohlberg's theory- Gilligan's theory- Contracts and Community- Profession and Professionalism- Models of professional values- Themes in engineering ethics- Business Ethics and Religious- Uses of Ethical Theory.

Module 1- Engineering as social Engagements

Engineering as Engagements – Engineers as responsible Engagements- Code of Ethics- Engineers- A historical analysis of how – Challenges- case study- Biogeo- gas industry.

Module 1 – Responsibilities and Styles

Collaboration and loyalty – Managing conflicts- Barriers for collaboration- Collective bargaining- Conflict resolution- Basis of collaboration- in moral categories- Conflict of interests- Organizational culture- Professional codes- Employees as part of the organization.

Module 1- Global Ethical Issues

Unethical Practices- Environmental issues- Business Ethics- Computer Ethics- Role in Sustainable Development- Responses in Managers- Cross-Cultural Responses- Responses to Organizational and individuals- Need leadership.

Text Books

1. M. Gorshkov, S. Srivastava and V. S. Senthil Kumar, Engineering Ethics, PHI Learning Private Ltd, New Delhi, 2012.
2. B. E. Neugarten, A text book on professional ethics and human values, New age international, P. Ltd, New Delhi, 2006.

Reference Books

1. Miles W. Martin and Robert Schencking, Ethics in Engineering 4th edition, Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi, 2014.
2. Charles D. Patterson, Engineering Ethics, Pearson Education, Prentice Hall, Noida, New Delhi, 2004.
3. Charles E. Harris, Michael J. Portman and Michael J. Robins, Engineering Ethics- Concepts and cases, University Thompson Learning, United States, 2003.
4. <http://www.ethicsreligion.org/Values.aspx?Category=values-and-Professional-values>

COURSE CALENDAR & SEMESTER SCHEDULE

SL.NO	Topic	NO. OF LECTURES
1	Module 1 - Human Values:	25
1.1	Motivs, Values and Ethics, Integrity, Academic Integrity, Work Ethics	3
1.2	Service Learning, Civic Virtues, Responses to Virtues, Living prudentially	2
1.3	Quality and Standard, Business, Concepts, Co-operative communication	2
1.4	Honesty, Self Confidence, Moral Progressivism	2
2	Module 2- Engineering Ethics & Professionalism:	
2.1	Source of Responsibility, Virtues, Theory of moral issues, Types of integrity	3
2.2	Moral Judgements, Moral Assessments, Leadership's Virtues	3
2.3	O'Rourke's theory, Economics and Community, Professions & Practice analysis, Matrix of professional roles, That is about right values	3
2.4	Self interests, Duties and Obligations, Case of Moral Theories	3
3	Module 3- Engineering as social Experiments:	
3.1	Engineering as Experimentation, Engineering as responsible Experimentation	3
3.2	Code of Ethics/Plagiarism, A balanced academic environment	2
3.3	Challenging case study, Biopolitical approach	2
4	Module 4- Keeping promises and Rights:	
4.1	Contractuality and Loyalty, Managing conflicts, Project Sustainability	3
4.2	Confidentiality in Engineering, Confidentiality, Role of confidentiality in moral integrity, Conflicts of interests	2
4.3	Displacement norms, Displacement rights, Negligence rights, Fair Distributionism	2
5	Module 5- Global Ethical Issues:	
5.1	Unethical business, Environmental Issues, Business Ethics, Corporate Ethics	2
5.2	Risks vs Technological Development, Moral learning	3
5.3	Engineers in Management, Consulting Engineers, Engineers as Economic entrepreneurs and soldiers	3