DIPLOMA WING

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA,BHOPAL

SCHEME OF STUDIES & EXAMINATIONS (IMPLEMENTED FROM SESSION : JULY-2023)

SECOND SEMESTER - GROUP 'A'

: NAME OF THE PROGRAMME :

Agriculture,Aircraft Maintenance,Automobile,Chemical,CSE,CHM,Electronics & Tele.,Electronics & Inst., Electrical & Electronics Engg.,Electrical & Mech.Engg.,Electronics Engg.,IT,Mechanical,Opto Electronics,RAC

S.N.	PAPER CODE	SUBJECT CODE	SUBJECT NAME	THEORY COMPONENT								PRACTICAL COMPONENT					TOTAL CREDITS	TOTAL MARKS
				HRS PER WEEK	CREDITS	TERM WORK			THEORY PAPER			HRS PER WEEK	CREDITS	LAB WORK	PRACTICAL EXAM/VIVA			
						QUIZ/ASSIGNMENT	MID TERM TEST*		TOTAL	MARKS	DURATION				MARKS	DURATION		
							I	II										
1	7357	201	MATHEMATICS - II	4	4	10	10	10	30	70	03 Hrs.	0	0	0	0	0	4	100
2	7358	202	APPLIED PHYSICS - II	4	4	10	10	10	30	70	03 Hrs.	4	2	20	30	3 Hrs.	6	150
3	7354	203	INTRODUCTION TO IT SYSTEM	3	3	10	10	10	30	70	03 Hrs.	4	2	20	30	3 Hrs.	5	150
4	7355	204	FUNDAMENTALS OF ELECT. & ELECTRONICS ENGG.	3	3	10	10	10	30	70	03 Hrs.	4	2	20	30	3 Hrs.	5	150
5	7356	205	ENGINEERING MECHANICS	3	3	10	10	10	30	70	03 Hrs.	4	2	20	30	3 Hrs.	5	150
6			ENVIRONMENTAL SCIENCE	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7			LIBERARY	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
TOTAL				19	17				150	350		17	8	80	120		25	700

NOTE - (1)* Two Best, out of Three Mid Term Tests (Progressive Tests) Marks should be entered here.

GRAND TOTAL OF CREDITS
25

GRAND TOTAL OF MARKS
700

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SEMESTER II – GROUP 'A'

COURSE TITLE	:	MATHEMATICS - II
PAPER CODE	:	7357
SUBJECT CODE	:	201
TREORY CREDITS	:	04
PRACTICAL CREDITS	:	00

Course Content:

Unit	Topics and Sub-topics	Hours	Marks
Unit – I : Determinants and Matrices	Value of the determinants up to 3rd order, consistency of equations, Crammer's rule (equation of two variables only). Algebra of matrices, Types of Matrices, Transpose, Adjoint & Inverse of a matrix.	8	14
Unit–II: Integral Calculus	Integration as inverse operation of differentiation. Simple integration by substitution, integration by parts. Definite integration, Applications of integration for Simple problem on evaluation of area bounded by a curve and axes.	8	14
Unit – III : Co-ordinate Geometry	Equation of straight line in various standard forms(general, two point, slope, intercepts), Angle between two lines. Parallel and Perpendicular lines, General equation of a circle and its characteristics. Introduction of conics section and there standard form (Parabola, Ellipse, Hyperbola)	8	14
Unit–IV: Vector Algebra	Definition notation and rectangular resolution of a vector. Addition and subtraction of vectors. Scalar and vector products of 2 vectors. Application of vector product (Area of triangle and Parallelograms, Perpendicular unit vector Simple problems related to work.	8	14
Unit -V : Differential Equations	Order and Degree of differential equation, General and Particular solution of first order and first degree differential equation by variable separation method (simple problems).	8	14

Course Objectives:

This course is designed to give a comprehensive coverage at an introductory level to the subject of Matrices& Determinants, Integral Calculus, Coordinate geometry, Basic elements of vector algebra and First Order Differential Equations

Course Outcomes:

By the end of the course the students are expected to learn

The students are expected to acquire necessary background in Determinants and Matrices so as to appreciate the importance of the Determinants are the factors that scale different parameterizations so that they all produce same overall integrals, i.e. they are capable of encoding the inherent geometry of the original shape. The cumulative effect of the original quantity or equation is the Integration. The coordinate geometry provides a connection between algebra and geometry through graphs of lines and curves. Tell the difference between a resultant and a concurrent force to model simple physical problems in the form of a differential equation, analyze and interpret the solutions.

References:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers,NewDelhi,40th Edition, 2007.

2. G.B.Thomas, R.L.Finney,CalculusandAnalyticGeometry,AddisonWesley,9thEdition, 1995.

3. S.S. Sabharwal, Sunita Jain, Eagle Parkashan, Applied Mathematics, Vol.I&II, Jalandhar.

4. Comprehensive Mathematics, Vol.I&II by Laxmi Publications, Delhi.

5. Reena Garg & Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishing House, New Delhi

S.N.	PAPER CODE	SUBJECT CODE	SUBJECT NAME	THEORY COMPONENT								PRACTICAL COMPONENT					TOTAL CREDITS	TOTAL MARKS
				HRS PER WEEK	CREDITS	TERM WORK				THEORY PAPER		HRS PER WEEK	CREDITS	LAB WORK	PRACTICAL EXAM/VIVA			
						QUIZ/ASSIGNMENT	MID TERM TEST*		TOTAL	MARKS	DURATION				MARKS	DURATION		
							I	II										
1	7357	201	MATHEMATICS - II	4	4	10	10	10	30	70	03 Hrs.	0	0	0	0	0	4	100

Blue Print of Question Paper

Time: Three Hours Maximum Marks: 70

Unit	Part-A		Part-B	Part-C	Part-D
	10 Marks	10 Marks	15 Marks	20 Marks	15 Marks
Unit – I : Determinants and Matrices Unit–II: Integral Calculus Unit – III : Co-ordinate Geometry Unit–IV: Vector Algebra Unit -V : Differential Equations	**Pattern:** 5Objective type questions. (one question from each unit.)	**Pattern:** 1 Question of Match the column. 5 parts(one part from each unit.)	**Pattern:** Short Numerical problems.(8 questions set)At least two questions from unit1, 2, 3 And one question fromunit4,5. (5questions are to be attempted).	**Pattern:** Numerical problems. (8 questions set) At least one question from unit1, 2 And two questions from unit3, 4, 5. (5questions are to be attempted).	**Pattern:** Numerical problems.(5/6 questions set, 1 from each unit. (3questions are to be attempted.)
Total Marks =70	**10**	**10**	**15**	**20**	**15**

Question Bank for Mathematics-II

Unit-1 Determinants and Matrices

Part-A

Q.1) Choose the correct answers.

(i) Value of determinant $\begin{vmatrix} 2 & 5 \\ 0 & 1 \end{vmatrix}$ is

(a) 5 (b) 2 (c) 1 (d) 0

(ii) If $\begin{vmatrix} x-2 & 1 \\ 0 & 2 \end{vmatrix} = 0$, then value of x is

(a) $x = 1$ (b) $x = -1$ (c) $x = 2$ (d) $x = -2$

(iii) The matrix $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ is

(a) Scalar matrix (b) Unit matrix

(c) Diagonal matrix (d) Lower triangular matrix

(iv) The matrix $\begin{bmatrix} 8 & 7 & 3 \\ 0 & 5 & 2 \\ 0 & 0 & 6 \end{bmatrix}$ is

(a) Scaler matrix (b) Upper triangular matrix

(c) Diagonal matrix (d) Lower triangular matrix

(v) Transpose of the matrix $\begin{bmatrix} 4 & 3 \\ 9 & 7 \end{bmatrix}$ is

(a) $\begin{bmatrix} 4 & 9 \\ 3 & 7 \end{bmatrix}$ (b) $\begin{bmatrix} 3 & 4 \\ 7 & 9 \end{bmatrix}$ (c) $\begin{bmatrix} 7 & 3 \\ 9 & 4 \end{bmatrix}$ (d) $\begin{bmatrix} 4 & 3 \\ 7 & 9 \end{bmatrix}$

(vi) If $A = [\,1 \quad 2]$, $B = \begin{bmatrix} 2 \\ 3 \end{bmatrix}$ then AB is equal to

(a) $[\,2 \quad 6]$ (b) $\begin{bmatrix} 2 \\ 6 \end{bmatrix}$ (c) $[\,8\,]$ (d) $[\,7\,]$

Q.2) Match the column

(A) $\begin{bmatrix} 4 & 3 & -1 \\ 3 & 8 & 0 \end{bmatrix}$	(a) $Diagonal\ matrix$
(B) $\begin{bmatrix} 5 & 0 \\ 0 & 11 \end{bmatrix}$	(b) $Rectengular\ matrix$
(C) $\begin{vmatrix} 6 & 5 \\ 6 & 5 \end{vmatrix}$	(c) 1
(D) $\begin{bmatrix} 3 & 7 \\ 5 & 11 \end{bmatrix}^T$	(d) $\begin{bmatrix} 3 & 5 \\ 7 & 11 \end{bmatrix}$
(E) $\begin{vmatrix} cosx & -sinx \\ sinx & cosx \end{vmatrix}$	(e) 0

Part-B / C

Q.1) If $A = \begin{bmatrix} 2 & -1 \\ 3 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$ then find the value of $A^2 - 2B$

Q.2) If $A = \begin{bmatrix} 3 & 2 & 1 \\ 0 & -1 & -2 \end{bmatrix}$, $B = \begin{bmatrix} 4 & 2 & -1 \\ 8 & 1 & 3 \end{bmatrix}$ then verify that

$(A + B)' = A' + B'$

Q.3) Find the value of determinant $\begin{vmatrix} 8 & 7 & 3 \\ 6 & 5 & 2 \\ 11 & 9 & 6 \end{vmatrix}$

Q.4) If $\begin{bmatrix} x & 2 \\ 1 & 3 \end{bmatrix} + 2\begin{bmatrix} 1 & y \\ 3 & 1 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ 7 & 5 \end{bmatrix}$ then find the value of x and y

Q.5) Solve by crammer rule $4x - 3y = 11,\ 3x + 7y = -1$

Q.6) If $A = \begin{bmatrix} 1 & 2 \\ -1 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 2 & -1 \\ 4 & 3 \end{bmatrix}$ then find the value of $|2A + 3B|$

Q.7) If $A = \begin{bmatrix} 1 & 7 \\ 5 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 1 & -1 \\ 0 & 2 \end{bmatrix}$ then find the value of $(A + B)^T$

Q.8) Solve by crammer rule $2x + y + 1 = 0, x - 2y + 3 = 0$

Q.9) If $x+y=\begin{bmatrix}1 & 2\\ 0 & -1\end{bmatrix}$ and $x-y=\begin{bmatrix}2 & 3\\ 4 & 1\end{bmatrix}$ then find the value of x and y

Q.10) Prove that following matrix is singular

$$\begin{bmatrix}1 & 1 & 2\\ 2 & 5 & 7\\ 2 & -1 & 1\end{bmatrix}$$

Part-D

Q.1) If $A=\begin{bmatrix}1 & 2 & 2\\ 2 & 1 & 2\\ 2 & 2 & 1\end{bmatrix}$ then find A^{-1}

Q.2) Find the inverse of A, where $A=\begin{bmatrix}1 & 3 & 2\\ 2 & -1 & 0\\ 3 & 2 & 1\end{bmatrix}$

Q.3) If $A=\begin{bmatrix}2 & -2\\ -2 & 2\end{bmatrix}$, then show that $A^3=16A$

Q.4) If $A=\begin{bmatrix}2 & 1 & 0\\ 3 & -1 & 4\\ 4 & 2 & 1\end{bmatrix}$ then show that $(A+A^T)$ is a symmetric matrix.

Q.5) If $A=\begin{bmatrix}2 & 1 & 0\\ 3 & -1 & 4\\ 4 & 2 & 1\end{bmatrix}$ then show that $(A-A^T)$ is a skew symmetric matrix.

Unit-II (Integral Calculus)

Part-A

Q.1) Choose the correct answers.

(i) $\int sec^2 x dx =$

(a) $secx$ (b) $tanx+c$

(c) $cosecx$ (d) $cotx+c$

(ii) $\int \frac{1}{x} dx =$

(a) $secx$ (b) $log_e x+c$

(c) $tanx+c$ (d) $tanx$

(iii) $\int_0^{\frac{\pi}{2}} sinx\, dx =$

(a) 0 (b) -1

(c) 1 (d) $\frac{\pi}{2}$

(iv) $\int_0^1 x\, dx =$

(a) $\frac{1}{2}$ (b) 1

(c) 0 (d) 3

(v) $\int 1dx =$

(a) $x + c$ (b) $x^2 + c$

(c) $\frac{1}{x} + c$ (d) c

(vi) $\int_0^1 \frac{dx}{x+1}$

(a) $log_e 2 + c$ (b) $log_e 2$

(c) $log_e 1$ (d) $log_e 1 + c$

Q.2) Match the column

(A) $\int_a^b f(x)\, dx$ (a) $\log_e sinx$

(B) $\int \frac{1}{x} dx$ (b) $sinx$

(C) $\int cosx\, dx$ (c) $log_e x$

(D) $\int tanxdx$ (d) $\int_a^b f(t)$

(E) $\int cotx\, dx$ (e) $log_e secx$

Part-B/C

Q.1) Find $\int \left(ax + \frac{b}{x}\right) dx$

Q.2) Find $\int tan^2 x \, dx$

Q.3) Find $\int xe^x dx$

Q.4) Find $\int_0^2 x^3 \, dx$

Q.5) Find $\int xe^{x^2} dx$

Q.6) Find $\int \frac{1}{x \log_e x} dx$

Q.7) Find $\int \frac{1}{cos^2 x \, sin^2 x} \, dx$

Q.8) Find $\int \sqrt{(1 + sin2x)} dx$

Q.9) Find $\int x \, log_e \, dx$

Q.10) Find $\int \frac{1}{(1+cos2x)} \, dx$

Q11) Find $\int e^x \cos e^x \, dx$

Q.12) Find $\int \frac{sin(\log_e x)}{x} dx$

Q.13) Find $\int \frac{e^{\sqrt{x}}}{\sqrt{x}} dx$

Q.14)Find $\int log_e x dx$

Part-D

Q.1) Find the area bounded by curve,

$y^2 = 4ax$, X-axis, $x = 0 , x = a$

Q.2) Find the area bounded by curve,

$y = 2x + x^2 - x^3$, x − axis $x = -1 , x = 1$

Q.3) Find the area enclosed by curve.

$y^2 = x$, x − axis, $x = 0 , x = 1$

Q.4) Find the area bounded straight line $x + y = a$ and both axes in first quadrant.

Q.5) Find the area bounded straight line $\frac{x}{a} + \frac{y}{b} = 1$ and both axes in first quadrant

Q.6) Find $\int \frac{e^x(1+x)}{sin^2(xe^x)} dx$

Q.7) Find $\int \frac{e^x(1+x)}{cos^2(xe^x)} dx$

Unit-3 (Coordinate Geometry)

Part – A

Q.1) Choose the correct answers.

(i) The general equation of a straight line is:

(a) $ax + by + c = 0$ (b) $ax^2 + bx + c = 0$

(c) $xy = c$ (d) $y = m x^2$

(ii) Slope of the line $5x - 2y + 3 = 0$ is:

(a) 5 (b) -5

(c) $\frac{5}{2}$ (d) $-\frac{5}{2}$

(iii) X-intercept of line $3x + 6 = 0$ is:

(a) -2 (b) 2

(c) -1 (d) 1

(iv) Condition for parallel lines

(a) $m_1 = m_2$ (b) $m_1 \times m_2 = -1$

(c) $m_1 + m_2 = 0$ (d) $m_1 \times m_2 = 1$

(v) Conic sections are obtained by cutting a:

(a) Sphere (b) Cube

(c) Cone (d) Cylinder

Q.2) Match the column

A. Equation of a line	a. $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$
B. Equation of a Ellipse	b. $y = mx + c$
C. Equation of a parabola	c. $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$
D. Equation of a hyperbola	d. $ax^2 + by^2 + 2gx + 2fy + c = 0$
E. Equation of a Circle	e. $y^2 = 4ax$

Part – B

Q.1) Find the equation of straight line which makes equal intercepts on the axes and passes through (1, 2).

Q.2) Find the equation of line which passes through origin and making angle of 45°.

Q.3) Find the equation of line passes the points $(2,3)$ and $(4,-7)$.

Q.4) If slope of line joining the points $(7,5)$ and $(k,1)$ is -4 then find k.

Q.5) Find the equation to the straight line cutting off intercepts 3 and 2 on axes of X and Y respectively.

Part – C

Q.1) Find the angle between the straight lines $x - \sqrt{3}y = 5$ and $x + \sqrt{3}y = 7$.

Q.2) Find the equation of line perpendicular to the line $2x - 3y + 5 = 0$ and passing through point (1, 1).

Q.3). Find the equation to a line passing through $(1,2)$ and parallel to the line

$2x + 3y = 4$.

Q.4) Find the equation of circle whose centre at $(2,-3)$ and having radius 5.

Q.5) Prove that the straight lines $y + 2x + 1 = 0$ and $2y - x + 3 = 0$ are perpendicular to each other.

Part – D

Q.1) Find the equation of line passing through $(1, 2)$ and parallel to the line passing through $(2,5)$ and $(4,1)$.

Q.2) Find the equation of line passing through $(-4, -3)$ and perpendicular to the line passing (1, 3) and (2, 7)

Q.3) Find the centre and radius of the circle

$3x^2 + 3y^2 - 5x - 6y + 4 = 0$

Q.4) Find the centre and radius of the circle

$9x^2 + y^2 = 4(x^2 - y^2 - 2x)$

Q.5) Find the centre and radius of the circle

$x^2 + y^2 - 14x - 18y - 14 = 0$

Unit-4 (Vector Algebra)

Part – A

Q.1) Choose the correct answers.

(i) Modulus of vector $4\hat{\imath} - 2\hat{\jmath} + 3\hat{k}$ is

(a) $\sqrt{11}$ (b) $\sqrt{29}$
(c) $\sqrt{21}$ (d) 3

(ii) Scalar product of vectors $2\hat{\imath} + 3\hat{\jmath} + 4\hat{k}$ and $\hat{\imath} + 2\hat{\jmath} + 3\hat{k}$ is

(a) 20 (b) 15
(c) 12 (d) 8

(ii) If vectors $\hat{\imath} + 4\hat{\jmath} + 3\hat{k}$ and $x\hat{\imath} + 2\hat{\jmath} - 4\hat{k}$ are mutually perpendicular then value of "x" is

(a) 0 (b) 2
(c) 3 (d) 4

(iv) If vectors $\vec{a}$ and $\vec{b}$ perpendicular then

(a) $\vec{a} \times \vec{b} = \vec{0}$ (b) $\vec{a}.\vec{b} = 1$

(c) $\vec{a}.\vec{b} = 0$ (d) $\left|\vec{a} \times \vec{b}\right| = 0$

(v) If vectors $\vec{a}$ and $\vec{b}$ are parallel then

(a) $\vec{a} \times \vec{b} = \vec{0}$ (b) $\vec{a}.\vec{b} = 1$

(c) $\vec{a}.\vec{b} = 0$ (d) $\left|\vec{a} \times \vec{b}\right| = 1$

Q.2) Match the column of following

(A) $\left\|6\hat{\imath} + 3\hat{\jmath} - 2\hat{k}\right\|$	(a) 1
(B) $\hat{\imath}.\hat{\imath}$	(b) 0
(C) $\hat{\jmath}.\hat{k}$	(c) 2
(D) $(2\hat{\imath} + 4\hat{\jmath}).(3\hat{\imath} - \hat{\jmath})$	(d) $\vec{0}$
(E) $\hat{\imath} \times \hat{\imath}$	(e) 7

Part – B/C

Q.1) If $\vec{a} = 2\hat{\imath} + \hat{\jmath} + \hat{k}$, $\vec{b} = -\hat{\imath} + \hat{\jmath} + \hat{k}$ then prove that $\vec{a}$ and $\vec{b}$ are perpendicular.

Q.2) If the position vectors of points P and Q are $2\hat{\imath} + 3\hat{\jmath} - \hat{k}$ and $4\hat{\imath} - 3\hat{\jmath} + 2\hat{k}$ then find $\overrightarrow{PQ}$.

Q.3) If the vectors $\hat{\imath} + 4\hat{\jmath} + 3\hat{k}$ and $\lambda\hat{\imath} + 2\hat{\jmath} - 4\hat{k}$ are perpendicular then find value of λ.

Q.4) Calculate the scalar product of $\vec{A} = 3\hat{\imath} + 4\hat{\jmath}$ and $\vec{B} = \hat{\imath} - 2\hat{\jmath}$.

Q.5)Find the unit vector in the direction of $3\hat{\imath} - 5\hat{\jmath} + 8\hat{k}$.

Q.6) If $= 2\hat{\imath} + \hat{\jmath}$, $\vec{b} = \hat{\imath} - \hat{\jmath} + \hat{k}$, then find $\left|\vec{a} \times \vec{b}\right|$.

Q.7) Show that the vectors $2\hat{\imath} - \hat{\jmath} + \hat{k}$, $\hat{\imath} - 3\hat{\jmath} - 5\hat{k}$ and $-\hat{\imath} - 2\hat{\jmath} - 6\hat{k}$ form a right angled triangle.

Q.8) If $|\vec{a} + \vec{b}| = |\vec{a} - \vec{b}|$, then prove that vectors $\vec{a}$ and $\vec{b}$ are perpendicular to each other.

Q.9) If $\vec{a} = \hat{\imath} + 2\hat{\jmath} - 3\hat{k}$, $\vec{b} = 3\hat{\imath} - \hat{\jmath} + 2\hat{k}$ then prove that $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ are perpendicular to each other.

Q.10) Find the unit vector parallel to the resultant of vectors $2\hat{\imath} + 4\hat{\jmath} - 5\hat{k}$ and $\hat{\imath} + 2\hat{\jmath} - 3\hat{k}$.

Part – D

Q.1) Find a vector perpendicular to each of the vectors $3\hat{\imath} + 7\hat{\jmath} + 2\hat{k}$ and

$2\hat{\imath} - 2\hat{\jmath} + 4\hat{k}$.

Q.2) Find the area of parallelogram whose adjacent sides are $3\hat{\imath} + \hat{\jmath} - 2\hat{k}$ and

$\hat{\imath} - 3\hat{\jmath} + 4\hat{k}$.

Q.3) Prove that $\vec{a} \times (\vec{b} + \vec{c}) + \vec{b} \times (\vec{c} + \vec{a}) + \vec{c} \times (\vec{a} + \vec{b}) = \vec{0}$

Q.4) If a force $\vec{F} = 2\hat{\imath} + \hat{\jmath} - \hat{k}$ is applied at a point $A(2, -1, 0)$ and due to this force it is displaced at point $B(2, 1, 0)$. Then calculate work done by force $\vec{F}$.

Q.5) Find area of triangle whose two sides are $\vec{a} = 2i + j - k$ and $\vec{b} = 3i + 2j + k$.

Unit-5 (Ordinary Differential Equation)

Part-A

Q.1) Choose the correct answers.

(i) General solution of differential equation $\frac{dy}{dx} = secxtanx$ is

(a) $y = secx + c$ (b) $y = tanx + c$

(c) $y = cosecx + c$ (d) $y = cotx + c$

(ii) General solution of differential equation $\frac{dy}{dx} = \sec^2 x$ is

(a) $y = secx + c$ (b) $y = tanx + c$

(c) $y = secx$ (d) $y = tanx$

(iii) General solution of differential equation $\frac{dy}{dx} = 2x$ is

(a) $y = x^2$ (b) $y = x^2 + c$ (c) $x = y^2$ (d) $x = y^2 + c$

(iv) General solution of differential equation $2xdx + 2ydy = 0$ is

(a) $x + y = c$ (b) $x^2 + y^2 = c$

(c) $x + y^2 = c$ (d) $x^2 + y = c$

(v) General solution of differential equation $dy = dx$ is

(a) $y = x + c$ (b) $y = x^2 + c$

(c) $y = \frac{1}{x} + c$ (d) $y = log_e x + c$

Q.2) Match the column

(A) $\frac{dy}{dx} = cosx + tanx$ (a) $Order = 2, Degree = 1$

(B) $\frac{d^2y}{dx^2} + 5\frac{dy}{dx} + 8y = e^{4x}$ (b) $Order = 1, Degree = 2$

(C) $\left(\frac{dy}{dx}\right)^2 + 2x\frac{dy}{dx} + y = 0$ (c) $Order = 2, Degree = 2$

(D) $\left[1 + \left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{2}} = k\frac{d^2y}{dx^2}$ (d) $Order = 2, Degree = 3$

(E) $\left(\frac{d^2y}{dx^2}\right)^3 + \omega^2 y = 0$ (e) $Order = 1, Degree = 1$

Part-B / C

Q.1) Solve the differential equation $\frac{dy}{dx} = \frac{y}{1+x^2}$

Q.2) Solve the differential equation $\frac{dy}{dx} + 2xy = 0$

Q.3) Find the general solution of differential equation $e^y \frac{dy}{dx} + e^x = 0$

Q.4) Solve the differential equation $xy^2dx + yx^2dy = 0$

Q.5) Solve the differential equation $(1 + x^2)dy + x\sqrt{1 - y^2}dx = 0$

Q.6) Find the solution of differential equation $\frac{dy}{dx} = e^{x-y} + x^2e^{-y}$

Q.7) Find the solution of differential equation $\frac{dy}{dx} = e^{x-2y} + x^4e^{-2y}$

Q.8) Solve the differential equation $(1 + x^2)dy = (1 + y^2)dx$

Q.9) Solve the differential equation $\frac{dy}{dx} = 1 + x + y + xy$

Q.10) Solve the differential equation $9y\frac{dy}{dx} + 4x = 0$

Part-D

Q.1) Find the particular solution of differential equation $\frac{dy}{dx} = e^{x-y}$, where $y = 1\ at\ x = 0$

Q.2) Solve the differential equation

$tany.sec^2xdx + tanx.sec^2ydy = 0$, given that $x = \frac{\pi}{4}\ and\ y = \frac{\pi}{4}$

Q.3) Solve $3e^xtanydx + (1 + e^x)sec^2ydy = 0$, given that $y(0) = \frac{\pi}{4}$

Q.4) Find the particular solution of differential equation

$\frac{dy}{dx} = e^{x+y},\ where\ y = 1\ at\ x = 1$

Q.5) Find the solution of differential equation

$\frac{dy}{dx} = sec^2x, where\ y = 1\ at\ x = \frac{\pi}{4}$

Q.6) Find the particular solution of $x\frac{dy}{dx} + coty = 0$, if $y = \frac{\pi}{4}\ when\ x = \sqrt{2}$

Module Question Paper-1

Mathematics-II

Time: Three Hours Maximum Marks: 70

Note: All parts are mandatory (सभी भाग अनिवार्य हैं।)

Part-A

Q.1) Choose the correct answers. $2\ each \times 5 = 10\ Marks$

सही उत्तर का चयन कीजिए।

(i) Value of following determinant is (निम्न लिखित सारणिक का मान हैं)

$$\begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix}$$

(a) 1 (b) 24

(c) 0 (d) -3

(ii) $\int cotxdx$ is equal to

$\int cotxdx$ का मान हैं

(a) sec^2x (b) $-cosec^2x$

(c) $tanx$ (d) $log_e sinx$

(iii) $y^2 = 4ax$ Represents ($y^2 = 4ax$ दर्शाता हैं)

(a) Circle वृत्त (b) Ellipse दीर्घवृत्त

(c) Parabola परवलय (d) Hyperbola अतिपरवलय

(iv) Modulus of vector $-3\hat{\imath} + 2\hat{\jmath} + 6\hat{k}$ is

सदिश $-3\hat{\imath} + 2\hat{\jmath} + 6\hat{k}$ का मापांक होगा

(a) -7 (b) 7

(c) ± 7 (d) 0

(v) General solution of differential equation $dy = dx$ is

अवकल समीकरण $dy = dx$ का व्यापक हल हैं

(a) $y = x + c$ (b) $y = x^2 + c$

(c) $y = \frac{1}{x} + c$ (d) $y = log_e x + c$

Q.2) Match the Column (सही जोड़ी का मिलान कीजिए) $2\ each \times 5 = 10\ Marks$

(A) $\begin{vmatrix} 1 & 3 & 5 \\ 0 & 2 & 4 \\ 0 & 0 & 3 \end{vmatrix}$ (a) 1

(B) $\int_0^{\frac{\pi}{2}} sinx\, dx$ (b) 6

(C) Slope of the line $5x - y + 3 = 0$ (c) 2

सरल रेखा $5x - y + 3 = 0$ का ढाल है

(D) $|6\hat{\imath} + 3\hat{\jmath} - 2\hat{k}|$ (d) 5

(E) Degree of equation $\left(\frac{dy}{dx}\right)^2 + y = 0$ (e) 7

अवकल समीकरण $\left(\frac{dy}{dx}\right)^2 + y = 0$ की घात हैं

Part-B

$3\ each \times 5 = 15\ Marks$

(Attempt any five out of eight questions) 8 में से कोई 5 प्रश्न हल कीजिए।

Q.1) If $\begin{bmatrix} x & 2 \\ 1 & 3 \end{bmatrix} + 2\begin{bmatrix} 1 & y \\ 3 & 1 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ 7 & 5 \end{bmatrix}$ then find the value of x and y.

यदि $\begin{bmatrix} x & 2 \\ 1 & 3 \end{bmatrix} + 2\begin{bmatrix} 1 & y \\ 3 & 1 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ 7 & 5 \end{bmatrix}$ तब x और y के मान ज्ञात कीजिए

Q.2) Find the value of determinant $\begin{vmatrix} 1^2 & 2^2 & 3^2 \\ 2^2 & 3^2 & 4^2 \\ 3^2 & 4^2 & 5^2 \end{vmatrix}$

सारणिक $\begin{vmatrix} 1^2 & 2^2 & 3^2 \\ 2^2 & 3^2 & 4^2 \\ 3^2 & 4^2 & 5^2 \end{vmatrix}$ का मान ज्ञात कीजिए

Q.3) Find the value of $\int_0^2 x^3\, dx$

समाकलन $\int_0^2 x^3\, dx$ का मान ज्ञात कीजिए

Q.4) Find the value of $\int tan^2\, x\, dx$

$\int tan^2\, x\, dx$ का मान ज्ञात कीजिए.

Q.5) Find the equation of line passes the points $(2,3)$ and $(4,-7)$.

बिंदुओ $(2,3)$ और $(4,-7)$ से होकर जाने वाली सरल रेखा का समीकरण ज्ञात करो.

Q.6) Find the equation of circle whose centre at $(1,-1)$ and having radius 4.

वृत्त का समीकरण ज्ञात कीजिए जिसका केंद्र $(1,-1)$ तथा त्रिज्या 4 हैं.

Q.7) If $\vec{a} = 2\hat{\imath} + \hat{\jmath} + \hat{k}$, $\vec{b} = -\hat{\imath} + \hat{\jmath} + \hat{k}$ then prove that $\vec{a}$ and $\vec{b}$ are perpendicular.

यदि $\vec{a} = 2\hat{\imath} + \hat{\jmath} + \hat{k}$, $\vec{b} = -\hat{\imath} + \hat{\jmath} + \hat{k}$ तब सिध्द कीजिए की $\vec{a}$ तथा $\vec{b}$ परस्पर लम्बवत सदिश हैं.

Q.8) Find the order and degree of differential equation $\left[1 + \left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{2}} = k\frac{d^2y}{dx^2}$

अवकल समीकरण $\left[1 + \left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{2}} = k\frac{d^2y}{dx^2}$ की कोटि और घात लिखिए

Part-C

$4\ each \times 5 = 20\ Marks$

(Attempt any five out of eight questions) 8 में से कोई 5 प्रश्न हल कीजिए।

Q.1) Solve by crammer rule $4x - 3y = 11,\ 3x + 7y = -1$

क्रेमर के नियम से $4x - 3y = 11,\ 3x + 7y = -1$ को हल कीजिए

Q.2) Find the value of $\int log_e x dx$

$\int log_e x dx$ का मान ज्ञात कीजिए

Q.3) Find the angle between the straight lines $x - \sqrt{3}y = 5$ and $x + \sqrt{3}y = 7$.

सरल रेखाओं $x - \sqrt{3}y = 5$ और $x + \sqrt{3}y = 7$ के बीच का कोण निकालिए

Q.4) Find the equation to a line passing through $(1,2)$ and parallel to the line $2x + 3y = 4$.

बिंदु $(1,2)$ से होकर जाने वाली तथा $2x + 3y = 4$ के समान्तर सरल रेखा का समीकरण ज्ञात कीजिए

Q.5) If $\vec{a} = 2\hat{\imath} + \hat{\jmath}$, $\vec{b} = \hat{\imath} - \hat{\jmath} + \hat{k}$, then find $|\vec{a} \times \vec{b}|$.

यदि $\vec{a} = 2\hat{\imath} + \hat{\jmath}$, $\vec{b} = \hat{\imath} - \hat{\jmath} + \hat{k}$, तब $|\vec{a} \times \vec{b}|$ ज्ञात कीजिए

Q.6) Find the unit vector parallel to the resultant of vectors $2\hat{\imath} + 4\hat{\jmath} - 5\hat{k}$ and $\hat{\imath} + 2\hat{\jmath} - 3\hat{k}$.

सदिशो $2\hat{\imath} + 4\hat{\jmath} - 5\hat{k}$ और $\hat{\imath} + 2\hat{\jmath} - 3\hat{k}$ के परिणामी सदिश का मात्रक सदिश ज्ञात कीजिए

Q.7) Solve the differential equation $xy^2dx + yx^2dy = 0$

अवकल समीकरण $xy^2dx + yx^2dy = 0$ को हल कीजिए

Q.8) Solve the differential equation $\frac{dy}{dx} = 1 + x + y + xy$

अवकल समीकरण $\frac{dy}{dx} = 1 + x + y + xy$ को हल कीजिए

Part-D

$5\ each \times 3 = 15\ Marks$

(Attempt any five out of eight questions) 5 में से कोई 3 प्रश्न हल कीजिए।

Q.1) If $A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$, then find A^{-1}

यदि $\mathrm{A} = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$, तब A^{-1} ज्ञात कीजिए

Q.2) Find the area bounded by following curve,

$y^2 = 4ax$, X-axis, $x = 0\,, x = a$

निम्नलिखित वक्रों से घिरे हुए क्षेत्र का क्षेत्रफल ज्ञात कीजिए

$y^2 = 4ax$, X-axis, $x = 0\,, x = a$

Q.3) Find the centre and radius of following equation of circle.

निम्नलिखित वृत्त के समीकरण के लिए केंद्र और त्रिज्या ज्ञात कीजिए

$$x^2 + y^2 - 14x - 18y - 14 = 0$$

Q.4) A particle is displaced from $A(2, -1, 0)$ to the point $B(2, 1, 0)$ under the action of constant force $\vec{F} = 2\hat{\imath} + \hat{\jmath} - \hat{k}$. Find the total work done.

बल $\vec{F} = 2\hat{\imath} + \hat{\jmath} - \hat{k}$ द्वारा एक कण को बिंदु $A(2, -1, 0)$ से बिंदु $B(2, 1, 0)$ पर विस्थापित करने में किये गये कार्य को ज्ञात कीजिए

Q.5) Find the solution of differential equation

$\frac{dy}{dx} = sec^2 x, where\ y = 1\ at\ x = \frac{\pi}{4}$

अवकल समीकरण $\frac{dy}{dx} = sec^2 x$ को हल कीजिए यदि $x = \frac{\pi}{4}$ पर $y = 1$

Module Question Paper-2

Mathematics-II

Time: Three Hours Maximum Marks: 70

Note: All parts are mandatory (सभी भाग अनिवार्य हैं।)

Part-A

Q.1) Choose the correct answers. $2\ each \times 5 = 10\ Marks$

सही उत्तर का चयन कीजिए

(i) Following matrix is called (निम्न लिखित आव्यूह कहलाता हैं)

$$\begin{bmatrix} 2 & 0 & 0 \\ 0 & 5 & 0 \\ 0 & 0 & 7 \end{bmatrix}$$

(a) Scalar Matrix अदिश आव्यूह (b) Diagonal Matrix विकर्ण आव्यूह

(c) Unit Matrix इकाई आव्यूह (d) Row Matrix पंक्ति आव्यूह

(ii) $\int tanxdx$ is equal to

$\int tanxdx$ का मान हैं

(a) sec^2x (b) $-cosec^2x$

(c) $log_e secx$ (d) $log_e sinx$

(iii) $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ Represents ($\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ दर्शाता हैं)

(a) Circle वृत्त (b) Ellipse दीर्घवृत्त

(c) Parabola परवलय (d) Hyperbola अतिपरवलय

(iv)If vectors $\vec{a} = 2\hat{\imath} + 3\hat{\jmath} + \lambda\hat{k}$ and $\vec{b} = -3\hat{\imath} - 2\hat{\jmath} + 4\hat{k}$ are perpendicular, then value of λ is

यदि $\vec{a} = 2\hat{\imath} + 3\hat{\jmath} + \lambda\hat{k}$ और $\vec{b} = -3\hat{\imath} - 2\hat{\jmath} + 4\hat{k}$ परस्पर लम्बवत सदिश हैं, तब λ का मान हैं

(a) -3 (b) 3

(c) ± 12 (d) -12

(v) Order of differential equation $\sqrt{\frac{dy}{dx}} = \frac{d^2y}{dx^2}$ is

अवकल समीकरण $\sqrt{\frac{dy}{dx}} = \frac{d^2y}{dx^2}$ की कोटि हैं

(a) $\frac{1}{2}$ (b) 2

(c) 4 (d) $2\frac{1}{2}$

Q.2) Match the Column (सही जोड़ी का मिलान कीजिए) $2\ each \times 5 = 10\ Marks$

(A) $\begin{vmatrix} cosx & sinx \\ -sinx & cosx \end{vmatrix}$ (a) $\frac{1}{3}$

(B) $\int_0^1 x^2\,dx$ (b) 1

(C) Slope (m) of the line (c) $x^2 + y^2 = a^2$

सरल रेखा की प्रवणता (m) है.

(D) $(6\hat{\imath} + 3\hat{\jmath}).\left(3\hat{\jmath} - 2\hat{k}\right)$ (d) $tan\theta$

(E) $xdx + ydy = 0$ (e) 9

Part-B

$3\ each \times 5 = 15\ Marks$

(Attempt any five out of eight questions) 8 में से कोई 5 प्रश्न हल कीजिए।

Q.1) If $A = \begin{bmatrix} 2 & 3 \\ 4 & 0 \end{bmatrix}, B = \begin{bmatrix} -1 & 5 \\ 1 & 6 \end{bmatrix}$ then verify that $(A+B)^T = A^T + B^T$

यदि $A = \begin{bmatrix} 2 & 3 \\ 4 & 0 \end{bmatrix}, B = \begin{bmatrix} -1 & 5 \\ 1 & 6 \end{bmatrix}$ तब सिध्द कीजिए $(A+B)^T = A^T + B^T$

Q.2) Prove that following matrix is singular

$$\begin{bmatrix} 1 & 1 & 2 \\ 2 & 5 & 7 \\ 2 & -1 & 1 \end{bmatrix}$$

सिध्द कीजिए की आव्यूह $\begin{bmatrix} 1 & 1 & 2 \\ 2 & 5 & 7 \\ 2 & -1 & 1 \end{bmatrix}$ अव्युत्क्रमणीय हैं.

Q.3) Find the value of $\int_0^1 \frac{dx}{x+1}$

समाकलन $\int_0^1 \frac{dx}{x+1}$ का मान ज्ञात कीजिए

Q.4) Find the value of $\int \sqrt{(1+sin2x)}dx$

$\int \sqrt{(1+sin2x)}dx$ का मान ज्ञात कीजिए.

Q.5) Find the equation of straight line which makes equal intercepts on the axes and passes through (3, 2).

उस सरल रेखा का समीकरण ज्ञात कीजिए जो दोनों कक्षों से बराबर अन्तः खंड काटती है और बिंदु (3, 2) होकर जाती हैं.

Q.6) Find the equation of circle whose centre at $(-2,3)$ and having radius 5.

वृत्त का समीकरण ज्ञात कीजिए जिसका केंद्र $(-2,3)$ तथा त्रिज्या 5 हैं.

Q.7) If the position vectors of points P and Q are $3\hat{\imath} + 2\hat{\jmath} - \hat{k}$ and $4\hat{\imath} - \hat{\jmath} + 2\hat{k}$ then find $\overrightarrow{PQ}$ and $|\overrightarrow{PQ}|$.

यदि बिंदुओ P तथा Q के स्थिति सदिश क्रमशः $3\hat{\imath} + 2\hat{\jmath} - \hat{k}$ और $4\hat{\imath} - \hat{\jmath} + 2\hat{k}$ हैं तब $\overrightarrow{PQ}$ और $|\overrightarrow{PQ}|$ ज्ञात कीजिए.

Q.8) Find the order and degree of differential equation $\left(\frac{d^2y}{dx^2}\right)^3 + \omega^2\left(\frac{dy}{dx}\right)^4 = 0$

अवकल समीकरण $\left(\frac{d^2y}{dx^2}\right)^3 + \omega^2\left(\frac{dy}{dx}\right)^4 = 0$ की कोटि और घात लिखिए

Part-C

$4\ each \times 5 = 20\ Marks$

(Attempt any five out of eight questions) 8 में से कोई 5 प्रश्न हल कीजिए।

Q.1) Solve by crammer rule $2x + y + 1 = 0\ and\ x - 2y + 3 = 0$

क्रेमर के नियम से $2x + y + 1 = 0$ और $x - 2y + 3 = 0$ को हल कीजिए

Q.2) Find the value of $\int \frac{e^{\sqrt{x}}}{\sqrt{x}} dx$

$\int \frac{e^{\sqrt{x}}}{\sqrt{x}} dx$ का मान ज्ञात कीजिए

Q.3) Prove that the straight lines $y + 2x + 1 = 0$ and $2y - x + 3 = 0$ are perpendicular to each other.

सिध्द कीजिए की सरल रेखाए $y + 2x + 1 = 0$ और $2y - x + 3 = 0$ परस्पर लम्बवत हैं

Q.4) Find the equation of line passing through $(1, 2)$ and parallel to the line passing through (2,5) and (4,1).

उस सरल रेखा का समीकरण ज्ञात कीजिए जो बिंदु (1,2) से जाती हैं तथा बिंदुओ (2,5) और (4,1) को मिलाने वाली रेखा के समान्तर हैं

Q.5) Find the area of parallelogram whose adjacent sides are $3\hat{\imath} + \hat{\jmath} - 2\hat{k}$ and $\hat{\imath} - 3\hat{\jmath} + 4\hat{k}$.

समान्तर चतुर्भुज का क्षेत्रफल ज्ञात कीजिए जिसकी आसन्न भुजाएं $3\hat{\imath} + \hat{\jmath} - 2\hat{k}$ और $\hat{\imath} - 3\hat{\jmath} + 4\hat{k}$ हैं

Q.6) Show that the vectors $2\hat{\imath} - \hat{\jmath} + \hat{k}$, $\hat{\imath} - 3\hat{\jmath} - 5\hat{k}$ and $-\hat{\imath} - 2\hat{\jmath} - 6\hat{k}$ form a right angled triangle.

सिध्द कीजिए की सदिश $2\hat{\imath} - \hat{\jmath} + \hat{k}$, $\hat{\imath} - 3\hat{\jmath} - 5\hat{k}$ और $-\hat{\imath} - 2\hat{\jmath} - 6\hat{k}$ एक समकोण त्रिभुज का निर्माण करते हैं

Q.7) Solve the differential equation $9y\frac{dy}{dx} + 4x = 0$

अवकल समीकरण $9y\frac{dy}{dx} + 4x = 0$ को हल कीजिए

Q.8) Solve the differential equation $\frac{dy}{dx} = e^{x-2y} + x^4 e^{-2y}$

अवकल समीकरण $\frac{dy}{dx} = e^{x-2y} + x^4 e^{-2y}$ को हल कीजिए

Part-D

$5\ each \times 3 = 15\ Marks$

(Attempt any five out of eight questions) 5 में से कोई 3 प्रश्न हल कीजिए।

Q.1) If $A = \begin{bmatrix} 2 & -2 \\ -2 & 2 \end{bmatrix}$, then show that $A^3 = 16A$

यदि $A = \begin{bmatrix} 2 & -2 \\ -2 & 2 \end{bmatrix}$, तब सिध्द कीजिए $A^3 = 16A$

Q.2) Find the area bounded by straight line $\frac{x}{a} + \frac{y}{b} = 1$ and both axes in first quadrant.

सरल रेखा $\frac{x}{a} + \frac{y}{b} = 1$ और दोनों अक्षो के द्वारा प्रथम चतुर्थांश में घिरे हुए क्षेत्र का क्षेत्रफल ज्ञात कीजिए.

Q.3) Find the centre and radius of following equation of circle.

निम्नलिखित वृत्त के समीकरण के लिए केंद्र और त्रिज्या ज्ञात कीजिए

$$9x^2 + y^2 = 4(x^2 - y^2 - 2x)$$

Q.4) Find a unit vector which is perpendicular to each of the vectors $2\hat{\imath} - \hat{\jmath} + \hat{k}$ and $3\hat{\imath} + 4\hat{\jmath} - \hat{k}$.

वह मात्रक सदिश ज्ञात कीजिए जो सदिशो $2\hat{\imath} - \hat{\jmath} + \hat{k}$ और $3\hat{\imath} + 4\hat{\jmath} - \hat{k}$ प्रत्येक पर लम्बवत हैं.

Q.5) Find the solution of differential equation

$tany.sec^2xdx + tanx.sec^2ydy = 0$, given that $x = \frac{\pi}{4}\ and\ y = \frac{\pi}{4}$

अवकल समीकरण $tany.sec^2xdx + tanx.sec^2ydy = 0$ को हल कीजिए जबकि दिया है $x = \frac{\pi}{4}$ और $y = \frac{\pi}{4}$

DIPLOMA WING
RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

SEMESTER II – GROUP 'B'

COURSE TITLE	:	APPLIED PHYSICS - II
PAPER CODE	:	7358
SUBJECT CODE	:	202
TREORY CREDITS	:	04
PRACTICAL CREDITS	:	02

Course Objectives

Applied Physics aims to give an understanding of this world both by observation and by prediction of the way in which objects behave. Concrete use of physical principles and analysis in various fields of engineering and technology are given prominence in the course content. The course will help the diploma engineers to apply the basic concepts and principles to solve broad-based engineering problems and to understand different technology based applications.

Teaching Approach

- Teachers should give examples from daily routine as well as, engineering/technology applications on various concepts and principles in each topic so that students are able to under- stand and grasp these concepts and principles. In all contents, SI units should be followed.
- Use of demonstration can make the subject interesting and develop scientific temper in the students. Student activities should be planned on all the topics.
- Activity- Theory - Demonstrate/practice approach may be followed throughout the course so that learning may be outcome and employability based.

Course Content

UNIT-1: Wave motion and its applications

Simple Harmonic Motion (SHM): definition, expression for displacement, velocity, acceleration, time-period, frequency, phase etc.

Wave motion, transverse and longitudinal waves with examples, definitions of wave velocity, frequency and wave length and their relationship, Sound and light waves and their properties,

Acoustics of buildings – reverberation, reverberation time, echo, noise, methods to control reverberation time and their applications.
Ultrasonic waves – Introduction and properties, engineering and medical applications of ultrasonic.

UNIT-2: Optics

Basic optical laws; reflection and refraction, refractive index, Critical angle, Total internal reflection, conditions for total internal reflection, applications of total internal reflection, lens and thin lenses, Image formation by lens, lens formula (without derivation), power of lens, magnification.

Optical Instruments; simple and compound microscope and its magnifying power, astronomical telescope in normal adjustment, uses of microscope and telescope.

Fiber Optics: Introduction to optical fibers, light propagation, acceptance angle and numerical aperture, applications in telecommunication and medical field.

UNIT-3: Electrostatics

Coulombs law, unit of charge, Electric field, Electric lines of force and their properties, Electric flux, Electric potential and potential difference, Gauss law, Application of Gauss law to find electric field intensity of straight charged conductor and charged conducting solid and hollow sphere.

Capacitor and its working, Types of capacitors, Capacitance and its units. Capacitance of a parallel plate capacitor, Series and parallel combination of capacitors, dielectric and its effect on capacitance.

UNIT-4: Current Electricity & Electromagnetism

Electric Current and its units, Direct and alternating current, Resistance and its units, Series and parallel combination of resistances, Factors affecting resistance of a wire, carbon resistances and colour coding, Ohm's law, Concept of terminal potential difference and Electro motive force (EMF) Kirchhoff's laws.

Heating effect of current, joule's law, Electric power, Electric energy and its units, Advantages of Electric Energy over other forms of energy.

Magnetic field, magnetic flux and units, Concept of electromagnetic induction, Faraday's Laws, Lorentz force, Force on current carrying conductor, Force on rectangular coil placed in magnetic field, Moving coil galvanometer: principle, construction and working, Conversion of a galvanometer into ammeter and voltmeter.

UNIT-5: Semiconductor and Modern Physics

Types of materials (insulator, semi-conductor, conductor), intrinsic and extrinsic semiconductors, p-n junction, junction diode and V-I characteristics, Diode as rectifier – half wave and full wave rectifier (centre taped)

Laser: spontaneous and stimulated emission; population inversion, pumping methods, optical feedback, Ruby laser and He-Ne laser, Laser characteristics, Engineering and medical applications of lasers.

Nanoscience and Nanotechnology: Introduction, nanoparticles and nano materials, properties at nanoscale, Nanotechnology, nanotechnology-based devices, and applications.

Learning Outcome:-

After undergoing this subject, the student will be able to:

a) Describe waves and wave motion, periodic and simple harmonic motions and solve simple problems. Establish wave parameters: frequency, amplitude, wavelength, and velocity and able to explain relation among them.
b) Explain ultrasonic waves and engineering, medical and industrial applications of Ultrasonic. Apply acoustics principles to various types of buildings for best sound effect.
c) State basic optical laws, establish the location of the images formed by thin converging lens, design and assemble microscope using lenses combination.
d) Describe refractive index of a liquid or a solid and will be able to explain conditions for total internal reflection.

e) Appreciate the potential of optical fiber in fields of medicine and communication.

f) Define capacitance and its unit, explain the function of capacitors in simple circuits, and solve simple problems.

g) Differentiate between insulators, conductors and semiconductors, and define the terms: potential, potential difference, electromotive force.

h) Express electric current as flow of charge, concept of resistance, measure of the parameters: electric current, potential difference, resistance.

i) List the effects of an electric current and its common applications, State Ohm's law, calculate the equivalent resistance of a variety of resistor combinations, distinguish between AC and DC currents, determine the energy consumed by an appliance,

j) State the laws of electromagnetic induction, describe the effect on a current-carrying conductor when placed in a magnetic field.

k) Explain the operation of appliances like moving coil galvanometer.

l) Apply the knowledge of diodes in rectifiers, power adapters and various electronic circuits. Use the knowledge of semiconductors in various technical gadgets like mobile phones, computers, LED, photocells, solar lights etc.

m) Illustrate the conditions for light amplification in various LASER and laser based instruments and optical devices.

n) Express importance of nanoscience and nanotechnology and impact of nanotechnology to the society.

References:

1. Text Book of Physics for Class XI&XII(Part-I, Part-II);N.C.E.R.T., Delhi
2. AppliedPhysics,Vol.IandVol.II,TTTIPublications,TataMcGrawHill,Delhi
3. Concepts in Physics by H.C.Verma, Vol.I &II, Bharti Bhawan Ltd.New Delhi
4. Engineering Physics by PVNaik, Pearson Education Pvt.Ltd, New Delhi.
5. vuqiz;qDr HkkSfrdh&II, vfer tSu ,oa bUnj dqekj flag] lat; ifCyds'ku] t;iqj A
6. e-books/e-tools/learningphysicssoftware/websitesetc.

APPLIED PHYSICS – II LAB

Course Objectives:

Concrete use of physical principles and analysis in various fields of engineering and technology is very prominence. The course aims to supplement the factual knowledge gained in the lecture by first hand manipulation of apparatus. This will develop scientific temper and help to apply the basic concepts and principles in solving engineering and technology based problems. In addition, students get necessary confidence in handling equipment and thus learn various skills in measurement.

List of Practicals/Activities: (To perform minimum 8 Practicals)

1. To determine and verify the time period of a cantilever.

2. To determine velocity of ultrasonic in different liquids using ultrasonic interferometer.

3. To verify laws of reflection from a plane mirror/ interface.

4. To verify laws of refraction (Snell's law) using a glass slab.

5. To determine focal length and magnifying power of a convex lens.

6. To verify Ohm's law by plotting graph between current and potential difference.

7. To verify laws of resistances in series and parallel combination.

8. To verify Kirchhoff's law using electric circuits.

9. To find resistance of a galvanometer by half deflection method.

10. To convert a galvanometer into an ammeter.

11. To convert a galvanometer into a voltmeter.

12. To draw V-I characteristics of a semiconductor diode (Ge, Si) and determine its knee volt- age.

Suggested Student Activities & Strategies

Apart from classroom and laboratory learning following are the suggested student related activities which can be undertaken to accelerate the attainment of various outcomes of the course.

a. Make survey of different physical products and compare the following points

- Measurements of dimensions
- Properties
- Applications

b. Library survey regarding engineering materials/products used in different industries

c. Seminar on any relevant topic.

Teachers should use the following strategies to achieve the various outcomes of the course.

- Different methods of teaching and media to be used to attain classroom attention.
- Massive open online courses (MOOCs) may be used to teach various topics/sub topics.
- 15-20% of the topics which are relatively simpler or descriptive in nature should be given to the students for self-learning and assess the development of competency through classroom presentations/projects.
- Micro-projects on relevant may be given to group of students for hand-on experiences.

Learning Outcome:

After undergoing this subject, the student will be able to;

a) Apply concept of vibrations and determine the time period of vibrating objects.

b) Use of equipment for determining velocity of ultrasonic in different liquids.

c) Verify optical laws; reflection, refraction from plane interfaces and surfaces.

d) Apply knowledge of optics to determine focal length and magnifying power of optical lenses.

e) Understand uses of electrical components and meters and verify Ohm's law for flow of current.

f) Quantify resistances and verify laws of series and parallel combination of resistances.

g) Apply concept of electrical vibrations in determine frequency of AC main.

h) Analyse electrical circuits and verify Kirchhoff's law governing electrical circuits.

i) Measure resistance of a galvanometer and how it is converted into an ammeter and voltmeter.

j) Investigate characteristics of semiconductor diodes.

Recommended Books:

1. Text Book of Physics for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi

2. Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publications (P) Ltd., New Delhi

3. Practical Physics by C. L. Arora, S. Chand & Company Ltd.

e-books/e-tools/ learning physics software/you Tube videos/ websites etc.

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RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL (M.P.)

SEMESTER – II

COURSE TITLE: APPLIED PHYSICS –II

SUBJECT CODE: 202

PAPER CODE: 7358

THEORY CREDIT: 04.

BLUE PRINT OF QUESTION PAPER

TIME : THREE HOURS **MAXIMUM MARKS : 70**

UNIT NO.	UNIT NAME	MARKS WISE NO OF QUESTIONS				**TOTAL MARKS**
		2 MARKS (Multiple choice type question)	**2 MARKS** (Fill in the blanks or match the column or very short answer type question)	**4 MARKS** (Short answer type question)	**6 MARKS** (Long answer type question)	
1	WAVE MOTION AND ITS APPLICATION	1	1	1	1	**14**
2	OPTICS	1	1	1	1	**14**
3	ELECTROSTATICS	1	1	1	1	**14**
4	CURRENT ELECTRICITY & ELECTROMAGNATISM	1	1	1	1	**14**
5	SEMICONDUCTOR & MODERN PHYSICS	1	1	1	1	**14**
TOTAL MARKS		**10**	**10**	**20**	**30**	**70**

Guidelines for Question Paper Design:

1. The question paper should be prepared on the basis of the blueprint.
2. The question paper should carry 70 marks and be of 3 hours duration.
3. Each unit is given equal weightage (14 marks for each unit).
4. There should be a total of six questions. All are compulsory for students to attempt.
5. Question no. 1 should be of multiple-choice type and carry 10 marks. It has 5 sub-questions (one from each unit). Each sub-question is of 02 marks.
6. Other questions (from question no. 02 to question no.06), one from each unit, has three sub-questions like (a), (b) and (c).
7. Sub-question (a) has 2 marks. It can be of fill-in-the-blanks / match-the-column / very short answer (VSA) type question. This question should be of cognitive type only.
8. Sub-questions (b) and (c) have 4 and 6 marks respectively. Sub-questions (b) should be of short answer (SA) type and Sub-questions (c) should be of long answer (LA) type. **Internal choices should be given to these sub-questions.**
9. Numerical questions can be asked only of 2 and 4 marks. Numerical questions can not be asked more than 10 marks.
10. Questions which are based on the same concept, law, fact etc. should not be repeated under different forms like MCQ. VSA, SA, LA.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL (M.P.)

SEMESTER – II

MODEL QUESTION PAPER : APPLIED PHYSICS –II

SUBJECT CODE: 202 **PAPER CODE: 7358**

TIME: 3 hours **MAXIMUM MARKS: 70**

NOTE: (1) All questions are compulsory. Question no. 1 is of multiple-choice type.

सभी प्रश्न अनिवार्य हैं। प्रश्न क्रमांक 1 बहुविकल्पीय प्रकार का है।

(2) Internal choices are given in 4 marks and 6 marks questions.

4 अंक तथा 6 अंक वाले प्रश्नों में आन्तरिक विकल्प दिए गए हैं।

(3) In case of any doubt or dispute, the English version question should be treated as final.

किसी भी संदेह अथवा विवाद की स्थिति में अंग्रेजी भाषा के प्रश्न को अन्तिम माना जायेगा।

Q.1 Choose the correct answer: **2x5 marks**

(i) Which of the following produces ultrasonic waves?

(a) Bat (b) Buzzer (c) Horse (d) None of these.

इनमे से कौन पराश्रव्य तरंगे उत्पन्न करता है :

(a) चमगादड़ (b) घंटी (c) घोड़ा (d) इनमे से कोई नहीं

(ii) Electric current represents:

(a) charge per unit volume (b) charge per unit time

(c) charge per unit area (d) None of these.

विद्युत धारा है :

(a) आवेश प्रति इकाई आयतन (b) आवेश प्रति इकाई समय

(c) आवेश प्रति इकाई क्षेत्रफल (d) इनमे से कोई नहीं

(iii) Focal length of a lens is 50 cm. its power is .....

(a) 1.2D (b) 2.1 D (c) 1 D (d) 2 D.

एक लेंस की फोकस दूरी 50 cm है । इसकी क्षमता ज्ञात है .....

(a) 1.2D (b) 2.1 D (c) 1 D (d) 2 D.

(iv) Current carriers in metallic conductors are?

(a) Free electrons (b) Protons (c) holes (d) neutrons.

धात्विक चालकों में धारा वाहक होते है :

(a) मुक्त इलेक्ट्रान (b) प्रोटॉन (c) होल (d) न्यूट्रॉन

(v) Dielectrics are basically -

(a) Insulators (b) Superconductors (c) Semiconductors (d) Conductors

परावैद्युत मूलतः है -

(a) कुचालक (b) अतिचालक (c) अर्द्धचालक (d) चालक

Q.2 a) Fill in the blank: **1X2 marks**

(i) The distance from one crest to the next is the _____.

एक श्रृंग से दूसरे श्रृंग के मध्य की दूरी .....

(ii) The speed of sound depends on ..... And temperature.

ध्वनि की गति ..... और तापमान पर निर्भर करती है

b) Explain echo and reverberation with example.

प्रतिध्वनि और अनुरणन की समझाइए।

OR (अथवा)

Derive a relation between acceleration and displacement for the particle in SHM. **4 marks**

सरल आवर्त गति करते कण के त्वरण और विस्थापन मे संबंध स्थापित कीजिए ।

c) Define ultrasonic waves. Write in detail the application of ultrasonic waves.

पराश्रव्य तरंगों को परिभाषित कीजिए। इनके चार गुण और चार उपयोग लिखिए।

OR (अथवा)

Differentiate longitudinal and transverse waves **6 marks**

अनुदैर्घ्य और अनुप्रस्थ तरंगों में अंतर लिखिए।

Q.3 a) write the law of reflection and refraction . **2 marks**

परावर्तन और अपवर्तन के नियमों को लिखिए।

b) Explain the principle of optical fiber. Write the applications of optical fiber in telecommunication and medical field. **4 marks**

प्रकाशिक तंतु के सिद्धांत को समझाईए। प्रकाशिक तंतु के उपयोग दूरसंचार और मेडिकल क्षेत्र मे लिखिए ।

OR (अथवा)

Explain total internal reflection and write necessary conditions for it.

पूर्ण आंतरिक परावर्तन को समझाईए और इसकी आवश्यक शर्तें लिखें।

c) Describe the astronomical telescope under following heads: **6 marks**

(i) neat and labeled ray diagram (ii) derivation of the formula of magnifying power.

खगोलीय दूरदर्शी का वर्णन निम्न शीर्षकों के अंतर्गत कीजिए:

(i) स्वच्छ एवं नामांकित किरण आरेख (ii) आवर्धन क्षमता के सूत्र की व्युत्पत्ति।

OR (अथवा)

Derive an expression for magnifying power of compound microscope when final image is form at

(i) least distance of distinct vision. (ii) infinity.

संयुक्त सूक्ष्मदर्शी की आवर्धन क्षमता के लिए सूत्र की स्थापना करें जबकि अंतिम प्रतिबिंब :

(i) सुस्पस्ट दृष्टि की न्यूमतम दूरी पर बने (ii) अनंत पर बने।

Q.4 a) write the vector formula for coulomb's law and electric field intensity. **2 marks**

कूलॉम का नियम और विद्युत क्षेत्र की तीव्रता के सूत्र सदिश रूप मे लिखिए ।

b) Derive an expression for the equivalent capacitance in series combination. **4 marks**

श्रेणीक्रम संयोजन में समतुल्य धारिता के लिए व्यंजक व्युत्पन्न करें।

OR (अथवा)

Define the dielectric materials. Explain its effect on capacitance.

परावैद्युत पदार्थों को परिभाषित कीजिए। इनके धारिता पर प्रभाव को समझाईए ।

c) Find the electric field intensity of straight charged conductor of infinite length with the help of Gauss' law. **6 marks**

गॉस के नियम की सहायता से अनंत लंबाई के सीधे चालक की विद्युत क्षेत्र की तीव्रता ज्ञात कीजिए।

OR (अथवा)

Explain the electric flux and write its unit. Also write the any four properties of electric line of force.

विद्युत फ्लक्स को समझाते हुए इसका मात्रक लिखिए। विद्युत बल रेखाओं के चार गुण लिखिए।

Q.5 a) **match the column:** **2 marks**

(i) Joule's law	(a) $R=R_1R_2/(R_1+R_2)$
(ii) Ohm's law	(b) $H = I^2RT$
(iii) Series combination of resistances.	(c) $R = R_1+R_2$
(iv) parallel combination of resistances	(d) $V = IR$

सही मिलान करें :

(i) जूल का नियम	(a) $R=R_1R_2/(R_1+R_2)$
(ii) ओम का नियम	(b) $H = I^2RT$
(iii) प्रतिरोधों का श्रेणी क्रम संयोजन	(c) $R = R_1+R_2$
(iv) प्रतिरोधों का समांतर क्रम संयोजन	(d) $V = IR$

b) Explain the Kirchhoff's law. **4 marks**

किरचॉफ के नियमों को समझाईए ।

OR (अथवा)

Explain the Faraday's law of electromagnetic induction.

फैराडे के विद्युत चुंबकीय प्रेरण के नियमों को समझाइए।

c) Define Lorentz force. Derive an expression for the force on a current carrying conductor in a magnetic field. **6 marks**

लॉरेंज बल को परिभाषित कीजिए। धारावाही चालक पर चुंबकीय क्षेत्र मे लगाने वाले बल के लिए व्यंजक स्थापित करें।

OR (अथवा)

Explain the construction and principal of moving coil galvanometer.

चल कुंडल धारामापी की सिद्धांत और कार्यविधि को समझाईए ।

Q.6 a) match the column: **2 marks**

(i) Energy band gap of Si	(a) 0
(ii) laser is	(b) very small in size
(iii) nano-materials are	(c) 1.1 eV
(iv) Energy band gap of Cu	(d) highly directional

सही मिलान करें :

(i) Si का ऊर्जा अंतराल	(a) 0
(ii) लेसर है	(b) आकार मे बहुत छोटा
(iii) नैनो-पदार्थ है	(c) 1.1 eV
(iv) Cu का ऊर्जा अंतराल	(d) उच्च दिशिक

b) Write a short note on uses of nano-particles. **4 marks**

नैनो-कणों के उपयोग पर एक संक्षिप्त टिप्पणी लिखें

OR (अथवा)

Differentiate between P type and N type semiconductor.

P प्रकार और N प्रकार के अर्द्धचालक मे अंतर लिखिए।

c) Explain **He – Ne** laser on following terms: **6 marks**

(i) construction and principle (ii) Energy level diagram

He – Ne लेसर को निम्न बिंदुओं के आधार पर समझाईए:

(i) संरचना और सिद्धांत (ii) ऊर्जा स्तर आरेख

OR (अथवा)

Explain the use of P-N junction diode as a full wave rectifier.

P-N संधि डायोड का उपयोग पूर्ण तरंग दिष्टकारी के रूप मे समझाइए।

DIPLOMA WING
RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

SEMESTER II – GROUP 'A'

COURSE TITLE	:	INTRODUCTION TO IT SYSTEM
PAPER CODE	:	7354
SUBJECT CODE	:	203
TREORY CREDITS	:	03
PRACTICAL CREDITS	:	02

Course Objectives::

This course is intended to make new students comfortable with computing environment - Learn- ing basic computer skills, Learning basic application software tools, Understanding Computer Hard-ware, Cyber security awareness

Course Content:

UNIT 1:

Basic Internet skills: Understanding browser, efficient use of search engines, awareness about Digital India portals (state and national portals) and college portals.

General understanding of various computer hardware components – CPU, Memory, Display, Key-board, Mouse, HDD and other Peripheral Devices.

UNIT 2:

OS Installation (Linux and MS Windows), Unix Shell and Commands, vi editor.

UNIT 3:

HTML4, CSS, making basic personal webpage.

UNIT 4:

Office Tools: OpenOffice Writer, OpenOffice Spreadsheet (Calc), OpenOffice Impress.

UNIT 5: Information security best practices.

Class lectures will only introduce the topic or demonstrate the tool, actual learning will take place inthe Lab by practicing regularly.

Suggested Lab Work:

This is a skill course. Topics/concepts taught in the class should be practiced in the Lab same week and practiced regularly during the semester till student becomes confident about it. This course is allabout some theory and a lot of practice.

References:

- R.S. Salaria, Computer Fundamentals, Khanna Publishing House
- Ramesh Bangia, PC Software Made Easy – The PC Course Kit, Khanna Publishing House
- Online Resources, Linux man pages, Wikipedia
- Mastering Linux Shell Scripting: A practical guide to Linux command-line, Bash scripting, and Shell programming, by Mokhtar Ebrahim, Andrew Mallett

Course outcomes:

At the end of the course student will be able to comfortably work on computer, install and configure OS, assemble a PC and connect it to external devices, write documents, create worksheets, prepare presentations, protect information and computers from basic abuses/ attacks.

INTRODUCTION TO IT SYSTEM LAB

Course Objectives:

This Lab course is intended to practice whatever is taught in theory class of 'Introduction of IT Sys- tems' and become proficient in using computing environment - basic computer skills, basic applica-tion software tools, Computer Hardware, cyber security features, etc.

Course Content:

S.No.	Topics for Practice
1	Browser features, browsing, using various search engines, writing search queries
2	Visit various e-governance/Digital India portals, understand their features, services of-fered
3	Read Wikipedia pages on computer hardware components, look at those components in lab, identify them, recognise various ports/interfaces and related cables, etc.
4	Install Linux and Windows operating system on identified lab machines, explore various options, do it multiple times
5	Connect various peripherals (printer, scanner, etc.) to computer, explore various features of peripheral and their device driver software.
6	Practice HTML commands, try them with various values, make your own Webpage
7	Explore features of Open Office tools, create documents using these features, do it multi-ple times
8	Explore security features of Operating Systems and Tools, try using them and see what happens.

This is a skill course. More you practice, better it will be.

References:

1. Online resources, Linux man pages, Wikipedia.
2. R.S. Salaria, Computer Fundamentals, Khanna Publishing House.
3. Ramesh Bangia, PC Software Made Easy – The PC Course Kit, Khanna Publishing House.
4. Mastering Linux Shell Scripting: A practical guide to Linux command-line, Bash scripting, and Shell programming, by Mokhtar Ebrahim, Andrew Mallett.
5. IT Essentials PC Hardware and Software Companion Guide, Davis Anfinson and Ken Quamme, CISC Press, Pearson Education.
6. PC Hardware and A+ Handbook, Kate J. Chase PHI (Microsoft).

Course outcomes:

At the end of the course student will be able to comfortably work on computer, install and configureOS, assemble a PC and connect it to external devices, write documents, create worksheets, prepare presentations, protect information and computers from basic abuses/attacks.

DIPLOMAWING

RAJIV GANDHI PROUDYOGIKI VISHWA VIDYALAYA, BHOPAL

II SEMESTER GROUP A

COURSE TITLE	FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING
PAPER CODE	7355
SUBJECT CODE	204
THEORY CREDITS	03
PRACTICAL CREDITS	02

Course Objectives: To provide basic knowledge of the different elements and concepts of electrical engineering field and to learn basic concepts of various active and passive electronic components, Signals, Op-Amp and their applications, Digital Electronics and their applications

Course Content:

S.No.	Unit	Topic	Sub–Topic	Hours	Marks
1.	Unit1	Overview of Electronic Components &Signals	1. Definition, symbol and Applications of Passive, Active Components: Resistances, Capacitors, Inductors, Diodes, Transistors, FET, MOS and CMOS. 2. Definition & wave form of Signals: DC/AC, voltage/current, periodic/non-periodic signals, average, rms, peak values 3. Definition and Symbols of Ideal/non-ideal voltage & current sources, independent/dependent voltage& current sources.	08	12
2.	Unit2	Overview of Analog Circuits	1. Introduction to Operational Amplifiers. 2. Block diagram of Op-Amp, 3. Ideal Op-Amp characteristics, Concept of Virtual ground 4. Practical Op-Amp: Inverting and Non-Inverting amplifier configurations 5. Application of Op-Amp as adder & Subtractor(Circuit diagram only)	08	12

3.	Unit 3	Overview of Digital Electronics	1. Introduction to Boolean Algebra. 2. Laws of Boolean algebra(Commutative law, Associative law, Distributive law, AND law, OR law, Inversion law) 3. Boolean Algebra Theorems (De Morgan's first and second law) 4. Symbol and Truth- table of Basic logic gates (AND, OR, NOT), Universal logic gates (NAND, NOR), Other logic gates (EX-OR, EX-NOR)	05	10
4.	Unit 4	Electric and Magnetic Circuits	1. Introduction to Electric and Magnetic circuits. 2. Definitions and units of Current, EMF, Potential Difference, Power and Energy; 3. Definitions and units of Magnetic Flux,Flux Density(B), M.M.F, Field Intensity(H) magnetic permeability 4. Introduction to hysteresis loop and BH curve; 5. Introduction to Electromagnetic induction: Faraday's laws of electromagnetic induction&Lenz's law 6. Comparison between electric and magnetic circuits.	08	12
5.	Unit 5	A.C. Circuits	1.Introduction to A.C. Circuit 2. Definitions of Important terms of alternating current: Cycle, Frequency, Periodic time, Amplitude, Angular velocity, RMS value, Average value, Form Factor Peak Factor, impedance, phase angle, and power factor; 3. Definitions and unit of Power in A. C. Circuits: Apparent, Reactive& Real, Introduction to power Triangle only.	08	12
6.	Unit 6	Transformer and Machines	1.Introduction to Transformer. 2. Transformer type based on voltage levels (Step up and Step-down Transformer). 3. Working principle of transformers; Emf equation and transformation ratio of transformers; 4. Introduction to Auto transformers; 5.Construction and Working principle ofDC Series motors	08	12

FUNDAMENTAL OF ELECTRICAL & ELECTRONICS ENGINEERING LAB

Course Content: SUGGESTED PRACTICALS/ EXERCISES

The practical in this section are PrOs (i.e., sub-components of the COs) to be developed and assessed in the student for the attainment of the competency

S, No.	Practical Outcomes (PrOs)	Unit No.
1.	Study of Colour Coding of Resistor	1
2	Study the VI characteristic of pn junction diode	1
3	Study the VI characteristic of Zener diode	1
4	Identify p type terminal and n type terminal of pn junction diode using multimeter	1
5	Study of Inverting and Non-Inverting amplifier configurations using IC 741	2
6.	Verify truth Table of Logic Gate: AND, OR, NOT	3
7.	Verify truth Table of Universal Logic Gate	3
8	Verify Boolean Algebra Laws	3
9	Measurement of Current and Voltage using multimeter	4
10.	Study of Sinusoidal Waveform Parameters using CRO: Amplitude, Peak to Peak, Time period, Frequency	5
11	Study of square, sawtooth and triangular waveform on CRO	5

Reference Books:

1. Ritu Sahdev, Basic Electrical Engineering, Khanna Publishing House, 2018
2. Mittle and Mittal, Basic Electrical Engineering, McGraw Education, New Delhi, 2015, ISBN : 978-0-

07-0088572-5
3. Saxena, S. B. Lal, Fundamentals of Electrical Engineering, Cambridge University Press, latest edition ISBN : 9781107464353
4. Theraja, B. L., Electrical Technology Vol – I, S. Chand publications, New Delhi, 2015, ISBN: 9788121924405
5. Theraja, B. L., Electrical Technology Vol – II, S. Chand publications, New Delhi, 2015, ISBN:
9788121924375
6. Jegathesan, V., Basic Electrical and Electronics Engineering, Wiley India, New Delhi, 2015, ISBN :
97881236529513
7. Sedha, R.S., A text book of Applied Electronics, S.Chand ,New Delhi, 2008, ISBN-13: 978-8121927833
8. Malvino, Albert Paul, David, Electronics Principles, McGraw Hill Eduction, New Delhi,2015, ISBN13: 0070634244-978
9. Mehta, V.K., Mehta, Rohit, Principles of Electronics, S. Chand and Company, New Delhi, 2014, ISBN13-9788121924504
10. Bell Devid, Fundamental of Electronic Devices and Circuits, Oxford University Press, New Delhi 2015 ISBN : 9780195425239

DIPLOMAWING
RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA,BHOPAL

SEMESTER II–GROUP'A'

COURSETITLE	:	ENGINEERING MECHANICS
PAPERCODE	:	7356
SUBJECT CODE	:	205
TREORY CREDITS	:	03
PRACTICAL CREDITS	:	02

Course Objectives:

Following are the objectives of this course:

1) To obtain resultant of various forces
2) To calculate support reactions through conditions of equilibrium for various structures
3) To understand role of friction in equilibrium problems
4) To know fundamental laws of machines and their applications to various engineering problems.

Course Contents:

Unit–I Basics of mechanics and force system

Significance and relevance of Mechanics, Applied mechanics, Statics,Dynamics. Space, time, mass, particle, flexible body and rigid body.
Scalar and vector quantity, Units of measurement (SIunits)–Fundamental units and derived units.
Force–unit, representation as a vector and by Bow's notation, characteristics and effects of a force, Principle of transmissibility of force, Force system and its classification.
Resolution of a force-Orthogonal components of a force,
Moment of a force, Varignon's Theorem.
Composition of forces – Resultant, analytical method for determination of resultant for concurrent, non-concurrent and parallel co-planar force systems–Law of triangle, parallelogram and polygon of forces.(Numerical problems preferably with figure)

Unit–II Equilibrium

Equilibrium and Equilibrant ,Free body and Free body diagram, Analytical and graphical methods of analysing equilibrium
Lami's Theorem–statement and explanation, Application for various engineering problems.
(Numerical problems preferably with figure)

Unit–III Friction

Friction and its relevance in engineering, types and laws of friction, limiting equilibrium, limiting friction, co-efficient of friction, angle of friction, angle of repose, relation between co- efficient of friction and angle of friction.

Equilibrium of bodies on level surface subjected to force parallel and inclined to plane.
Equilibrium of bodies on inclined plane subjected to force parallel to the plane only.(Numerical problems preferably with figure)

Unit–IV Centroid and centre of gravity

Centroid of geometrical plane figures (square, rectangle, triangle, circle, semi-circle, quarter circle)
Centroid of composite figures composed of not more than two geometrical figures
Centre of Gravity of simple solids-Cube, cuboid, cone, cylinder, sphere, hemisphere (No Derivation required)
(Simple numerical problems with figure)

Unit–V Simple lifting machine

Simple lifting machine, load, effort, mechanical advantage, applications and advantages.
Velocity ratio, efficiency of machines, law of machine.
Ideal machine, friction in machine, maximum Mechanical advantage and efficiency, reversible and non-reversible machines, conditions for reversibility.

Suggested Learning Resources:

1. D.S.Bedi, *Engineering Mechanics*, Khanna Publications, NewDelhi(2008)
   Khurmi, R.S., *Applied Mechanics*, S. Chand & Co. New Delhi.
2. Bansal RK, A textbook of Engineering Mechanics ,Laxmi Publications.
3. Ramamrutham ,Engineering Mechanics, S.Chand & Co.NewDelhi.
4. Dhade, Jamadar& Walawelkar, Fundamental of Applied Mechanics, Pune Vidhyarthi Gruh.
5. Ram,H.D.;Chauhan,A.K.,FoundationsandApplicationsofAppliedMechanics,Cam-bridge University Press.
6. Meriam,J. L.,Kraige,L.G.,EngineeringMechanics-Statics,Vol.I,WileyPublication,NewDelhi.

Course outcomes: After completing this course, student will be able to:

1. Identify the force systems forgiven conditions by applying the basics of mechanics.
2. Determine unknown force(s)of different engineering systems.
3. Apply the principles of friction in various conditions for useful purposes.
4. Find the centroid and centre of gravity of various components in engineering systems.
5. Calculate the mechanical advantage, velocity ratio and efficiency of a simple lifting machine.

ENGINEERING MECHANICS LAB

Course Objectives::

Following are the objectives of this course:

1. To obtain resultant of various forces
2. To understand role of friction in equilibrium problems
3. To know fundamental laws of machines and their applications to various engineering problem.
4. To obtain the centroid of geometrical plane figures.

List of Practical to be performed:

1. To study various equipments related to Engineering Mechanics.
2. Determine resultant of concurrent force system applying Law of Polygon of forces using force table.
3. Determine resultant of concurrent force system graphically.
4. Determine resultant of parallel force system graphically.
5. Verify Lami's theorem.
6. Study forces in various members of jibcrane.
7. Determine coefficient of friction for motion onhorizontal and inclined plane.
8. Determine centroid of geometrical plane figures.

Suggested Learning Resources:

1. Bedi D.S.,Engineering Mechanics,Khanna Publishing House
2. Khurmi,R.S., Applied Mechanics, S.Chand & Co.NewDelhi.
3. BansalRK, A text book of Engineering Mechanics,Laxmi Publications.
4. Ramamrutham, Engineering Mechanics, S.SChand & Co. NewDelhi
5. Dhade, Jamadar&Walawelkar,FundamentalofAppliedMechanics,PuneVidhyarthiGruh.
6. Ram,H.D.;Chauhan,A.K.FoundationsandApplicationsofAppliedMechanics,Cambridge University Press.
7. Meriam, J.L.,Kraige,L.G.,EngineeringMechanics-Statics,Vol.I,WileyPublication,NewDelhi.

Course outcomes:

Aftercompleting this course, student will be able to

1. Identify the force systems forgiven conditions by applying the basics of mechanics.
2. Determine unknown force(s) of different engineering systems.
3. Apply the principles of friction in various conditions for useful purposes.
4. Find the centroid and centre of gravity of various components in engineering systems.

DIPLOMA WING
RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

SEMESTER II – GROUP 'A'

COURSE TITLE	:	ENVIRONMENTAL SCIENCE
PAPER CODE	:	--
SUBJECT CODE	:	--
TREORY CREDITS	:	00
PRACTICAL CREDITS	:	00

Course Objectives:

Technicians working in industries or elsewhere essentially require the knowledge of environmentalscience so as to enable them to work and produce most efficient, economical and eco-friendly fin- ished products.

- Solve various engineering problems applying ecosystem to produce eco – friendly products.
- Use relevant air and noise control method to solve domestic and industrial problems.
- Use relevant water and soil control method to solve domestic and industrial problems.
- To recognize relevant energy sources required for domestic and industrial applications.
- Solve local solid and e-waste problems.

Course Content:

Pre requisite: - High School Chemistry

Unit-1 Ecosystem

Structure of ecosystem, Biotic & Abiotic componentsFood

chain and food web

Aquatic (Lentic and Lotic) and terrestrial ecosystem

Carbon, Nitrogen, Sulphur, Phosphorus cycle.

Global warming -Causes, effects, process, Green House Effect, Ozone depletion

Unit– 2 Air and, Noise Pollution

Definition of pollution and pollutant, Natural and manmade sources of air pollution (Refriger- ants, I.C., Boiler)

Air Pollutants: Types, Particulate Pollutants: Effects and control (Bag filter, Cyclone separator, Electrostatic Precipitator)

Gaseous Pollution Control: Absorber, Catalytic Converter, Effects of air pollution due to Refrig-erants, I.C., Boiler

Noise pollution: sources of pollution, measurement of pollution level, Effects of Noise pollu-tion, Noise pollution (Regulation and Control) Rules, 2000

Unit- 3 Water and Soil Pollution

Sources of water pollution, Types of water pollutants, Characteristics of water pollutants Tur- bidity, pH, total suspended solids, total solids BOD and COD: Definition, calculation

Waste Water Treatment: Primary methods: sedimentation, froth floatation, Secondary meth- ods: Activated sludge treatment, Trickling filter, Bioreactor, Tertiary Method: Membrane sepa- ration technology, RO (reverse osmosis).

Causes, Effects and Preventive measures of Soil Pollution: Causes-Excessive use of Fertilizers,

Pesticides and Insecticides, Irrigation, E-Waste.

Unit– 4 Renewable sources of Energy

Solar Energy: Basics of Solar energy. Flat plate collector (Liquid & Air). Theory of flat plate col-lector. Importance of coating. Advanced collector. Solar pond. Solar water heater, solar dryer.Solar stills.

Biomass: Overview of biomass as energy source. Thermal characteristics of biomass as fuel. Anaerobic digestion. Biogas production mechanism. Utilization and storage of biogas.

Wind energy: Current status and future prospects of wind energy. Wind energy in India. Environmental benefits and problem of wind energy.

New Energy Sources: Need of new sources. Different types new energy sources. Applications of (Hydrogen energy, Ocean energy resources, Tidal energy conversion.) Concept, origin and power plants of geothermal energy

Unit-5 Solid Waste Management, ISO 14000 & Environmental Management 06 hours

Solid waste generation- Sources and characteristics of : Municipal solid waste, E- waste, bio-medical waste.

Metallic wastes and Non-Metallic wastes (lubricants, plastics, rubber) from industries.

Collection and disposal: MSW (3R, principles, energy recovery, sanitary landfill), Hazardous waste

Air quality act 2004, air pollution control act 1981 and water pollution and control act1996.Structure and role of Central and state pollution control board.

Concept of Carbon Credit, Carbon Footprint. Environmental management in fabrication industry.ISO14000: Implementation in industries, Benefits.

References:

(a) Suggested Learning Resources:

Books:

1. S.C. Sharma & M.P. Poonia, Environmental Studies,Khanna Publishing House,NewDelhi
2. C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011.
3. Arceivala, Soli Asolekar, Shyam, Waste Water Treatment for Pollution Control and
4. Reuse, Mc-Graw Hill Education India Pvt. Ltd., New York, 2007, ISBN:978-07-062099-
5. Nazaroff, William, Cohen, Lisa, Environmental Engineering Science, Willy, New York, 2000,ISBN 10: 0471144940.
6. O.P. Gupta, Elements of Environmental Pollution Control, Khanna Publishing House, New Delhi
7. Rao, C. S., Environmental Pollution Control and Engineering, New Age International Publication, 2007, ISBN: 81-224-1835-X.
8. Rao, M. N.Rao, H.V.N, Air Pollution, Tata Mc-Graw Hill Publication, New delhi, 1988, ISBN: 0-07-451871-8.
9. Frank Kreith, Jan F Kreider, Principles of Solar Engineering, McGraw-Hill, New York ; 1978,ISBN: 9780070354760.
10. Aldo Vieira, Da Rosa, Fundamentals of renewable energy processes, Academic Press Oxford, UK; 2013. ISBN: 9780123978257.
11. Patvardhan, A.D, Industrial Solid Waste, Teri Press, New Delhi, 2013, ISBN:978-81-7993-502-6
12. Metcalf & Eddy, Waste Water Engineering, Mc-Graw Hill, New York, 2013, ISBN: 077441206.
13. Keshav Kant, Air Pollution & Control, Khanna Publishing House, New Delhi (Edition 2018)

(b) Open source software and website address:

1) www.eco-prayer.org
2) www.teriin.org
3) www.cpcp.nic.in
4) www.cpcp.gov.in
5) www.indiaenvironmentportal.org.in
6) www.whatis.techtarget.com
7) www.sustainabledevelopment.un.org
8) www.conserve-energy-future.com)

Teachers should use the following strategies to achieve the various outcomes of the course.

- Different methods of teaching and media to be used to attain classroom attention.
- Massive open online courses (MOOCs) may be used to teach various topics/sub topics.
- 15-20% of the topics which are relatively simpler of descriptive in nature should be given to thestudents for self-learning and assess the development of competency through classroom presen-tations.
- Micro-projects may be given to group of students for hand-on experiences
- Encouraging students to visit to sites such as Railway station and research establishment aroundthe institution.

Course outcomes

At the end of the course student will be able to

1. Understand the ecosystem and terminology and solve various engineering problems ap-plying ecosystem knowledge to produce eco – friendly products.
2. Understand the suitable air, extent of noise pollution, and control measures and acts.
3. Understand the water and soil pollution, and control measures and acts.
4. Understand different renewable energy resources and efficient process of harvesting.
5. Understand solid Waste Management, ISO 14000 & Environmental Management.