

**Curriculum
of
Diploma Programme
in
Chemical Engineering**



**State Board of Technical Education (SBTE)
Bihar**

Semester – I

Teaching & Learning Scheme

Board of Study	Course Codes	CourseTitles	Teaching & Learning Scheme (Hours/Week)					
			Classroom Instruction (CI)		Lab Instruction (LI)	Notional Hours (TW+ SL)	Total Hours (CI+LI+TW+SL)	Total Credits (C)
			L	T				
	2400101	Basic Engg. Mathematics (ME, ME (Auto), CE, MIE, CSE, AIML, EE, CRE, CHE, ELX, ELX (R))	2	1	-	2	5	4
	2400102A	Applied Physics -A (CE, ME, ME (Auto), MIE, AE, FTS, CRE, CHE)	3	-	4	2	9	6
	2400103A	Applied Chemistry -A (ME, ME (Auto), CE, MIE, AE, CHE, FTS, CRE)	3	-	4	2	9	6
	2400104	Communication Skills (English) (Common for all Programmes)	3	-	4	2	9	6
	2415105	Engg. Drawing & Graphics (MIE, AE, CRE, CE, CHE, FTS, TE, EE, ELX, ELX (R))	-	-	4	2	6	3
	2418107	ICT Tools (CE, ME, ME (Auto), FTS, CSE, AIML, MIE, CRE, CHE, FPP, TE, CACDDM, GT)	-	-	4	2	6	3
	2400008	Sports, Yoga and Meditation (Common for All Programmes)	-	-	1	1	2	1
	2400009	Open Educational Resources (Non-exam course) (FTS, CHE, CSE, EE, ME, ME (Auto), MIE, ELX, AIML, CRE, CACDDM, FPP, GT)	1	-	-	-	1	1
TOTAL			12	1	21	13	47	30

Note: Prefix will be added to Course Code if applicable (T for theory Paper, P for Practical Paper and S for Term work)

Legend:

CI: Classroom Instruction (Includes different instructional/implementation strategies i.e. Lecture (L), Tutorial (T), Case method, Demonstrations, Video demonstration, Problem based learning etc. to deliver theoretical concepts)

LI: Laboratory Instruction (Includes experiments/practical performances/problem-based experiences in laboratory, workshop, field or other locations using different instructional/Implementation strategies)

Notional Hours: Hours of engagement by learners, other than the contact hours for ensuring learning.

TW: Term work (includes assignments, seminars, micro projects, industrial visits, any other student activities etc.)

SL: Self Learning, MOOCs, spoken tutorials, online educational resources etc.

C: Credits = (1 x CI hours) + (0.5 x LI hours) + (0.5 x Notional hours)

Note: TW and SL have to be planned by the teacher and performed by the learner under the continuous guidance and feedback of teacher to ensure outcome of learning.

Semester - I

Assessment Scheme

Board of Study	Course Codes	Course Titles	Assessment Scheme (Marks)						Total Marks (TA+TWA+LA)
			Theory Assessment (TA)		Term work & Self-Learning Assessment (TWA)		Lab Assessment (LA)		
			Progressive Theory Assessment (PTA)	End Theory Assessment (ETA)	Internal	External	Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)	
	2400101	Basic Engg. Mathematics (ME, ME (Auto), CE, MIE, CSE, AIML, EE, CRE, CHE, ELX, ELX (R))	30	70	20	30	-	-	150
	2400102A	Applied Physics -A (CE, ME, ME (Auto), MIE, AE, FTS, CRE, CHE)	30	70	20	30	20	30	200
	2400103A	Applied Chemistry -A (ME, ME (Auto), CE, MIE, AE, CHE, FTS, CRE)	30	70	20	30	20	30	200
	2400104	Communication Skills (English) (Common for all Programmes)	30	70	20	30	20	30	200
	2415105	Engg. Drawing & Graphics (MIE, AE, CRE, CE, CHE, FTS, TE, EE, ELX, ELX (R))	-	-	20	30	20	30	100
	2418107	ICT Tools (CE, ME, ME (Auto), FTS, CSE, AIML, MIE, CRE, CHE, FPP, TE, CACDDM, GT)	-	-	20	30	20	30	100
	2400008	Sports, Yoga and Meditation (Common for All Programmes)	-	-	10	-	06	09	25
	2400009	Open Educational Resources (Non-exam course)	25	-	-	-	-	-	25
TOTAL			145	280	130	180	106	159	1000

Note: Prefix will be added to Course Code if applicable (T for theory Paper, P for Practical Paper and S for Term work)

Legend:

- PTA: Progressive Theory Assessment in class room (includes class test, mid-term test and quiz using online/offline modes)
 PLA: Progressive Laboratory Assessment (includes process and product assessment using rating Scales and rubrics)
 TWA: Term work & Self Learning Assessment (Includes assessment related to student performance in assignments, seminars, micro projects, industrial visits, self-learning, any other student activities etc.)

Note:

- Separate passing is must for progressive and end semester assessment for both theory and practical.
- ETA & ELA are to be carried out at the end of the term/ semester.
- Term Work is to be done by the students under the guidance of internal faculty but its assessment will be done **internally (40%)** as well as **externally (60%)**. Assessment related to planning and execution of Term Work activities like assignment, micro project, seminar and self-learning is to be done by internal faculty (Internal Assessment) whereas assessment of output/product/ presentation related to these activities will be carried out by external faculty/expert (External Assessment). However, criteria of internal as well as external assessment may vary as per the requirement of respective course. For valid and reliable assessment, the internal faculty should prepare checklist & rubrics for these activities.

- A) **Course Code** : **2400101 (T2400101/S2400101)**
 B) **Course Title** : Basic Engineering Mathematics
 C) **Pre-requisite Course(s)** : Algebra, Geometry, Trigonometry
 D) **Rationale** :

This course provides strong foundation in mathematical concepts and techniques that can be applied in a variety of settings and can help them develop important problem-solving and logical thinking skills that are valuable. This basic course of Mathematics is being introduced as a foundation which will help in developing the competency and the requisite course outcomes. Calculus is a branch of Mathematics that calculates how matter, particles and heavenly bodies actually move. Derivatives are useful to find maxima and minima of the function, velocity and acceleration and also useful for many engineering optimization problems. Statistics can be defined as a type of mathematical analysis which involves the method of collecting and analyzing data and then summing up the data into a numerical form for a given set of factual data or real-world observations. This course is an attempt to initiate the multi-dimensional logical thinking and reasoning capabilities. It will help to apply the principles of basic mathematics to solve related technology problems. The course provides the insight to analyze engineering problems scientifically using, determinants, matrices, trigonometry, coordinate geometry, and statistics. This course further develops the skills and understanding of mathematical concepts which underpin the investigative tools used for modeling and analysis in a wide range of applications in engineering.

- E) **Course Outcomes (COs):** After the completion of the course, teachers are expected to ensure the accomplishment of following course outcomes by the learners. For this, the learners are expected to perform various activities related to three learning domains (Cognitive, Psychomotor and Affective) in classroom/ laboratory/ workshop/ field/ industry.

After completion of the course, the students will be able to-

- CO-1** Demonstrate the ability to solve engineering related problems based on applications of algebra.
CO-2 Use concept of derivative as a tool to solve engineering related problems.
CO-3 Apply differential calculus to solve branch specific problems.
CO-4 Use concept of Coordinate geometry to solve branch specific engineering related problems.
CO-5 Apply techniques and methods of probability and statistics to crack branch specific problems.

- F) **Suggested Course Articulation Matrix (CAM):**

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)	
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2
CO-1	3	-	-	-	-	-	-		
CO-2	3	1	-	-	-	-	-		
CO-3	3	1	1	-	-	-	1		
CO-4	3	1	-	-	-	-	-		
CO-5	3	2	1	1	-	-	1		

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional

G) **Teaching & Learning Scheme:**

Board of Study	Course Code	Course Title	Scheme of Study (Hours/Week)					
			Classroom Instruction (CI)		Lab Instruction (LI)	Notional Hours (TW+ SL)	Total Hours (CI+LI+TW+SL)	Total Credits (C)
			L	T				
	2400101	Basic Engineering Mathematics	02	01	-	02	05	04

Note: Prefix will be added to Course Code if applicable (T for theory Paper, P for Practical Paper and S for Term work)

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LI: Laboratory Instruction (Includes experiments/ practical performances / problem-based experiences in laboratory, workshop, field or other locations using different instructional/ Implementation strategies)

Notional Hours: Hours of engagement by learners, other than the contact hours for ensuring learning.

TW: **Term Work** (includes assignments, seminars, micro projects, industrial visits, any other student activities etc.)

SL: Self Learning, MOOCs, Spoken Tutorials, **online educational resources** etc.

C: Credits= (1xCIhours) + (0.5xLIhours) + (0.5xNotionalhours)

Note: **TW** and SL have to be planned by the teacher and performed by the learner under the continuous guidance and feedback of teacher to ensure outcome of learning.

H) **Assessment Scheme:**

Board of Study	Course Code	Course Title	Assessment Scheme(Marks)						Total Marks (TA+TWA+LA)
			Theory Assessment (TA)		Term Work& Self-Learning Assessment (TWA)		Lab Assessment (LA)		
			Progressive Theory Assessment (PTA)	End Theory Assessment (ETA)	Internal	External	Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)	
	2400101	Basic Engineering Mathematics	30	70	20	30	-	-	150

Note: Prefix will be added to Course Code if applicable (T for theory Paper, P for Practical Paper and S for Term work)

Legend:

PTA: Progressive Theory Assessment in class room (includes class test, mid-term test and quiz using online/offline modes)

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TWA: Term work & Self Learning Assessment (Includes assessment related to student performance in assignments, seminars, micro projects, industrial visits, self-learning, any other student activities etc.)

Note:

- Separate passing is must for progressive and end semester assessment for both theory and practical.
- ETA & ELA are to be carried out at the end of the term/ semester.
- Term Work is to be done by the students under the guidance of internal faculty but its assessment will be done **internally (40%)** as well as **externally (60%)**. Assessment related to planning and execution of Term Work activities like assignment, micro project, seminar and self-learning is to be done by internal faculty (Internal Assessment) whereas assessment of output/product/ presentation related to these activities will be carried out by external faculty/expert (External Assessment). However, criteria of internal as well as external assessment may vary as per the requirement of respective course. For valid and reliable assessment, the internal faculty should prepare checklist & rubrics for these activities.

I) **Course Curriculum Detailing:** This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (CI), Laboratory Instruction (LI), Term Work (TW) and Self Learning (SL). Students are expected to demonstrate the attainment of Theory Session Outcomes (TSOs) and Lab Session Outcomes (LSOs) leading to attainment of Course Outcomes (COs) upon the completion of the course. While curriculum detailing, NEP 2020 related reforms like Green skills, Sustainability, Multidisciplinary aspects, Society connect, Indian Knowledge System (IKS) and others must be integrated appropriately.

J) **Theory Session Outcomes (TSOs) and Units: T2400101**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
<i>TSO 1a.</i> Find solution of system of equations in three unknown applying Cramer's rule. <i>TSO 1b.</i> Solve simple given problems based on Algebra of matrices. <i>TSO 1c.</i> Find inverse of matrix applying the concept of Adjoint of matrix. <i>TSO 1d.</i> Find solution of simultaneous equations in three variables using the concept of Matrix Inversion method. <i>TSO 1e.</i> Solve problems based on sum, subtraction of Vectors. <i>TSO 1f.</i> Solve simple problems related to Scalar and Vector product of vectors.	Unit-1.0 Algebra Determinant 1.1 Concept and properties of determinant. 1.2 Solutions of simultaneous equations in three Unknowns by Cramer's rule. Matrices 1.3 Algebra of matrices (Addition, Subtraction, Multiplication by Scalar and Multiplication of Two matrices). 1.4 Transpose, Adjoint and Inverse of Matrix. 1.5 Solutions of simultaneous equations of a Matrix of order 3 x3 by Inversion method. Vectors 1.6 Position vector. 1.7 Algebra of Vectors (Addition, Subtraction, Scalar Multiplication with vector). 1.8 Scalar product. 1.9 Vector product.	CO1
<i>TSO 2a.</i> Define concept of function and its types. <i>TSO 2b.</i> Solve simple problems based on Domain and range of function. <i>TSO 2c.</i> Evaluate problems of limit function based on Indeterminate form. <i>TSO 2d.</i> Check continuity of function at a point. <i>TSO 2e.</i> Find differentiation of some simple function (sinx, cosx, tanx and e^x) by first principle. <i>TSO 2f.</i> Calculate derivative of given Algebraic, trigonometric and exponential functions. <i>TSO 2g.</i> Find derivative of sum, product and quotient of given two functions. <i>TSO 2h.</i> Find the differentiation of given composite functions applying the concept of Chain rule. <i>TSO 2i.</i> Find derivative of Logarithmic, Implicit and Parametric functions.	Unit-2.0 Differential Calculus Function and Limit 2.1 Concept of function. 2.2 Different type of functions. 2.3 Domain and Range of function. 2.4 Concept of Limits and its evaluation. Continuity 2.5 Concept of continuity with simple problems. Differentiation 2.6 Differentiation by first principle. 2.7 Differentiation of Algebraic, trigonometric, Exponential and Logarithmic functions. 2.8 Differentiation of sum, product and quotient of two functions. 2.9 Differentiation of composite functions by Chain Rule. 2.10 Logarithmic differentiation. 2.11 Implicit differentiation. 2.12 Differentiation of Parametric functions.	CO2

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
<i>TSO 3a.</i> Find second order derivative of given simple functions. <i>TSO 3b.</i> Solve simple problems based on Rolle 's Theorem and Mean Value Theorem. <i>TSO 3c.</i> Apply concept of Rate of change to solve give simple problems related to velocity, acceleration. <i>TSO 3d.</i> Apply rules of derivative to solve given applied problems related to tangent and normal. <i>TSO 3e.</i> Apply rules of derivative to solve applied problems based on Maxima-Minima and Radius of curvature.	Unit-3.0 Application of Differential Calculus 3.1 Successive differentiation up to second order. 3.2 Rolle 's Theorem and Mean value Theorem (without proof) with examples. 3.3 Rate of change of quantities. 3.4 Equation of Tangent and Normal. 3.5 Maxima and Minima. 3.6 Radius of curvature.	CO3
<i>TSO 4a.</i> Calculate angle between given two lines also find slope. <i>TSO 4b.</i> Formulate equation of straight lines of different forms. <i>TSO 4c.</i> Find perpendicular distance of a straight line from a given point and perpendicular distance between two parallel lines. <i>TSO 4d.</i> Solve given simple problems related to Circle and Parabola for engineering applications. <i>TSO 4e.</i> Solve given simple problems related to Ellipse for engineering applications.	Unit-4.0 Co-ordinate Geometry Co-ordinate systems 4.1 Introduction of Co-ordinate systems. Straight lines 4.2 Slope of a line, angle between two lines. Various forms of Straight Lines 4.3 Point-slope form, Two-point form, Slope intercept form, Intercept form, Normal form, General form. 4.4 Perpendicular distance of a line from a point, perpendicular distance between two parallel lines. Conic Section 4.5 Introduction of Conic-Section. 4.6 Equation of Circle in standard form. 4.7 Standard equation of parabola, ellipse and hyperbola.	CO4
<i>TSO 5a.</i> Compute probability of given simple problems based on Addition and Multiplication theorem. <i>TSO 5b.</i> Evaluate Mean, Median and Mode of the given data for engineering applications. <i>TSO 5c.</i> Calculate Range, Variance and standard deviation of given data for engineering applications. <i>TSO 5d.</i> Calculate Coefficient of variance of given data for engineering applications.	Unit-5.0 Probability and Statistics Probability 5.1 Concept of Probability. 5.2 Addition and multiplication theorems of Probability. Measure of Central tendency 5.3 Mean, Median, Mode. Measure of Dispersion 5.4 Range, Variance, Standard Deviation. 5.5 Coefficient of Variation.	CO5

Note: One major TSO may require more than one Theory session/Period.

K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical:

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
<i>LSO 1.1.</i> Determine the value of determinant by using available open source software. <i>LSO 1.2.</i> Determine inverse of a non-singular matrix by using open source software. <i>LSO 1.3.</i> Apply Matrix Inversion method to determine currents through various branches of given electrical networks. <i>LSO 1.4.</i> Determine the resultant force applied at a particle using properties of vector for a given engineering problem.	1.	- Value of determinant of order 3, 4 and higher using open source software. - Inverse of the non-singular matrix using open source software. - Calculation of current in electrical networks by Matrix Inversion method. - Geometrical interpretation of operations of vector algebra.	CO1
<i>LSO 2.1.</i> Geometrically represent the domain and range of given Modulus function, Signum function and Floor function. <i>LSO 2.2.</i> Verify geometrically the continuity of given function at a point. <i>LSO 2.3.</i> Determine the concavity and convexity of a given continuous function for given engineering application. <i>LSO 2.4.</i> Find acceleration of the given moving body at a time t.	2.	- Geometrical interpretation of domain and range of a function. - Geometrical interpretation of limit and continuity. - Branch specific engineering application of derivative. - Vibrations of a mass-spring system. - Branch specific engineering application of derivative of parametric function.	CO2
<i>LSO 3.1.</i> Determine the maximum height of a projectile trajectory using Rolle's theorem. <i>LSO 3.2.</i> Use Lagrange's Mean Value theorem to find point at which the slope of the tangent becomes equal to the slope of the secant through its endpoints. <i>LSO 3.3.</i> Use the concept of derivative to find the slope of a bending curve for given engineering problem. <i>LSO 3.4.</i> Use the concept of tangent and normal to solve the given problem of Engineering Drawing. <i>LSO 3.5.</i> Use the concept of Maxima and Minima to obtain optimum value for given engineering problem. <i>LSO 3.6.</i> Use the concept of radius of curvature to solve given branch specific engineering problem.	3.	- Geometrical Interpretation of Rolle's Theorem. - Geometrical Interpretation of Lagrange's Mean Value theorem. - Branch specific engineering application of rate of change of quantities. - Branch specific engineering applications of tangent and normal. - Branch specific engineering applications of maxima and minima. - Engineering applications of Radius of curvature.	CO3
<i>LSO 4.1.</i> Apply the concept of Gradient to draw graphs in engineering drawing. <i>LSO 4.2.</i> Use given form of straight line to calculate the speed, distance and time of moving object. <i>LSO 4.3.</i> Use concept of Ellipse to prepare a Model of the path of Planet and its foci.	4.	- Geometrical interpretation of Gradient. - Geometrical Interpretation of line in various forms. - Geometrical interpretation of perpendicular distance of a line. - Geometrical representation of conic-section.	CO4

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
LSO 5.1. Use concept of probability to solve given problems based on Board, Playing card. LSO 5.2. Calculate the Standard Deviation for Concrete with the given data.	5.	- Applications of Probability and related theorems. - Applications of Mean, Median, and Mode for applied problems.	CO5

L) **Suggested Term Work and Self Learning: S2400101** Some sample suggested assignments, micro project and other activities are mentioned here for reference.

a. **Assignments:** Questions/Problems/Numerical/Exercises to be provided by the course teacher in line with the targeted COs.

- Solve the simultaneous system of equation in two variables by Matrix Inversion Method. Write down a Mathematical programming using any open source software to verify the result.
- A rigid body is subjected to multiple forces acting at different points. Apply vector technique to calculate the net moment or torque acting on the body. Discuss the equilibrium condition and the significance of moment in term of structural integrity and mechanical system using open source software.
- Represent the Graph of Trigonometric function, Logarithmic function on Geogebra and interpret the nature of graph and Make a pdf file.
- Find the derivative of $y = x^{\sin x}$ and visualize the graph of the function and its derivative using any open source software geometrically.
- A window in the form of a rectangle surmounted by a semicircular opening. The total perimeter of the window to admit maximum light through the whole opening. Prepare a model using concept of Maxima and Minima for the above problem and verify the result.
- Find the curvature of $x = 4\cos t$ and $y = 3 \sin t$, at what point on this ellipse does the curvature have the greatest and least values? What are the magnitudes? Visualize the result graphically using any open source software.
- When a double sided right circular cone is intersected by a plane, different types of conic sections are generated. Represent all these conic section on Geogebra and write down their equation.
- Explain how parabolic reflectors are used in engineering applications such as Satellite Dish Antennas or Head Lights.
- By Collecting the Data of Last 5 IPL series, Calculate the probability of winning a match by any two teams.
- Collect the Data of Marks obtained by your class in 1st class test. Compute the Mean, Median, Mode and variance of the data and interpret the result.

b. **Micro Projects:**

- Prepare charts displaying properties of Determinant and Matrices.
- Prepare a chart for the use of Vector algebra to solve problems of rate of change of the mass of a fluid flow.
- Draw graph of functions like x^2 , $\sin x$, $\cos x$, $\tan x$ and e^x etc analytically on graph paper and verify using suitable open-source software like SageMaths, MATHS3D, GeoGebra, Graph and DPLOT and prepare a pdf file.
- Collect at least 10 engineering applications for each Limits, Continuity and Differentiability and prepare a pdf file.
- Prepare a chart consisting of 8-10 engineering related functions whose derivative does not exist.
- Prepare model showing the application of Rolle's Theorem to determine the projectile trajectories of maximum height.
- Prepare a chart consisting of any 10 applications of Mean value theorem related to real world problems.
- Model to maximize the volume of a box made of a rectangle tin sheet by cutting off squares of same size from each corner and folding up. Also design models for at least 5 similar situation and prepare a soft file with animation.

9. Prepare models using the concept of tangent and normal to bending of roads in case of sliding of a vehicle.
10. Prepare models using the concept of radius of curvature to bending of railway track.
11. Make a short video of duration 5-7 minutes for the use of Derivative to calculate the profit and loss in business using graphs.
12. Download 5-7 videos based on applications of Derivative to check the temperature variation, to find the range of magnitudes of the earthquake etc. watch them and write a report to detail out the mathematical steps involved.
13. Prepare the Charts of formulae showing different forms of straight line for engineering applications.
14. Draw the graph for the standard equations of Circle, Parabola, Ellipse and Hyperbola on the Chart paper using any open source software and make a file.
15. Prepare the Charts consisting tree diagram to find probability of given event.
16. Collect the data of world of work and find mean, mean deviation and standard deviation for that data using any open source software of Statistics and make a soft copy.
17. Download 5-7 videos based on applications of probability for the weather forecast, watch them and write a report to detail out the mathematical steps involved.

c. Other Activities:

1. Seminar Topics:

- Applications of Integral calculus in control systems, dynamics and vibrations.
- Applications of Determinant and matrices in graphic design to make digital images.
- Application of Determinant and matrices for calculating the battery power outputs.
- Application of Vector algebra in engineering mechanics.
- Application of limit and continuity to measure the strength of the magnetic field, electric field.
- Applications of Derivative for engineering & technology.
- Application of radius of curvature for engineering and Science.
- Applications of Derivative in economy to compute the level of output at which the total revenue is the highest, the profit is the highest and (or) the lowest etc.
- Applications of Co-ordinate geometry to design of athletic tracks, recreational parks, building plans, roundabouts, Ferris wheels.
- Application of ellipses to be used to orbits of planets, satellites, moons and comets etc.
- Probability and statistics: Civil engineering, estimation of model uncertainties, identification of probability distribution.

2. Visits: Visiting following places would provide students an opportunity to see the application of various branches of mathematics in different fields. This will also help students to comprehend the career opportunities available in the field of mathematics.

- Visit to a Science museum.
- Visit to a mathematics research institute.
- Visit to a Data Science Center.
- Visit to a mathematics department of a college or university.
- Visit to a software company.
- Visit to a Space Agency.
- Visit to a Gaming Studio.
- Visit to a Science library.
- Visit to planetarium.
- Participation in mathematics competition.

3. Self-learning topics:

- Participate in MOOCs based Course on Matrix offered from Foreign University: Methods and Applications.
- Participate in MOOCs based Course on Differential calculus: Methods and Applications.
- Participate in MOOCs based Course on Probability and its Engineering applications.
- Participate in MOOCs based Course on Statistics and its Engineering applications.
- Watching videos on applications of coordinate geometry to Real world problems.

M) Suggested Course Evaluation Matrix: The course teacher has to decide and use appropriate assessment strategy and its weightage in theory, laboratory and Term Work for ensuring CO attainment. The response/performance of each student in each of these designed activities is to be used to calculate **CO attainment**.

COs	Course Evaluation Matrix						
	Theory Assessment (TA)**		Term Work Assessment (TWA)			Lab Assessment (LA)#	
	Progressive Theory Assessment (PTA) Class/Mid Sem Test	End Theory Assessment (ETA)	Term Work & Self Learning Assessment			Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)
			Assignments	Micro Projects	Other Activities*		
CO-1	20%	20%	15%	20%	10%		
CO-2	15%	20%	20%	20%	15%		
CO-3	20%	15%	15%	20%	25%		
CO-4	20%	20%	25%	20%	25%		
CO-5	25%	25%	25%	20%	25%		
Total Marks	30	70	20	20	10		
			50				

Legend:

- *: Other Activities include self- learning, seminar, visits, surveys, product development, software development etc.
 **: Mentioned under point- (N)
 #: Mentioned under point-(O)

Note:

- The percentage given are approximate
- In case of Micro Projects and End Laboratory Assessment (ELA), the achieved marks will be equally divided in all those COs mapped with total experiments.
- For CO attainment calculation indirect assessment tools like course exit survey need to be used which comprises of questions related to achievement of each COs.

N) Suggested Specification Table for End Semester Theory Assessment: Specification table represents the reflection of sample representation of assessment of cognitive domain of full course.

Unit Title and Number	Total Classroom Instruction (CI) Hours	Relevant COs Number(s)	Total Marks	ETA (Marks)		
				Remember (R)	Understanding (U)	Application & above (A)
Unit-1.0 Algebra	8	CO1	12	4	4	4
Unit-2.0 Differential Calculus	10	CO2	14	4	8	2
Unit-3.0 Application of Differential Calculus	8	CO3	12	4	4	4
Unit-4.0 Co-ordinate Geometry	10	CO4	14	4	6	4
Unit-5.0 Probability and Statistics	12	CO5	18	4	6	8
Total	48	-	70	20	28	22

Note: Similar table can also be used to design class/mid-term/ internal question paper for progressive assessment.

O) Suggested Assessment Table for Laboratory (Practical):

SN	Laboratory Practical Titles	Relevant Cos Number(s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
1.					

Legend:

PRA*: Process Assessment

PDA**: Product Assessment

Note: This table can be used for both end semester as well as progressive assessment of practical. Rubrics need to be prepared by the course teacher for each experiment/ practical to assess the student performance.

P) Suggested Instructional/ Implementation Strategies: Different Instructional/ Implementation Strategies may be appropriately selected, as per the requirement of the content/outcome. Some of them are Improved Lecture, Tutorial, Case Method, Group Discussion, Industrial visits, Industrial Training, Field Trips, Portfolio Based, Learning, Role Play, Live Demonstrations in Classrooms, Lab, Field Information and Communications Technology (ICT) Based Teaching Learning, Blended or flipped mode, Brainstorming, Expert Session, Video Clippings, Use of Open Educational Resources (OER), MOOCs etc.

Q) List of Major Laboratory Equipment, Tools and Software:

S. No.	Name of Equipment, Tools and Software	Broad Specifications	Relevant Experiment/Practical Number
1.	High end computers	Processor Intel Core i7 with Compilers and Programming Languages; RAM 32 GB, DDR3/DDR4, HDD 500 GB, OS Windows 10.	All
2.	Software	Scientific Calculators, Graphing Calculator, SCILAB, GraphEq^2.13, Micro soft Mathematics, GeoGebra, Math3D	1,2,3,4,5
3.	Printer	High Speed Duplex Printer	
4.	Scanner	Handheld 3D scanner, Accuracy up to 0.1 mm, Resolution up to 0.2 mm, Wireless technology with an inbuilt touch screen and battery, Extended field of view for capturing both large and small objects.	

R) Suggested Learning Resources:**(a) Books:**

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Elementary Engineering Mathematics	B. S. Grewal	Khanna Publishers, 15 th Edition. ISBN: 978-81-7409-257-1
2.	Engineering Mathematics (Third edition)	Croft, Anthony	Pearson Education, New Delhi, 2014. ISBN 978-81-317-2605-1
3.	Calculus and Its Applications	Marvin L. Bittinger David J. Ellenbogen Scott A. Surgent	Addison-Wesley 10 th Edition ISBN-13: 978-0-321-69433-1
4.	Calculus and Analytic Geometry	G. B. Thomas, R. L. Finney	Addison Wesley, 9 th Edition, 1995. ISBN 978-8174906168

5.	Understanding Engineering Mathematics	John Bird	Routledge; First Edition ISBN 978-0415662840
6.	Advanced Engineering Mathematics	Krezig, Ervin	Wiley Publ., New Delhi, 2014, ISBN: 978-0-470-45836-5
7.	Mathematics-I	Deepak Singh	Khanna Book Publishing Co. (P) Ltd. ISBN: 978-93-91505-42-4
8.	Mathematics-II	Garima Singh	Khanna Book Publishing Co. (P) Ltd. ISBN: 978-93-91505-52-3
9.	Consider Dimension and Replace Pi	M.P. Trivedi and P.Y. Trivedi	Notion Press; 1st edition (2018), ISBN: 978-1644291795

(b) Online Educational Resources:

1. <https://ocw.mit.edu/>
2. <https://tutorial.math.lamar.edu/>
3. <https://www.khanacademy.org/>
4. <https://www.feynmanlectures.caltech.edu/>
5. <https://www.wolframalpha.com/>
6. <https://www.dplot.com/>
7. <https://www.geogebra.org/>
8. <https://www.easycalculation.com/>
9. <https://www.scilab.org/>
10. <https://www.desmos.com/>
11. <https://nptel.ac.in/>
12. <https://swayam.gov.in/>
13. <https://ndl.iitkgp.ac.in/>
14. <https://parakh.aicte-india.org/>
15. <https://ekumbh.aicte-india.org/>
16. <https://learnengg.com/LE/Index>
17. <https://ncert.nic.in/textbook.php>
18. [https://nios.ac.in/online-course-material/sr-secondary-courses/mathematics-\(311\).aspx](https://nios.ac.in/online-course-material/sr-secondary-courses/mathematics-(311).aspx)

Note: Teachers are requested to check the creative commons **license** status/ financial implications of the suggested, online educational resources before use by the students.

(c) Others:

1. Online Mathematics Courses.
2. Mathematics Communities and Forums.
3. Mathematics Journals.
4. Mathematics Podcast.
5. Mathematics Tutorials.
6. Mathematics Quizzes.
7. Mathematics Animation.
8. Mathematics Simulations.
9. Mathematics Games.
10. Mathematics Puzzles.
11. Mathematics Brain Teasers.
12. Mathematics Apps.
13. Mathematics Blog.
14. Mathematics Challenges.

- A) **Course Code** : **2400102A(T2400102A/P2400102A/S2400102A)**
 B) **Course Title** : Applied Physics – A (ME, ME (Auto), CE, MIE, CRE, CHE, AE, FTS, RE)
 C) **Pre- requisite Course(s)** :
 D) **Rationale** :

As a subject Physics includes large numbers of diverse topics, related to materials, energy and their interactions that exists in the world around us, it empowers us to explain the different physical phenomena by observation and prediction. Engineering Diploma graduates are required to use of principles of physics in various fields of engineering and technology and same has been given prominence in the course content. This course will help the diploma engineers to apply the basic concepts and principles of physics for solving various broad-based engineering problems and comprehend different state of art technology-based applications.

- E) **Course Outcomes (COs):** After the completion of the course, teachers are expected to ensure the accomplishment of following course outcomes by the learners. For this, the learners are expected to perform various activities related to three learning domains (Cognitive, Psychomotor and Affective) in classroom/ laboratory/ workshop/ field/ industry.

After completion of the course, the students will be able to-

- CO-1** Estimate the errors in measurements of physical quantity with precision.
CO-2 Apply the concepts and principles of rotational motion in various civil and mechanical engineering problems.
CO-3 Select relevant materials for industrial applications based on its physical and thermal properties.
CO-4 Apply the concept of waves for various engineering applications involving wave dynamics
CO-5 Apply the basic concepts of modern physics for solving engineering problems.

- F) **Suggested Course Articulation Matrix (CAM):**

Course Outcomes (COs)	Programme Outcomes(POs)							Programme Specific Outcomes* (PSOs)	
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2
CO-1	3	1	-	-	-	1	2		
CO-2	3	2	2	1	1	1	1		
CO-3	3	1	2	1	1	1	1		
CO-4	3	2	2	1	-	1	1		
CO-5	3	2	1	2	-	1	2		

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional

- G) **Teaching & Learning Scheme:**

Board of Study	Course Code	Course Title	Scheme of Study (Hours/Week)					
			Classroom Instruction (CI)		Lab Instruction (LI)	Notional Hours (TW+ SL)	Total Hours (CI+LI+TW+SL)	Total Credits (C)
			L	T				
	2400102A	Applied Physics- A	03	-	04	02	09	06

Note: Prefix will be added to Course Code if applicable (T for theory Paper, P for Practical Paper and S for Term work)

Legend:

- CI: Classroom Instruction (Includes different instructional/implementation strategies i.e. Lecture (L), Tutorial (T), Case method, Demonstrations, Video demonstration, Problem based learning etc. to deliver theoretical concepts)
- LI: Laboratory Instruction (Includes experiments/practical performances /problem-based experiences in laboratory, workshop, field or other locations using different instructional/Implementation strategies)
- Notional Hours: Hours of engagement by learners, other than the contact hours for ensuring learning.
- TW: Term Work (includes assignments, seminars, micro projects, industrial visits, any other student activities etc.)
- SL: Self Learning, MOOCs, spoken tutorials, online educational resources etc.
- C: Credits = (1 x CI hours) + (0.5 x LI hours) + (0.5 x Notional hours)
- Note:** TW and SL have to be planned by the teacher and performed by the learner under the continuous guidance and feedback of teacher to ensure outcome of learning.

H) Assessment Scheme:

Board of Study	Course Code	Course Title	Assessment Scheme (Marks)						Total Marks (TA+TWA+LA)
			Theory Assessment (TA)		Term Work & Self-Learning Assessment (TWA)		Lab Assessment (LA)		
			Progressive Theory Assessment (PTA)	End Theory Assessment (ETA)	Internal	External	Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)	
	2400102A	Applied Physics- A	30	70	20	30	20	30	200

Note: Prefix will be added to Course Code if applicable (T for theory Paper, P for Practical Paper and S for Term work)

Legend:

- PTA: Progressive Theory Assessment in class room (includes class test, mid-term test and quiz using online/offline modes)
- PLA: Progressive Laboratory Assessment (includes process and product assessment using rating Scales and rubrics)
- TWA: Term work & Self Learning Assessment (Includes assessment related to student performance in assignments, seminars, micro projects, industrial visits, self-learning, any other student activities etc.)

Note:

- Separate passing is must for progressive and end semester assessment for both theory and practical.
- ETA & ELA are to be carried out at the end of the term/ semester.
- Term Work is to be done by the students under the guidance of internal faculty but its assessment will be done **internally (40%)** as well as **externally (60%)**. Assessment related to planning and execution of Term Work activities like assignment, micro project, seminar and self-learning is to be done by internal faculty (Internal Assessment) whereas assessment of output/product/ presentation related to these activities will be carried out by external faculty/expert (External Assessment). However, criteria of internal as well as external assessment may vary as per the requirement of respective course. For valid and reliable assessment, the internal faculty should prepare checklist & rubrics for these activities.

- I) Course Curriculum Detailing:** This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (CI), Laboratory Instruction (LI), Term Work (TW) and Self Learning (SL). Students are expected to demonstrate the attainment of Theory Session Outcomes (TSOs) and Lab Session Outcomes (LSOs) leading to attainment of Course Outcomes (COs) upon the completion of the course. While curriculum detailing, NEP 2020 related reforms like Green skills, Sustainability, Multidisciplinary aspects, Society connect, Indian Knowledge System (IKS) and others must be integrated appropriately.

J) Theory Session Outcomes (TSOs) and Units: T2400102A

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
<i>TSO 1a.</i> Distinguish between fundamental and derived physical quantity. <i>TSO 1b.</i> Estimate the errors in the measurement of given physical quantity. <i>TSO 1c.</i> Derive dimensional formula of a given physical quantity. <i>TSO 1d.</i> Apply dimensional analysis for inter conversion of units. <i>TSO 1e.</i> Establish relation between physical quantities using dimensional analysis. <i>TSO 1f.</i> Use dimensional analysis to check the correctness of a given equation.	Unit-1.0 Unit and Measurements 1.1 Physical quantities, fundamentals and derived units and system of units 1.2 Accuracy, precision and errors (systematic and random) in measurements, Method of estimation of errors (absolute and relative) in measurement, propagation of errors, significant figures 1.3 Dimensions and dimensional formulae of physical quantities, Principle of homogeneity of dimension in an equation 1.4 Applications of dimensions: conversion from one system of units to other, corrections of equations and derivation of simple equations	CO1
<i>TSO 2a.</i> Explain circular motion and various terms related to circular motion. <i>TSO 2b.</i> Apply the concept of centripetal and centrifugal forces in a given situation. <i>TSO 2c.</i> Distinguish between translational and rotational motion. <i>TSO 2d.</i> Explain the terms torque and angular momentum. <i>TSO 2e.</i> Apply the principle of conservation of angular momentum in a given situation. <i>TSO 2f.</i> Find the moment of inertia of a given regular shape body.	Unit-2.0 Circular and Rotational Motion 2.1 Circular motion, angular displacement, angular velocity, frequency, time period, angular acceleration, relation between angular & linear velocity, linear acceleration & angular acceleration 2.2 Centripetal and centrifugal forces: banking of roads and bending of cyclist 2.3 Translational and rotational motion, torque and angular momentum, conservation of angular momentum and its applications 2.4 Moment of inertia and its physical significances, radius of gyration of rigid body, theorem of parallel and perpendicular axes (statements only), moment of inertia of rod, ring, disc and sphere (hollow and solid)	CO2
<i>TSO 3a.</i> Explain the stress-strain curve of a given elastic or plastic body. <i>TSO 3b.</i> Interrelate different coefficient of elasticity. <i>TSO 3c.</i> Apply the concepts of surface tension and viscosity to solve a given engineering problem. <i>TSO 3d.</i> Explain the behavior of given fluids on the basis of their viscosity. <i>TSO 3e.</i> Determine the various modes heat transfer in a given engineering problem. <i>TSO 3f.</i> Establish relation between coefficients of	Unit-3.0 Physical Properties of Matter and Heat 3.1 Elasticity: Hooke's law, Coefficient of elasticity; Young's modulus, Bulk Modulus and modulus of rigidity and their inter-relation (No derivation), Poisson's ratio, stress-strain curve, elastic potential energy 3.2 Surface tension: Intermolecular Force, cohesive and adhesive forces, Surface Tension, Surface Energy, angle of contact, Ascent formula (No derivation), applications of surface tension, capillary action, effect of temperature and impurity on surface tension	CO3

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
thermal expansion.	3.3 Viscosity: Fluid, Viscosity and coefficient of viscosity, Critical Velocity, Reynold's number, streamline and turbulent flow, Terminal velocity, Stokes law and effect of temperature on viscosity. 3.4 Heat: Concept of Heat and Temperature and its difference, modes of heat transfer: conduction, convection, radiation, coefficient of thermal conductivity, thermal expansion of solid, liquid and gas, coefficient of linear, surface and cubical expansions and relation amongst them.	
<i>TSO 4a.</i> Differentiate among periodic, oscillatory and simple harmonic motion. <i>TSO 4b.</i> Explain the various terms related to SHM. <i>TSO 4c.</i> Derive the expression for time period of given Bar pendulum. <i>TSO 4d.</i> Distinguish between mechanical and electromagnetic waves with examples <i>TSO 4e.</i> Differentiate between longitudinal and transverse waves with examples <i>TSO 4f.</i> Find the relation between the terms used to describe wave motion. <i>TSO 4g.</i> Explain the principle of Superposition of waves and beat formation with examples.	Unit-4.0 Simple Harmonic Motion and Wave Motion 4.1 Periodic and Oscillatory Motion 4.2 Simple Harmonic Motion (SHM): Displacement, Amplitude, phase, velocity, acceleration, time period, frequency and their interrelation, Conservation of energy in SHM, Compound pendulum: Bar pendulum 4.3 Types of waves: Mechanical and Electromagnetic waves, Transverse and longitudinal waves, wave velocity, frequency and wave length and their relationship, wave equation, amplitude, phase, phase difference, superposition of waves, Beats formation	CO4
<i>TSO 5a.</i> Apply the concept of photoelectric effect to explain the of photonic devices. <i>TSO 5b.</i> Explain Laser, components of laser and its various engineering applications. <i>TSO 5c.</i> Explain propagation of light in optical fiber and its engineering applications. <i>TSO 5d.</i> Describe the properties of nanomaterials and its various applications.	Unit-5.0 Modern Physics 5.1 Photoelectric effect; Photon, threshold frequency, work function, Stopping Potential, Einstein's photoelectric equation. 5.2 Lasers: Properties, Energy levels, ionization and excitation potentials; spontaneous and stimulated emission; population inversion, pumping methods, types of lasers: Ruby laser, He-Ne Laser, engineering and medical applications of lasers. 5.3 Optical fibers: Total internal reflection, acceptance angle and numerical aperture, Optical fiber types, applications of optical fibers 5.4 Nanotechnology: Properties (optical, magnetic and dielectric properties) of Nanomaterials and its application	CO5

Note: One major TSO may require more than one Theory session/Period.

K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical: **P2400102A**

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
<i>LSO 1.1.</i> Use Vernier caliper to measure the known and unknown dimensions of a given small object. <i>LSO 1.2.</i> Estimate the mean absolute error up to two significant figures.	1.	Vernier caliper	CO1

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
<i>LSO 2.1.</i> Use screw gauge to measure the diameter/ thickness of a given object. <i>LSO 2.2.</i> Estimate the mean absolute, relative and percentage errors up to three significant figures.	2.	Screw gauge	CO1
<i>LSO 3.1.</i> Use Spherometer to measure radius of curvature of given convex and concave mirror/surface. <i>LSO 3.2.</i> Estimate errors in the measurement.	3.	Spherometer	CO1
<i>LSO 4.1.</i> Determine the spring constant of a given spring.	4.	Spring Oscillator	CO4
<i>LSO 5.1.</i> Determine the time period of oscillation of given bar pendulum. <i>LSO 5.2.</i> Determine the radius of gyration and moment of inertia about an axis perpendicular to the plane of oscillation and passing through its center of mass of given bar pendulum.	5.	Bar Pendulum	CO2, CO4
<i>LSO 6.1.</i> Determine the coefficient of linear expansion of material of a given rod.	6.	Pullingger's apparatus	CO3
<i>LSO 7.1.</i> Use Searle's apparatus to determine the Young's modulus of a given wire.	7.	Searle's apparatus	CO3
<i>LSO 8.1.</i> Apply Stokes law to determine the coefficient of viscosity of a given viscous liquid.	8.	Stokes law	CO3
<i>LSO 9.1.</i> Determine the inverse square law relation between the distance of photocell and light source v/s intensity of light source.	9.	Photo-electric cell experiment	CO5
<i>LSO 10.1.</i> Determine the Numerical Aperture (NA) of a given step index optical fiber.	10.	Numerical Aperture of an optical fiber	CO5
<i>LSO 11.1.</i> Measure wavelength of a He-Ne/diode laser by using a plane diffraction grating.	11.	He-Ne/diode laser	CO5
<i>LSO 11.2.</i> Find the moment of inertia of a given flywheel	12	Fly wheel	CO2
<i>LSO 11.3.</i> Plot the graph between KE of Photo electron v/s frequency of incident light <i>LSO 11.4.</i> Determine the value of Plank's Constant (h) from the graph between KE v/s frequency of incident light. <i>LSO 11.5.</i> Determine the variation of stopping potential w.r.t frequency of incident photon	13	Photo electric effect (virtual lab experiment)	CO5
<i>LSO 11.6.</i> Determine the wave length of different spectral lines of Hydrogen spectra	14	Emission Spectra of Hydrogen (virtual lab experiment)	CO5

- L) **Suggested Term Work and Self Learning: S2400102A** Some sample suggested assignments, micro project and other activities are mentioned here for reference.
- a. **Assignments:** Questions/Problems/Numerical/Exercises to be provided by the course teacher in line with the targeted COs such as.
1. Convert the units of given physical quantity from one system of units to another.
 2. Find the different terms related to SHM/ wave from given equation of SHM/ wave.
 3. Determine the change in the parameters related to rotational motion, when a regular shaped body rolls down on an inclined plane and give comparison for different bodies/ parameters.
 4. Measure room temperature of hot bath/ bodies by using mercury thermometer and convert it into different temperature scales (lab- based).
 5. Use online tool to determine S/V ratio of a given shape and size. (online assignment)
- b. **Micro Projects:**
1. Make prototype Vernier calipers and screw gauge of desired Least Count,
 2. Collect wires of different materials and find the fracture point for required applications
 3. Design prototype model to find thermal conductivity of different metals.
 4. Prepare model for determining moment of inertia of bodies with different shapes
 5. Fiber optics: Demonstrate the phenomenon of total internal reflection.
 6. LASER: Prepare model to demonstrate the properties and applications of LASER.
 7. Viscosity: Collect 3 to 5 liquids and prepare a working model to differentiate liquids based on viscosity and demonstrate their applications.
 8. Motion: Prepare model of ball rolling down on inclined plane to demonstrate the conservation of energy and motion of an object in inclined plane.
 9. Waves in string: standing waves in string using woofer loudspeaker
 10. Use smartphone to measure the different physical quantity with the sensor applications
- c. **Other Activities:**
1. Seminar Topics:
 - Needs of measurements in engineering and science.
 - Applications of circular motions in daily life.
 - LASER: Production & applications in science, industry, medical and defense, holography.
 - Optical fibers: Construction and application in communication systems.
 - Synthesis and applications of nanomaterials.
 - CNT, Graphene and fullerene(C₆₀)
 - Application of modes of different heat transmission in daily life.
 2. Visits:
 - Visit nearby industry with Instrumentation, production and Laser/optical fibers facilities. Prepare report of visit with special comments Instrumentation technique and material used.
 - Visit planetarium, Science city and research institutions for exploring the experimental and research facilities available.
 3. Self-learning topics:
 - Vectors and its properties with applications
 - Types of fundamental units, system of units
 - Newton's Laws of motion, momentum, inertia, impulse
 - Inertial and non-inertial frame of reference
 - Derivation of formula for moment of inertia
 - Force, work, energy, power, work-energy theorem, law of conservation of energy
 - Frictions and its types
 - Pressure, density, Pascal's law, atmospheric and gauge pressure
 - Work done in various Processes, Adiabatic constant ($C_p/C_v = \gamma$), Mayer's formula ($C_p - C_v = R$)
 - CO₂ Laser, Semiconductor LASER.
 - Interference and Diffraction of light

M) Suggested Course Evaluation Matrix: The course teacher has to decide and use appropriate assessment strategy and its weightage in theory, laboratory and Term Work for ensuring CO attainment. The response/performance of each student in each of these designed activities is to be used to calculate **CO attainment**.

COs	Course Evaluation Matrix						
	Theory Assessment (TA)**		Term Work Assessment (TWA)			Lab Assessment (LA)#	
	Progressive Theory Assessment (PTA) Class/Mid Sem Test	End Theory Assessment (ETA)	Term Work & Self Learning Assessment			Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)
			Assignments	Micro Projects	Other Activities*		
CO-1	12%	12%	20%	20%	10%	30%	20%
CO-2	18%	18%	20%	20%	10%	10%	20%
CO-3	30%	30%	30%	20%	30%	30%	20%
CO-4	15%	15%	15%	20%	20%	10%	20%
CO-5	25%	25%	15%	20%	30%	20%	20%
Total Marks	30	70	20	20	10	20	30
			50				

Legend:

*: Other Activities include self- learning, seminar, visits, surveys, product development, software development etc.

** : Mentioned under point- (N)

: Mentioned under point-(O)

Note:

- The percentage given are approximate
- In case of Micro Projects and End Laboratory Assessment (ELA), the achieved marks will be equally divided in all those COs mapped with total experiments.
- For CO attainment calculation indirect assessment tools like course exit survey need to be used which comprises of questions related to achievement of each COs.

N) Suggested Specification Table for End Semester Theory Assessment: Specification table represents the reflection of sample representation of assessment of cognitive domain of full course.

Unit Title and Number	Total Classroom Instruction (CI) Hours	Relevant COs Number(s)	Total Marks	ETA (Marks)		
				Remember (R)	Understanding (U)	Application & above (A)
Unit-1.0 Unit and Measurements	6	CO1	8	4	2	2
Unit-2.0 Circular and Rotational motion	10	CO2	12	4	4	4
Unit-3.0 Physical Properties of Matter and Heat	12	CO3	20	4	8	8
Unit-4.0 Simple Harmonic motion and Wave Motion	8	CO4	12	2	4	6
Unit-5.0 Modern Physics	12	CO5	18	6	6	6
Total	48	-	70	20	24	26

Note: Similar table can also be used to design class/mid-term/ internal question paper for progressive assessment.

O) Suggested Assessment Table for Laboratory (Practical):

S. No.	Laboratory Practical Titles	Relevant COs Number(s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
1.	Vernier caliper	CO1	60	30	10
2.	Screw gauge	CO1	60	30	10
3.	Spherometer	CO1	60	30	10
4.	Spring Oscillator	CO3	50	40	10
5.	Bar Pendulum	CO2	50	40	10
6.	Pullingger's apparatus	CO3	60	30	10
7.	Searle's apparatus	CO3	50	40	10
8.	Stokes law	CO3	60	30	10
9.	Photo-electric cell experiment	CO5	40	50	10
10.	Numerical Aperture of an optical fiber	CO5	50	40	10
11.	He-Ne/diode laser	CO5	60	30	10
12.	Fly wheel	CO2	60	30	10
13.	Photo electric effect (virtual lab experiment)	CO5	70	20	10
14.	Emission spectra of Hydrogen (virtual lab experiment)	CO5	70	20	10

Legend:

PRA*: Process Assessment

PDA**: Product Assessment

Note: This table can be used for both end semester as well as progressive assessment of practical. Rubrics need to be prepared by the course teacher for each experiment/practical to assess the student performance.

P) Suggested Instructional/Implementation Strategies: Different Instructional/ Implementation Strategies may be appropriately selected, as per the requirement of the content/outcome. Some of them are Improved Lecture, Tutorial, Case Method, Group Discussion, Industrial visits, Industrial Training, Field Trips, Portfolio Based, Learning, Role Play, Live Demonstrations in Classrooms, Lab, Field Information and Communications Technology (ICT)Based Teaching Learning, Blended or flipped mode, Brainstorming, Expert Session, Video Clippings, Use of Open Educational Resources (OER), MOOCs etc.

Q) List of Major Laboratory Equipment, Tools and Software:

S. No.	Name of Equipment, Tools and Software	Broad Specifications	Relevant Experiment / Practical Number
1.	Vernier-Caliper	Range: 0-15 cm, Resolution 0.01 cm.	1,8
2.	Micrometer screw gauge	Range 0-25 mm, Resolution 0.01 mm	2,7,8
3.	Spherometer	Vertical scale range -10mm to 10 mm, Graduation resolution 0.01 mm	3
4.	Spring oscillator	A spring, a measuring ruler, mass hanger and variable masses (50 gram, 100 gram) .	4
5.	Bar pendulum	Bar pendulum, meter scale a knife-edge with a platform, spirit level, precision stop watch	5
6.	Pullingger's apparatus	Linear-expansion apparatus with steam generator, thermometer 0-100°C range, rubber tubes, metal rods of aluminum, iron, copper, brass and steel	6
7.	Searle's apparatus	Two long steel wires of the same length and diameter, Brass rods, stopwatch, meter scale, 0.5 kg slotted masses, hanger	7
8.	Stokes's law apparatus	A long cylindrical glass jar, Transparent viscous fluid, stop watch, bob, glycerin, tube clamp stand, Meter scale, Spherical ball, Thread	8
9.	Photo-electric cell experiment	Photo cell mounted in the metal box, Lamp holder with 60W bulb, analog meters (500μA & 1000mV), wooden bench fitted with scale and connecting wires	9
10.	Numerical aperture of an optical fiber	Laser Diode (2- 3 mW, 632nm) Objective (10X), Optical fiber (1-meter-long), detector with BNC connector, Auto arranging Multimeter, Screen with circular graduations, one circular base with linear and circular motion, optical bench	10
11.	He-Ne/diode laser	He-Ne Laser (output 0.5 –5.0mW, wavelength 632.8 nm power supply 240V, 50Hz) Or diode laser (2- 3 mW, 632nm), Transmission grating 15000 lines/inch, photo detector with BNC connector and holder, screen with clamp type holder, knife edge with micrometer movement, digital multimeter, scale with mount	11
12.	Fly wheel	Fly wheel setup, (Fly wheel 200 mm diameter with axial support on bearing, hanger 100g+9x100g slotted weight	12
13.	Photo electric effect (virtual lab experiment)	https://vlab.amrita.edu/?sub=1&brch=195&sim=840&cnt=1	13
14.	Emission Spectra of Hydrogen (virtual lab experiment)	https://vlab.amrita.edu/?sub=1&brch=195&sim=359&cnt=1	14

R) Suggested Learning Resources:**(a) Books:**

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Concept of physics-1	H.C. Verma	Bharti Bhawan Publications, 2021 ISBN: 8177091875, 978-8177091878
2.	Concept of physics-2	H.C. Verma	Bharti Bhawan Publications, 2021 ISBN: 8177092324, 978-8177092325
3.	Text Book of Physics for Class XI (Part-I, Part-II)	N.C.E.R.T., Delhi	N.C.E.R.T., Delhi, 2019 ISBN: 81-7450-508-3(Part-I) & ISBN: 81-7450-566-0 (Part-II)
4.	Text Book of Physics for Class XII (Part-I, Part-II)	N.C.E.R.T., Delhi	N.C.E.R.T., Delhi, 2019 ISBN: 81-7450-631-4 (Part-I) & ISBN: 81-7450-671-3 (Part II)

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
5.	Engineering Physics	P. V. Naik	Pearson Education Ltd., 1993 ISBN: 817758362X, 978-8177583625
6.	Applied Physics-I	Dr. Mina Talati & Vinod Kumar Yadav	Khanna Book Publishing (2021) ISBN : 978-93-91505-43-1
7.	Applied Physics-II	Dr. Hussain Jeevakhan	Khanna Book Publishing (2021) ISBN: 978-93-91505-57-8
8.	Engineering Physics	D. K. Bhattacharya & Poonam Tandon	Oxford University Press, ISBN: 0199452814, 978-0199452811

(b) Online Educational Resources:

1. <https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype>
2. www.nanowerk.com
3. <https://www.open2study.com/courses/basic-physics-150315/>
4. <https://nptel.ac.in/courses/122107035>
5. <https://nptel.ac.in/courses/122104016>
6. <http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html>
7. <https://www.physicsclassroom.com/>
8. <https://phys.org/>
9. <https://vlab.amrita.edu/?sub=1>
10. <https://www.olabs.edu.in/?pg=topMenu&id=40>
11. <https://www.khanacademy.org/science/physics>

Note: Teachers are requested to check the creative commons license status/ financial implications of the suggested, online educational resources before use by the students.

(c) Others:

1. Fundamentals of Physics, David Halliday, Robert Resnick and Jearl Walker
2. Engineering Physics, R.K. Gaur and S. L. Gupta
3. University Physics with Modern Physics, Sears and Zemansky
4. Physics for Scientists and Engineers with Modern Physics by Raymond A. Serway and John W. Jewett
5. Physics Laboratory Manual, David H Loyd

- A) **Course Code** : **2400103A (T2400103A/P2400103A/S2400103A)**
 B) **Course Title** : Applied Chemistry- A (ME, ME (Auto), CE, MIE, AE, CHE, FTS, CRE)
 C) **Pre- requisite Course(s)** :
 D) **Rationale** :

Students pursuing diplomas in engineering fields like mechanical, automotive, civil, mining, chemical, ceramic, agricultural, fire technology and safety need to study applied chemistry as a prerequisite course. After completion of this course student will have a deep understanding of chemical concepts, their uses, and how they relate to engineering field. Diploma engineers deals with various concept of chemistry to be approved in diverse technical and engineering field. Ever increasing use of materials like metals, alloys and fuel and lubricants will compel engineers to acquire essential applied chemistry knowledge to select engineering material, which will be economical and eco-friendly. Through this course, they will be able to understand structural arrangement of fundamental particles, atoms and molecules. The knowledge of chemical bonding will help the engineers and scientist to design new engineering materials and form chemical compounds with desirable properties. The study of concepts like water treatment and analysis, fuels and combustions and electrochemistry have constantly proved the importance of applied chemistry.

- E) **Course Outcomes (COs):** After the completion of the course, teachers are expected to ensure the accomplishment of following course outcomes by the learners. For this, the learners are expected to perform various activities related to three learning domains (Cognitive, Psychomotor and Affective) in classroom/ laboratory/ workshop/ field/ industry.

After completion of the course, the students will be able to-

- CO-1** Solve various engineering problems applying the basic concepts of atomic structure, chemical bonding, and solutions.
CO-2 Use relevant water treatment techniques to solve domestic and industrial problems.
CO-3 Solve engineering problems using concepts of engineering materials and properties.
CO-4 Use relevant fuels and lubricants for domestic and industrial applications.
CO-5 Solve engineering problems using the concepts of electrochemistry and corrosion.

- F) **Suggested Course Articulation Matrix (CAM):**

Course Outcomes (COs)	Programme Outcomes(POs)							Programme Specific Outcomes* (PSOs)	
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2
CO-1	3	2	1	-	-	-	1		
CO-2	3	3	2	2	2	1	1		
CO-3	3	2	1	2	1	1	1		
CO-4	3	1	1	1	1	1	1		
CO-5	3	2	1	1	-	1	2		

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional

G) Teaching & Learning Scheme:

Board of Study	Course Code	Course Title	Scheme of Study (Hours/Week)					
			Classroom Instruction (CI)		Lab Instruction (LI)	Notional Hours (TW+ SL)	Total Hours (CI+LI+TW+SL)	Total Credits (C)
			L	T				
	2400103A	Applied Chemistry-A	03	-	04	02	09	06

Note: Prefix will be added to Course Code if applicable (T for theory Paper, P for Practical Paper and S for Term work)

Legend:

CI: Classroom Instruction (Includes different instructional/implementation strategies i.e. Lecture (L), Tutorial (T), Case method, Demonstrations, Video demonstration, Problem based learning etc. to deliver theoretical concepts)

LI: Laboratory Instruction (Includes experiments/practical performances /problem-based experiences in laboratory, workshop, field or other locations using different instructional/Implementation strategies)

Notional Hours: Hours of engagement by learners, other than the contact hours for ensuring learning.

TW: Term Work (includes assignments, seminars, micro projects, industrial visits, any other student activities etc.)

SL: Self Learning, MOOCs, spoken tutorials, online educational resources etc.

C: Credits = (1 x CI hours) + (0.5 x LI hours) + (0.5 x Notional hours)

Note: TW and SL have to be planned by the teacher and performed by the learner under the continuous guidance and feedback of teacher to ensure outcome of learning.

H) Assessment Scheme:

Board of Study	Course Code	Course Title	Assessment Scheme (Marks)						Total Marks (TA+TWA+LA)
			Theory Assessment (TA)		Term Work & Self-Learning Assessment (TWA)		Lab Assessment (LA)		
			Progressive Theory Assessment (PTA)	End Theory Assessment (ETA)	Internal	External	Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)	
	2400103A	Applied Chemistry-A	30	70	20	30	20	30	200

Note: Prefix will be added to Course Code if applicable (T for theory Paper, P for Practical Paper and S for Term work)

Legend:

PTA: Progressive Theory Assessment in class room (includes class test, mid-term test and quiz using online/offline modes)

PLA: Progressive Laboratory Assessment (includes process and product assessment using rating Scales and rubrics)

TWA: Term work & Self Learning Assessment (Includes assessment related to student performance in assignments, seminars, micro projects, industrial visits, self-learning, any other student activities etc.)

Note:

- Separate passing is must for progressive and end semester assessment for both theory and practical.
- ETA & ELA are to be carried out at the end of the term/ semester.
- Term Work is to be done by the students under the guidance of internal faculty but its assessment will be done **internally (40%)** as well as **externally (60%)**. Assessment related to planning and execution of Term Work activities like assignment, micro project, seminar and self-learning is to be done by internal faculty (Internal Assessment) whereas assessment of output/product/ presentation related to these activities will be carried out by external faculty/expert (External Assessment). However, criteria of internal as well as external assessment may vary as per the requirement of respective course. For valid and reliable assessment, the internal faculty should prepare checklist & rubrics for these activities.

- I) **Course Curriculum Detailing:** This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (CI), Laboratory Instruction (LI), Term Work (TW) and Self Learning (SL). Students are expected to demonstrate the attainment of Theory Session Outcomes (TSOs) and Lab Session Outcomes (LSOs) leading to attainment of Course Outcomes (COs) upon the completion of the course. While curriculum detailing, NEP 2020 related reforms like Green skills, Sustainability, Multidisciplinary aspects, Society connect, Indian Knowledge System (IKS) and others must be integrated appropriately.

J) **Theory Session Outcomes (TSOs) and Units: T2400103A**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
<i>TSO-1a</i> Describe the three subatomic particles in an atom. <i>TSO-1b</i> Conclude Rutherford model of atom. <i>TSO-1c</i> Apply the different atomic theories and principles for structural illustration. <i>TSO-1d</i> Calculate uncertainty in position and momentum. <i>TSO-1e</i> Draw the shapes of s, p and d orbitals. <i>TSO-1f</i> Write the electronic configuration of different elements. <i>TSO-1g</i> Differentiate between ionic, covalent, and coordinate compounds based on the type of chemical bonding. <i>TSO-1h</i> Explain the unique behavior of water. <i>TSO-1i</i> Prepare the solution of given concentration.	Unit-1.0 Atomic Structure and Chemical Bonding and Solutions: 1.1 Atoms and its fundamental particles, 1.2 Rutherford Model of Atom, 1.3 Bohr's Theory, Hydrogen spectrum explanation based on Bohr's Model of Atom, 1.4 Wave Mechanical model of atom, de Broglie relationship, Heisenberg Uncertainty Principle 1.5 Quantum Numbers, Shapes of Atomic Orbitals, 1.6 Pauli's Exclusion Principle, Hund's Rule of Maximum Multiplicity, Aufbau Principle, Electronic Configuration (till atomic number 30). 1.7 Concept of Chemical bonding - Cause of chemical bonding, Types of Bonds: Ionic Bond (NaCl, CaCl₂, MgO), Covalent Bond, Polar and Nonpolar Covalent Bonds (H₂, F₂, HF, HCl) & Co-ordinate Bond (CO, NH₄⁺, O₃, H₂SO₄), 1.8 Dipole Moment (NH₃, NF₃), Hydrogen bonding. 1.9 Solution- (solute, solvent) and their strength- Molarity, Normality, Molality.	CO1
<i>TSO-2a</i> Classify hard and soft water based on their properties. <i>TSO-2b</i> List the impurities responsible for hardness. <i>TSO-2c</i> Calculate the hardness of water. <i>TSO-2d</i> Determine the hardness by EDTA method. <i>TSO-2e</i> Apply different water softening techniques to soften the hard water. <i>TSO-2f</i> Calculate the amount of lime and soda required for removal of hardness. <i>TSO-2g</i> Differentiate between BOD and COD. <i>TSO-2h</i> Use the Indian standard specification of drinking water.	Unit-2.0 Water 2.1 Introduction, Sources of Water. Hardness of Water- Temporary & Permanent hardness. 2.2 Degree of Hardness (In terms of CaCO₃ equivalent), Unit of Hardness, Quantitative Measurement of Water Hardness by EDTA method. 2.3 Municipal supply of Water, Treatment of water, Water Softening Technique-Soda Lime Process, Zeolites method and ion exchange method, 2.4 Water Quality Index - Biological Oxygen Demand, Chemical Oxygen Demand, Determination of Dissolved Oxygen 2.5 Indian standard specification of drinking water.	CO2
<i>TSO-3a</i> List ores of metals. <i>TSO-3b</i> Describe ore, gangue, matrix. <i>TSO-3c</i> Select Appropriate metallurgical processes for concentration, extraction, and purification of given ore. <i>TSO-3d</i> Describe alloy with examples. <i>TSO-3e</i> Write the constituent of given alloy. <i>TSO-3f</i> Write the composition properties and uses of ferrous and non-ferrous alloys. <i>TSO-3g</i> Distinguish between homopolymer and	Unit-3.0 Engineering materials 3.1 Natural Occurrence of Metals- Minerals, ores. 3.2 Metallurgy - General principles of Metallurgy, Gangue, Flux and Slag, Steps involved in metallurgy. 3.3 Extraction of Aluminium, Iron and Copper from their important ores along with reactions, Properties and uses. 3.4 Alloys – Definition, Purpose of alloying, Ferrous and Non-Ferrous Alloy with suitable examples,	CO3

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
copolymer. <i>TSO-3h</i> Write the monomers of given polymers. <i>TSO-3i</i> Explain vulcanization process. <i>TSO-3j</i> Explain cement & its manufacture. <i>TSO-3k</i> Differentiate among the different engineering materials based on their chemical composition and composition-based applications.	Composition, Properties, and their applications. 3.5 Polymers-Homopolymers and Copolymers, Natural polymers and synthetic polymers, Addition and Condensation polymerization, Thermoplastic and Thermosetting plastic. 3.6 Monomers, applications, and synthesis of Polythene, PVC, Orlon, Terylene, Nylon 66, Nylon 6, Bakelite. 3.7 Natural Rubber and its vulcanization, advantages of vulcanized rubber. 3.8 Cement, Average composition of Portland cement, Raw material for manufacture of cement, Setting of Cement.	
<i>TSO-4a</i> Classify fuels. <i>TSO-4b</i> Describe HCV and LCV. <i>TSO-4c</i> Explain knocking, octane number and cetane number. <i>TSO-4d</i> Use different gaseous fuels based on their composition, calorific value, and other properties. <i>TSO-4e</i> Explain uses of NPK fertilizers. <i>TSO-4f</i> Select relevant lubricant based on their composition, calorific value, and other properties. <i>TSO-4g</i> Determine viscosity, flash, and fire point of given lubricant for its specific use. <i>TSO-4h</i> Explain Flash, Fire, Cloud & Pour point.	Unit-4.0 Chemistry of Fuel and Lubricants 4.1 Fuels, Characteristics of an Ideal Fuel. 4.2 Classification of Fuel- Solid, liquid and gas fuel, Calorific Values (HCV and LCV), 4.3 Petroleum and its fractional distillation. 4.4 Cracking, knocking, Fuel Rating (Octane Number, Cetane Number). 4.5 Composition, uses, advantages and disadvantages of LPG, CNG and Biogas. 4.6 Manures, NPK fertilizers (preparation and uses). 4.7 Fire Extinguishers and their types. 4.8 Lubricants- Classification of Lubricants with examples, Functions and Properties of Good Lubricant. 4.9 Viscosity & Viscosity Index. Flash point. Fire point, Cloud & Pour point	CO4
<i>TSO-5a.</i> Describe Electrolyte and Nonelectrolyte. <i>TSO-5b.</i> Describe Metallic and electrolytic conduction. <i>TSO-5c.</i> Explain the faraday law of electrolysis. <i>TSO-5d.</i> Calculate the mass of metal deposited after passing a certain amount of current. <i>TSO-5e.</i> Calculate the emf at different temperature, pressure, and molar concentration. <i>TSO-5f.</i> Predict the feasibility of a cell. <i>TSO-5g.</i> Explain the working of a cell. <i>TSO-5h.</i> Describe corrosion. <i>TSO-5i.</i> Explain the different methods to prevent corrosion.	Unit-5.0 Electrochemistry 5.1. Introduction, Electrolyte and Nonelectrolyte, Electrolytic and Metallic Conduction, Factors affecting Electrolytic Conductance. 5.2. Molar Conductivity and Equivalent Conductivity. Variation of Molar Conductivity, Kohlrausch's law. 5.3. Faraday's Laws of Electrolysis. 5.4. Galvanic Cell, Electrode Potential, Measurement of Electrode Potential SHE (Standard Hydrogen electrode), EMF, Electrochemical Series, Nernst Equation for Electrode Potential. 5.5. Batteries, Primary Cells-Dry cell, Secondary cell - Lead storage battery, Fuel cells. 5.6. Corrosion, their types (Dry & Wet corrosion) and prevention.	CO5

Note: One major TSO may require more than one Theory session/Period.

K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical: P2400103A

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
LSO-1.1. Calculate amount of oxalic acid required. LSO-1.2. Prepare N/10 oxalic acid solution.	1.	Preparation of 250 ml of N/10 Oxalic acid Solution	CO1
LSO-2.1. Calculate amount of Sodium Carbonate required. LSO-2.2. Prepare N/10 Sodium Carbonate Solution.	2.	Preparation of 250ml of N/10 Sodium Carbonate Solution.	CO1
LSO 3.1. Perform acid base titration. LSO 3.2. Prepare oxalic acid solution	3.	Determination of strength of Sodium Hydroxide solution by titrating against Oxalic Acid Solution	CO1
LSO 4.1. Perform Complexometric titration. LSO 4.2. Standardize EDTA solution.	4.	Determination of the total hardness of tap water by EDTA method	CO2
LSO 5.1. Calculate % of moisture	5.	Estimation of moisture content in given coal sample gravimetrically.	CO4
LSO-6.1. Perform double displacement reaction. LSO-6.2. Test the presence of sulphate.	6.	Preparation of Barium Sulphate from Barium Chloride.	CO2
LSO-7.1. Use viscometer. LSO-7.2. Calculate viscosity using the drop number method.	7.	Determination of viscosity of liquid Using Ostwald Viscometer.	CO4
LSO-8.1. Construct Daniel cell. LSO-8.2. Compare the effect of dilution of electrolytes on the emf of a Daniel cell.	8.	Comparison of the effect of dilution of electrolytes on the emf of a Daniel cell.	CO5
LSO 9.1. Perform acid base titration using pH meter.	9.	Determination of pH of given solution by pH meter.	CO2
LSO-10.1. Carry out Polymerization. LSO-10.2. Set the environment for carrying out polymerization.	10.	Preparation of Phenol Formaldehyde Resin (Bakelite).	CO3
LSO-11.1. Perform iodometry titration. LSO-11.2. Use of starch as indicator.	11.	Determination of dissolved Oxygen in given sample of Water.	CO2
LSO-12.1. Calculate pH.	12.	Determination of pH of soil using baking soda and vinegar.	CO2

L) Suggested Term Work and Self Learning: S2400103A Some sample suggested assignments, micro project and other activities are mentioned here for reference.

a. Assignments: Questions/Problems/Numerical/Exercises to be provided by the course teacher in line with the targeted Cos such as

1. Write electronic structure of given atoms.
2. Compare the wavelengths of different macroscopic and microscopic particles moving with same velocity.
3. Prepare a model to find the soap lather forming capacity of tap water on addition of lime.
4. Prepare chart showing different industrial application of metal and relate it with required property or properties using internet.
5. Explain the working principle of TEL as antiknock.
6. Prepare chart showing different types of liquid fuels with their calorific values and uses.
7. Prepare a comparative chart of commercially available lubricants based on mechanism of lubrication.
8. Compare the EMF of Zinc - Copper cell with different cathodic concentration and predict out of low and high cathodic concentration, which increases EMF?
9. Prove the statement mathematically. "It is impossible to determine the position and momentum simultaneously with accuracy."

b. Micro Projects:

1. Form three groups of students in the class. Consider a hypothetical situation of exchanging/ sharing/giving of different items/belongings and demonstrate the type of ionic, covalent, and co-ordinate bonding amongst the students in a simulated situation. Present your findings.
2. Model of electronic configurations for different atoms ($Z=30$)
3. Prepare a model to demonstrate the application of electrolytic cells.
4. Collect three metallic strips of Al, Cu, Fe, strips, Place them in different acidic and alkaline solutions of the same concentration. Observe and record the loss in weight of metals due to acidic and alkaline environments. Discuss the findings with your teacher and colleagues.
5. Classify the surrounding corrosion into dry corrosion and wet corrosion.
6. Collect different samples of utensils reinforced materials, iron, copper, brass, bronze, and other alloys. Place them in an open environment under tin shade. Observe the corrosive properties over a period of four weeks. Record your observations. Discuss the findings with your teacher and colleagues.
7. Collect the water sample from different sources of ground and surface water (at least five). Explore the new and simplest softening and water treatment methods and perform the same at your home by creating the different assemblies and manipulative techniques at home. Determine the turbidity and pH of water (using pH paper).
8. Collection of data of various cement, glass, paints, and varnishes available in the market.
9. Compare the EMF of a given cell using different fruit juice as electrolyte.
10. Compare the hardness of different sample water by measuring the time required for forming lather.
11. Determine the flash point and fire point of a lubricant.
12. Collect petrol from different petrol pumps and compare the extent of knocking by comparing their mileage.

c. Other Activities:

1. Seminar Topics:
 - Water Softening techniques.
 - Advantages and drawbacks of different atomic structures proposed by different scientists.
 - Properties of good lubricants.
 - Application of Nernst equation.
2. Visits: Visit nearby Water treatment plant. Prepare report of visit.
Visit a nearby battery shop. Prepare a report of visit.
3. Self-learning topics:

M) Suggested Course Evaluation Matrix: The course teacher has to decide and use appropriate assessment strategy and its weightage in theory, laboratory and Term Work for ensuring CO attainment. The response/performance of each student in each of these designed activities is to be used to calculate **CO attainment**.

COs	Course Evaluation Matrix						
	Theory Assessment (TA)**		Term Work Assessment (TWA)			Lab Assessment (LA)#	
	Progressive Theory Assessment (PTA) Class/Mid Sem Test	End Theory Assessment (ETA)	Term Work & Self Learning Assessment			Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)
			Assignments	Micro Projects	Other Activities*		
CO-1	20%	20%	15%	-	-	20%	20 %
CO-2	20%	20%	10%	25%	-	20%	20 %

CO-3	20%	20%	15%	25%	33%	15%	20 %
CO-4	15%	15%	30%	25%	33%	15%	20 %
CO-5	25%	25%	30%	25%	34%	30%	20 %
Total Marks	30	70	20	20	10	20	30
			50				

Legend:

*: Other Activities include self- learning, seminar, visits, surveys, product development, software development etc.

** : Mentioned under point- (N)

: Mentioned under point-(O)

Note:

- The percentage given are approximate
- In case of Micro Projects and End Laboratory Assessment (ELA), the achieved marks will be equally divided in all those COs mapped with total experiments.
- For CO attainment calculation indirect assessment tools like course exit survey need to be used which comprises of questions related to achievement of each COs.

N) Suggested Specification Table for End Semester Theory Assessment: Specification table represents the reflection of sample representation of assessment of cognitive domain of full course.

Unit Title and Number	Total Classroom Instruction (CI) Hours	Relevant COs Number(s)	Total Marks	ETA (Marks)		
				Remember (R)	Understanding (U)	Application & above (A)
Unit-1.0 Atomic Structure and Chemical Bonding	8	CO1	14	4	4	6
Unit-2.0 Water	8	CO2	14	4	4	6
Unit-3.0 Engineering Material	8	CO3	14	4	6	4
Unit-4.0 Chemistry of fuels and Lubricants	12	CO4	10	4	2	4
Unit-5.0 Electrochemistry	12	CO5	18	4	6	8
Total	48	-	70	20	22	28

Note: Similar table can also be used to design class/mid-term/ internal question paper for progressive assessment.

O) Suggested Assessment Table for Laboratory (Practical):

S. No.	Laboratory Practical Titles	Relevant COs Number(s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
1.	Preparation of 250 ml of N/10 Oxalic acid Solution	CO1	30	60	10
2.	Preparation of 250ml of N/10 Sodium Carbonate Solution.	CO1	40	50	10
3.	Determination of strength of Sodium Hydroxide solution by titrating against Oxalic Acid Solution.	CO1	30	60	10
4.	Determination of the total hardness of tap water by EDTA method.	CO2	30	60	10

S. No.	Laboratory Practical Titles	Relevant COs Number(s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
5.	Estimation of moisture content in given coal sample gravimetrically.	CO3	30	60	10
6.	Preparation of Barium Sulphate from Barium Chloride.	CO2	30	60	10
7.	Determination of viscosity of lubricating oil using Ostwald Viscometer	CO4	30	60	10
8.	Comparison of the effect of dilution of electrolytes on the emf of a Daniel cell.	CO5	40	50	10
9.	Determination of pH of given solution by pH meter.	CO2	40	50	10
10.	Preparation of Phenol Formaldehyde Resin (Bakelite).	CO3	40	50	10
11.	Determination of dissolved Oxygen in given sample of Water.	CO2	30	60	10
12.	Determination of pH of soil using baking soda and vinegar.	CO2	30	60	10

Legend:

PRA*: Process Assessment

PDA**: Product Assessment

Note: This table can be used for both end semester as well as progressive assessment of practical. Rubrics need to be prepared by the course teacher for each experiment/practical to assess the student performance.

P) Suggested Instructional/Implementation Strategies: Different Instructional/ Implementation Strategies may be appropriately selected, as per the requirement of the content/outcome. Some of them are Improved Lecture, Tutorial, Case Method, Group Discussion, Industrial visits, Industrial Training, Field Trips, Portfolio Based, Learning, Role Play, Live Demonstrations in Classrooms, Lab, Field Information and Communications Technology (ICT)Based Teaching Learning, Blended or flipped mode, Brainstorming, Expert Session, Video Clippings, Use of Open Educational Resources (OER), MOOCs etc.

Q) List of Major Laboratory Equipment, Tools and Software:

S. No.	Name of Equipment, Tools and Software	Broad Specifications	Relevant Experiment/Practical Number
1.	Electronic balance,	Scale range of 0.001g to 500g. Pan size 100 mm; response time 3-5 sec.; power requirement 90-250 V, 10 watt.	1,2,3,5,6,7,8,9
2.	Electric oven	Inner size 18"x18"x18"; temperature range 100 to 250 ^o C. with the capacity of 40lt.	5
3.	Ostwald Viscometer	Size 120x1 mm (length x internal diameter) Overall, Height 237 mm Material- Glass	7
4.	Digital pH Meter	Type: Microcontroller Based, Display: LED / LCD / Touch Screen, 3 digits, Calibration: up to 3 points with auto buffer, pH Range (pH): 0.00 to 14.00, +/- 0.05, Power Requirements: 230 V +/- 10, 50 Hz AC, Modes: pH mV- C, Temperature Compensation Type: Automatic, Temperature Compensation Range (Degree C): 0 to 100, Temperature Accuracy (Degree C): +/- 0.3, Resolution (pH): 0.01	9,12

R) Suggested Learning Resources:**(a) Books:**

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Engineering Chemistry	Jain & Jain	Dhanpat Rai Publishing Co.(P) Ltd., New Delhi, 2015, ISBN: 93-521-6000-2
2.	A Textbook of Engineering Chemistry	Dr S. S. Dara & Dr S. S. Umare	S. Chand & Co.(P) Ltd., New Delhi, 2014, ISBN:81-219-0359-9
3.	Textbook of Chemistry for Class XI & XII (Part-I & II)	NCERT	NCERT, New Delhi, 2017-18, Class-XI, ISBN: 81-7450-494-X (part-I), 81-7450-535-O (part-II), Class-XII, ISBN: 81-7450-648-9 (part-I), 81-7450-716-7 (part-II)
4.	Engineering Chemistry	Shikha Agarwal	Cambridge Uni. Press, New Delhi, 2019, ISBN: 978-1-108-72444-9
5.	Understanding Chemistry	C.N.R. Rao	World scientific publishing Co., 2009, ISBN: 9789812836045
6.	Engineering Chemistry	Dr. Vikram, S.	Wiley India Pvt. Ltd., New Delhi, 2013, ISBN: 9788126543342
7.	Applied Chemistry Laboratory Practices, Vol. I & II	Dr. G.H. Hunger & Prof. A.N. Pathak.	NITTTR, Chandigarh, Publication, 2013-14
8.	Chemistry for Engineers	Rajesh Agnihotri	Wiley India Pvt. Ltd., 2014, ISBN: 9788126550784
9.	Fundamental of Electrochemistry	V. S. Bagotsky	Wiley International N. J., 2005, ISBN: 9780471700586
10.	Applied Chemistry with Lab manual	Anju Rawlley Devdatta V. Saraf	Khanna Book Publishing Co. (P) Ltd. New Delhi, 2021, ISBN- 978-93-91505-44-8.

(b) Online Educational Resources:

1. www.chemguide.co.uk/atommenu.html (Atomic structure and chemical bonding)
2. www.visionlearning.com (Atomic structure and chemical bonding)
3. **Error! Hyperlink reference not valid.** www.chem1.com (Atomic structure and chemical bonding)
4. <https://www.wastewaterlearning.com/elearning/> (Water Treatment)
5. www.capital-refractories.com (Metals, Alloys, Cement, and Refractory Materials)
6. www.em-ea.org/guide%20books/book-2/2.1%20fuels%20and%20combustion.pdf (Fuel & Combustion)
7. www.chemcollective.org (Metals, Alloys)
8. www.wqa.org (Water Treatment)
9. PhET: Free online physics, chemistry, biology, earth science and math simulations (colorado.edu)
10. Courses: NPTEL
11. Virtual Labs (vlab.co.in)
12. olabs.edu.in
13. Khan Academy | Free Online Courses, Lessons & Practice

Note: Teachers are requested to check the creative commons license status/ financial implications of the suggested, online educational recourses before use by the students.

(c) Others:

1. Learning Packages.
2. Lab Manuals.
3. Manufacturers' Manual
4. Users' Guide

- A) **Course Code** : **2400104(T2400104/P2400104/S2400104)**
 B) **Course Title** : Communication Skills (English) (Common for all Programmes)
 C) **Pre-requisite Course(s)** :
 D) **Rationale**

Communication forms a crucial element in success of any organization or industry in the globalized economy. The global village gives due weightage to English language and it enjoys a privileged status. Engineering students with English as a communicative language open for many opportunities across the globe. This course will develop Listening, Speaking, Reading and Writing Skills (LSRW) in the students for effective dissemination of their ideas, projects, patents and researches in the form of presentations, reports, research papers, memos, circular etc. Additionally, it will help students of diploma in engineering to present concepts and designs in effective manner along with writing CVs, Group Discussions, Mock Interview sessions in placements and job recruitments. Though communication skills in SBTE, Bihar largely emphasizes to communicate effectively in english but communication in hindi is also focused to some extend at diploma level.

- E) **Course Outcomes (COs):** After the completion of the course, teachers are expected to ensure the accomplishment of following course outcomes by the learners. For this, the learners are expected to perform various activities related to three learning domains (Cognitive, Psychomotor and Affective) in classroom/ laboratory/ workshop/ field/ industry.

After completion of the course, the students will be able to-

- CO-1** Communicate contextually in different situations.
CO-2 Use Verbal Communication effectively
CO-3 Deploy Non-Verbal Communication contextually.
CO-4 Write various texts using vocabulary and correct grammar.
CO-5 Draft effective business correspondence with brevity and clarity.

- F) **Suggested Course Articulation Matrix (CAM):**

Course Outcomes (COs)	Programme Outcomes(POs)							Programme Specific Outcomes* (PSOs)	
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2
CO-1	3	-	-	-	-	3	3		
CO-2	-	-	-	-	-	3	3		
CO-3	-	-	-	-	-	3	3		
CO-4	-	-	-	-	3	3	3		
CO-5	3	-	-	-	-	3	3		

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional

G) Teaching & Learning Scheme:

Board of Study	Course Code	Course Title	Scheme of Study (Hours/Week)					
			Classroom Instruction (CI)		Lab Instruction (LI)	Notional Hours (TW+ SL)	Total Hours (CI+LI+TW+SL)	Total Credits (C)
			L	T				
	2400104	Communication Skills (English)	03	-	04	02	09	06

Note: Prefix will be added to Course Code if applicable (T for theory Paper, P for Practical Paper and S for Term work)

Legend:

CI: Classroom Instruction (Includes different instructional/implementation strategies i.e. Lecture (L), Tutorial (T), Case method, Demonstrations, Video demonstration, Problem based learning etc. to deliver theoretical concepts)

LI: Laboratory Instruction (Includes experiments/practical performances /problem-based experiences in laboratory, workshop, field or other locations using different instructional/Implementation strategies)

Notional Hours: Hours of engagement by learners, other than the contact hours for ensuring learning.

TW: Term Work (includes assignments, seminars, micro projects, industrial visits, any other student activities etc.)

SL: Self Learning, MOOCs, spoken tutorials, online educational resources etc.

C: Credits = (1 x CI hours) + (0.5 x LI hours) + (0.5 x Notional hours)

Note: TW and SL have to be planned by the teacher and performed by the learner under the continuous guidance and feedback of teacher to ensure outcome of learning.

H Assessment Scheme:

Board of Study	Course Code	Course Title	Assessment Scheme (Marks)						Total Marks (TA+TWA+LA)
			Theory Assessment (TA)		Term Work & Self-Learning Assessment (TWA)		Lab Assessment (LA)		
			Progressive Theory Assessment (PTA)	End Theory Assessment (ETA)	Internal	External	Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)	
	2400104	Communication Skills (English)	30	70	20	30	20	30	200

Note: Prefix will be added to Course Code if applicable (T for theory Paper, P for Practical Paper and S for Term work)

Legend:

PTA: Progressive Theory Assessment in class room (includes class test, mid-term test and quiz using online/offline modes)

PLA: Progressive Laboratory Assessment (includes process and product assessment using rating Scales and rubrics)

TWA: Term work & Self Learning Assessment (Includes assessment related to student performance in assignments, seminars, micro projects, industrial visits, self-learning, any other student activities etc.)

Note:

- Separate passing is must for progressive and end semester assessment for both theory and practical.
- ETA & ELA are to be carried out at the end of the term/ semester.
- Term Work is to be done by the students under the guidance of internal faculty but its assessment will be done **internally (40%)** as well as **externally (60%)**. Assessment related to planning and execution of Term Work activities like assignment, micro project, seminar and self-learning is to be done by internal faculty (Internal Assessment) whereas assessment of output/product/presentation related to these activities will be carried out by external faculty/expert (External Assessment). However, criteria of internal as well as external assessment may vary as per the requirement of respective course. For valid and reliable assessment, the internal faculty should prepare checklist & rubrics for these activities.

- I) **Course Curriculum Detailing:** This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (CI), Laboratory Instruction (LI), Term Work (TW) and Self Learning (SL). Students are expected to demonstrate the attainment of Theory Session Outcomes (TSOs) and Lab Session Outcomes (LSOs) leading to attainment of Course Outcomes (COs) upon the completion of the course. While curriculum detailing, NEP 2020 related reforms like Green skills, Sustainability, Multidisciplinary aspects, Society connect, Indian Knowledge System (IKS) and others must be integrated appropriately.
- J) **Theory Session Outcomes (TSOs) and Units:** T2400104 The details of TSOs and units for communication in english is mentioned in Part – A while communication in hindi is mentioned in Part – B in the following table.

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
Part -A (English) TSO 1a Define communication and its different forms. TSO 1b. Explain the elements of communication with examples. TSO 1c. Explain the linkages between different stages of communication with the help of a diagram. TSO 1d. Apply the principles of effective communication and state two examples of communication. TSO 1e. State eight examples for explaining different types of barriers to communication. TSO 1f. Identify the barriers of communication. TSO1g. Suggest the ways to overcome/minimise barriers to communication.	Unit-1.0 Communication 1.1 Communication: Role, Relevance, Elements (Context-Sender-Message-Channel-Receiver-Feedback) 1.2 Process / Stages: Ideation- Encoding, Selecting Proper Channel, Transmission, Receiving, Decoding, Giving Feedback 1.3 7 Cs / Principles of Effective Communication: Considerate, Correct, Concrete, Concise, Clear, Complete. Courteous 1.4 Barriers to Communication: Physiological, Physical, Psychological, Mechanical, Semantic/Language, Cultural. Overcome/minimize Barriers	CO1 CO2
TSO 2a. Distinguish formal and informal communication. TSO 2b. Illustrate the types of Formal Communication with examples. TSO 2c. Define verbal & non-verbal communication. TSO 2d. Explain advantage of oral and written Communication. TSO 2e. Interpret non-verbal codes. TSO 2f. Explain the role of tables, charts & graphs in communication. TSO 2g. Differentiate Intrapersonal and Interpersonal Communication with examples. TSO 2h. List the advantages and disadvantages of Group Communication.	Unit- 2.0 Types of Communication 2.1 On the basis of organizational structure: Formal (Vertical, Horizontal, Diagonal), Informal (Grapevine) 2.2 On the basis of method of expression: Verbal-Oral & Written communication. Non-Verbal Communication and its Codes- Kinesics, Chronemics, Proxemics, Haptics, Vocalics/Paralanguage, Artifacts, Graphic and Visual Communication 2.3 On the basis of number of people involved: Intrapersonal Communication, Interpersonal Communication, Group Communication	CO3
TSO 3a. Prepare a glossary of new words from the given texts. TSO 3b. Summarize the given texts in your own words. TSO 3c. Recognize the types of sentences in the given texts. TSO 3d. Find out idioms and phrases used in the	Unit-3.0 Reading Comprehension Comprehension, vocabulary enhancement and grammar exercises based on the reading of the following texts: Section-1 (Prose)	CO4 CO5

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
given texts. TSO 3e. Write a short biography of the given writers. TSO 3f. Identify the figures of speech used in the given texts. TSO 3g. Classify the forms of poetry. TSO 3h. Elaborate the central idea / theme of the given poems in your own words.	3.1 An Astrologer's Day by R K Narayan 3.2 Indian Civilization and Culture by M K Gandhi 3.3 The Secret of Work by Swami Vivekanand 3.4 My Struggle for an Education by Brooker T Washington Section-2 (Poetry) 3.5 Where the Mind is without Fear by R N Tagore 3.6 Ode on Solitude by Alexander Pope 3.7 Stopping by Woods on a Snowy Evening by Robert Frost 3.8 A Psalm of Life by H W Longfellow	
TSO 4a. Form new words adding prefix and suffix to the given root words. TSO 4b. Write synonyms and antonyms of the given words. TSO 4c. Use the given idioms and phrases in your own sentences. TSO 4d. Distinguish between acronym and abbreviation. TSO 4e. Prepare a list of technical jargons of your respective branch. TSO 4f. Identify the parts of speech of the specific words in the given sentences. TSO 4g. Fill in the blanks with suitable verb forms in the given sentences. TSO 4h. Transform the given sentences as directed. TSO 4i. Punctuate the given paragraphs.	Unit-4.0 Vocabulary and Grammar 4.1 Word Formation: Prefix, Suffix, Acronym 4.2 Synonyms, Antonyms, Homonyms, One Word Substitution, Idioms and Phrases 4.3 Technical Jargons -Related to the respective program 4.4 Parts of speech 4.5 Time and Tense 4.6 Transformation: Voice, Narration, Removal of 'Too', Question Tag 4.7 Punctuation	CO4, CO5
TSO 5a. Write the precis of the given passage with suitable title. TSO 5b. Draft letters and applications for the given purpose. TSO 5c. Compose E-mails, Notices, Memos, and Circulars. TSO 5d. Prepare reports of the projects of your respective branch. TSO 5e. Write a report on the events organized in your institute.	Unit-5.0 Professional Writing 5.1 Precis Writing 5.2 Business Letters / Applications 5.3 Drafting E-mails, Notices, Memos, Circulars 5.4 Report Writing: Project and Event/ Incident Report Writing	CO5
Part -B (हिंदी) TSO 1a सम्प्रेषण कौशल का अर्थ स्पष्ट कर सकेंगे. TSO 1b भाव एवं सम्प्रेषण में अंतर बता पाएँगे. TSO 1c सम्प्रेषण की प्रक्रिया का उल्लेख कर सकेंगे. TSO 1d श्रवण अविव्यक्ति, वाचन और लेखन की अवधारणा को स्पष्ट कर सकेंगे. TSO 1e सम्प्रेषण कौशल के निर्धारक तत्वों का विवेचन कर सकेंगे. TSO 1f प्रभावशाली सम्प्रेषण के सिद्धांतों का समावेश अपने वार्तालाप में कर सकेंगे.	Units-1: सम्प्रेषण सिद्धान्त एवं व्यवहार 1.1 सम्प्रेषण : परिचय , अर्थ एवं परिभाषा 1.2 सम्प्रेषण की प्रक्रिया एवं तत्व 1.3 सम्प्रेषण के प्रकार : औपचारिक एवं अनौपचारिक, शाब्दिक एवं अशब्दिक 1.4 प्रभावशाली सम्प्रेषण के सिद्धांत एवं सम्प्रेषण व्यवधान	CO1 CO2 CO3

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
<i>TSO 2a</i> तकनीकी कौशल एवं व्यवहार कौशल में अन्तर बता पाएँगे . <i>TSO 2b</i> व्यवहार कौशल का महत्व स्पष्ट कर पाएँगे . <i>TSO 2c</i> आत्मा जागरूकता एवं आत्मा विश्लेषण का विवेचन सोदाहरण कर पाएँगे . <i>TSO 2d</i> भावनात्मक बुद्धिमत्ता एवं करुणा, अनुकूलनशीलता एवं लचीलापन का विकास कर पाएँगे. <i>TSO 2e</i> दैनिक जीवन में अनुकूलनशीलता एवं लचीलापन को आत्मसात कर पाएँगे .	Unit-2 : व्यावसायिकउत्कृष्टता हेतु व्यवहार कौशल 2.1 परिचय : तकनीकी कौशल एवं व्यवहार कौशल 2.2 व्यवहार कौशल का महत्व 2.3 जीवन कौशल : आत्म जागरूकता एवं आत्म विश्लेषण 2.4 भावनात्मक बुद्धिमत्ता एवं करुणा, अनुकूलनशीलता एवं लचीलापन व्यवहार कौशल का उपयोग	CO1
<i>TSO 3a</i> पठित गद्यांश एवं पद्यांश से प्राप्त नयी शब्दावली विकसित कर पाएँगे <i>TSO 3b</i> दिए गये कहानियों, कविताओं एवं निबंधों का सारांश अपने शब्दों में लिख पाएँगे. <i>TSO 3c</i> दिए गये कहानियों, कविताओं एवं निबंधों में प्रयुक्त मुहावरों एवं अलंकारों को बता पाएँगे . <i>TSO 3d</i> कविताओं का भावार्थ स्पष्ट कर पाएँगे .	Unit-3 : पाठ-बोध : शब्दावली परिवर्धन एवं व्याकरण अभ्यास 3.1 नमक का दरोगा , ईदगाह - मुंशी प्रेमचंद 3.2 बात (निबंध)- प्रताप नारायण मिश्र 3.3 वह प्रदीप जो दिख रहा है झिलमिल दूर नहीं है - रामधारी सिंह दिनकर 3.5 नर हो न निराश करो मन को - मैथिलीशरण गुप्त 3.6 कबीर के दोहे -काल्ह करे सो आज कर , जाति न पूछो साधू की , ऐसी वाणी बोलिए	CO4
<i>TSO 4a</i> अपनी शाखा से सम्बन्धित तकनीकी शब्दावली का चयन कर पाएँगे . <i>TSO 4b</i> पर्यायवाची एवं विलोम शब्दों से सम्बंधित शब्दावली तैयार कर सकेंगे . <i>TSO 4c</i> दिये गये गद्यांशों में विराम चिह्नों का सही प्रयोग कर पाएँगे .	Unit-4 : शब्दावली एवं व्याकरण 2 Hrs 4.1 सामान्य शब्दावली 4.2 प्रशासनिक शब्दावली 4.3 शब्द भेद, अनेक शब्दों के लिए एक शब्द 4.4 विराम चिन्ह 4.5 मुहावरें एवं कहावतें	CO4 CO5
<i>TSO 5a</i> दिए गये दिए गये गद्यांशों का संक्षेपण कर पाएँगे . <i>TSO 5b</i> विभिन्न प्रकार के पत्रों, आवेदनों ,सूचनाओं, विज्ञप्तियों को लिख पाएँगे . <i>TSO 5c</i> अपनी शाखा से सम्बंधित प्रतिवेदन लेखन कर पाएँगे . <i>TSO 5d</i> अपने संस्थान में हुए आयोजनों का प्रतिवेदन लिख पाएँगे.	Unit-5 : लेखन कौशल 5.1 सार- लेखन 5.2 औपचारिक एवं व्यवसायिक पत्र लेखन 5.3 प्रारूप लेखन - सूचना, निविदा लेखन, प्रतिवेदन लेखन, बायोडाटा	CO5

Note: One major TSO may require more than one theory session/period.

K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical: P2400104 These practical are common for both Part – A and Part -B.

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
LSO1.a Identify the emotions of the speakers.	1	Emotions of the speakers.	CO1
LSO2.a Interpret instructions of audio transcripts.	2	Instructions of audio transcripts.	CO1
LSO3.a Solve the language puzzles based on the audio transcript.	3	Language puzzles.	CO1
LSO4.a Repeat words on language lab software after listening to them.	4	Repetition of words	CO1
LSO5.a Summarize the excerpt in their own words.	5	Summarize the excerpt.	CO1
LSO6.a Answer the questions based on the listening excerpt	6	Listening excerpt	CO2
LSO7.a Differentiate the sounds of minimal pairs, syllables and words etc.	7	Sounds of minimal pairs, syllables and words etc.	CO2
LSO8.a Pronounce the words/ sentences correctly based on the phonetic transcription.	8	Phonetic transcription.	CO2
LSO9.a Read out the words and sentences on the basis of stress and intonation marks put.	9	Stress and intonation.	CO2
LSO10.a Apply the paralanguage codes in verbal dialogues to show the different emotions.	10	Paralanguage Codes	CO2
LSO11.a Integrate the non-verbal codes in their verbal dialogues.	11	Non-verbal Codes	CO2
LSO12.a Correct the verbal and non-verbal presentations of their peer while giving feedback.	12	Feedback on Presentations	CO2
LSO13.a Differentiate the sounds of minimal pairs, syllables and words etc.	13	Syllables and Words	CO2
LSO14.a Locate the dictated words from the excerpt.	14	Dictated words	CO3
LSO15.a Arrange the correct and logical sequence of the jumbled sentences.	15	Jumbled Sentences.	CO3
LSO16.a Read the given the texts aloud with proper pause and proper pronunciation.	16	Pronunciation.	CO3
LSO17.a Compare the point of view with their peers.	17	Point of view of Self and Peers	CO4
LSO18.a Identify the main ideas of the excerpt	18	Main ideas of the excerpt	CO4
LSO19.a Prepare a list of technical jargons and register specific to their program /industry.	19	Technical Jargons	CO5
LSO20.a Write the specifications of the machines/ equipment available in the workshops / labs.	20	Specifications of the machines/ equipment	CO5
LSO21.a Write a report on the projects of their respective branches.	21	Report on the Projects	CO5

L) Suggested Term Work and Self Learning: S2400104 Some sample suggested assignments, micro project and other activities are mentioned here for reference.

a. Assignments: Questions/Problems/Numerical/Exercises to be provided by the course teacher in line with the targeted COs.

1. Visit your institute's library/ web search and enlist the books, journals and magazines related to your respective branches to prepare bibliography consisting name of the authors, title of the books, publication and place of publication.
2. SWOT Analysis: Analyze yourself with respect to your strength and weaknesses, opportunities and threats with respect to your communication.
3. Conduct interview of an eminent personality and write a report on it.
4. Deliver a seminar for 10-12 minutes using PPT on the topic given.
5. Prepare your individual time-table for a week and prioritize your activities.
6. Visit any historical places/ offices / farms/ industries / development sites etc. nearby your city and prepare a report on it.

b. Micro Projects:

- a) Book review – students should read a book and then write his reviews about the book and present it in the class.
- b) Interview of any successful person in your locality in context with his life journey, inspiration social contribution, role model and keys to success.
- c) Prepare register of technical jargons of the industry related to their specific branch.
- d) Prepare a presentation on environmental issues of their locality with their solution.

c. Other Activities:

1. Arrange a Blood Donation Camp in collaboration with a blood bank and prepare a communication plan for the same.
2. Organize a cleanliness campaign in your campus premises and nearby places prepare hoardings, boards, collages, posters for the same.
3. Organize a campaign on educational awareness in the nearby places prepare advertising campaign for the same.

4. Self- learning topics:

- Collect new words from daily newspapers.
- Observe negotiation skills in the nearby shops.
- Watch educational channels for improving English communication

M) Suggested Course Evaluation Matrix: The course teacher has to decide and use appropriate assessment strategy and its weightage in theory, laboratory and Term Work for ensuring CO attainment. The response/performance of each student in each of these designed activities is to be used to calculate **CO attainment**. This matrix has been prepared considering both Part – A and Part -B.

COs (Includes in Part -A & B)	Course Evaluation Matrix					
	Theory Assessment (TA)**		Term Work Assessment (TWA)			Lab Assessment (LA)#
	Progressive Theory Assessment (PTA) Class/Mid Sem Test	End Theory Assessment (ETA)	Term Work & Self Learning Assessment			Progressive Lab Assessment (PLA)
			Assignments	Micro Projects	Other Activities*	End Laboratory Assessment (ELA)
CO-1	15%	20%	15%	20%	-	20%
CO-2	10%	15%	10%	20%	25%	10%
CO-3	20%	25%	15%	20%	25%	15%
CO-4	25%	20%	30%	20%	25%	15%
CO-5	30%	20%	30%	20%	25%	40%
Total Marks	30	70	20	20	10	20
			50			30

Legend:

*: Other Activities include self- learning, seminar, visits, surveys, product development, software development etc.

** : Mentioned under point- (N)

: Mentioned under point-(O)

Note:

- The percentage given are approximate
- In case of Micro Projects and End Laboratory Assessment (ELA), the achieved marks will be equally divided in all those COs mapped with total experiments.
- For CO attainment calculation indirect assessment tools like course exit survey need to be used which comprises of questions related to achievement of each COs.

N) Suggested Specification Table for End Semester Theory Assessment: Specification table represents the reflection of sample representation of assessment of cognitive domain of full course.

Unit Title and Number	Total Classroom Instruction (CI) Hours	Relevant COs Number (s)	Total Marks	ETA (Marks)		
				Remember (R)	Understanding (U)	Application & above (A)
(Part - A)	5	CO1, CO2	10	3	3	4
Unit-1.0 Communication Theory and Practice						
Unit- 2.0 Types of Communication	5	CO3	8	2	2	4
Unit-3.0 Reading Comprehension	8	CO4, CO5	12	3	3	6
Unit-4.0 Vocabulary and Grammar	7	CO4, CO5	10	3	3	4
Unit-5.0 Professional Writing	7	CO5	10	3	4	3
(Part-B)	2	CO1, CO2	3	1	1	1
Units-1: सम्प्रवेशन सिद्धान्त एवं व्यवहार						
Unit-2: व्यावसायिक उत्कृष्टता हेतु व्यवहार कौशल	2	CO3	3	1	1	1
Unit-3: पाठ-बोध :शब्दावली परिवर्धन, एवं व्याकरण अभ्यास	5	CO4, CO5	5	1	1	3

Unit Title and Number	Total Classroom Instruction (CI) Hours	Relevant COs Number (s)	Total Marks	ETA (Marks)		
				Remember (R)	Understanding (U)	Application & above (A)
Unit-4: शब्दावली एवं व्याकरण	4	CO5	5	1	1	3
Unit-5: लेखन कौशल	3	CO5	4	2	1	1
Total	48		70	20	20	30

Note: Similar table can also be used to design class/mid-term/ internal question paper for progressive assessment.

O) Suggested Assessment Table for Laboratory (Practical):

S. No.	Laboratory Practical Titles	Relevant COs Number (s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
1	Emotions of the Speakers.	CO1	30	60	10
2	Instructions of Audio Transcripts.	CO1	30	60	10
3	Language Puzzles.	CO1	30	60	10
4	Repetition of Words.	CO1	30	60	10
5	Summarize the Excerpts.	CO1	30	60	10
6	Listening Excerpts.	CO2	30	60	10
7	Sounds of minimal Pairs, Syllables and Words etc.	CO2	30	60	10
8	Phonetic Transcription.	CO2	30	60	10
9	Stress and Intonation.	CO2	30	60	10
10	Paralanguage Codes	CO2	30	60	10
11	Non-Verbal Codes	CO2	30	60	10
12	Verbal and Non-Verbal Presentations	CO2	30	60	10
13	Sounds of minimal pairs, syllables and words	CO2	30	60	10
14	Locate the Dictated Words	CO3	30	60	10
15	Jumbled Sentences.	CO3	30	60	10
16	Pronunciation.	CO3	30	60	10

S. No.	Laboratory Practical Titles	Relevant COs Number (s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
17	Compare the Point of view with their Peers.	CO4	30	60	10
18	Main Ideas of the Excerpt	CO4	30	60	10
19	Technical Jargons	CO5	30	60	10
20	Specifications of the machines/ equipment	CO5	30	60	10
21	Report on the Projects	CO5	30	60	10

Legend:

PRA*: Process Assessment

PDA**: Product Assessment

Note: This table can be used for both end semester as well as progressive assessment of practical. Rubrics need to be prepared by the course teacher for each experiment/practical to assess the student performance.

P) Suggested Instructional/Implementation Strategies: Different Instructional/ Implementation Strategies may be appropriately selected, as per the requirement of the content/outcome. Some of them are Improved Lecture, Tutorial, Case Method, Group Discussion, Industrial visits, Industrial Training, Field Trips, Portfolio Based, Learning, Role Play, Live Demonstrations in Classrooms, Lab, Field Information and Communications Technology (ICT)Based Teaching Learning, Blended or flipped mode, Brainstorming, Expert Session, Video Clippings, Use of Open Educational Resources (OER), MOOCs etc.

Q) List of Major Laboratory Equipment, Tools and Software:

S. No.	Name of Equipment, Tools and Software	Broad Specifications	Relevant Experiment/Practical Number
1.	High end computers	Intel® Core™ i5-9400 (6-Core, 9MB Cache, up to 4.1GHz with Intel® Turbo Boost Technology) RAM: 8GB DDR 4 HDD: 3.5" 1TB 7200RPM SATA Hard Drive OS: Windows 10 Pro 64bit OEM License Other ports: Gigabyte LAN card	1 to 21
2.	Language Lab software	Teacher console supporting audio-visual language lab	1 to 21
3.	Printer	LaserJet printer	1 to 21
4.	Head Phones with microphones	Logitech H111 wired on headphones	1 to 21
5.	Computer Furniture	Computer Desk, chair	1 to 21
6.	Smart Projector	Standard Specification	1 to 21

R) Suggested Learning Resources:

(a) Books:

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Communication Skills In English (AICTE Prescribed Text Book)	Dr. Anjana Tiwari	Khanna and Khanna, New Delhi
2.	Business Communication	Dr. Nishith Rajaram Dubey, Anupam Singh	Publisher: Indra Publishing House, 2023 ISBN- 978-93-93577-69-6
3.	Communication Skills	Sanjay Kumar & Pushap Lata	Oxford University Press, India

4.	Employability Skills	Dr. Nishith Rajaram Dubey, Anupam Singh	Indra Publishing House, 2023 ISBN - 978-93-93577-68-9
5	Technical Communication for Engineers	Shalini Verma	S. Chand
6.	English Grammar	Raymond Murphy	S. Chand
7.	British English Grammar and Composition	Dr. Ashok Kumar Singh	Student's Friends
8.	A Textbook of English Phonetics	T. Balasubramanian	Macmillan Publishers
9.	Thesaurus of English Words and Phrases	Roget	Simon and Schuster
10	Better English Pronunciation	J. D. O'Connor	Cambridge: Cambridge University Press, 1980
11	An English Grammar: Comprehending Principles and Rules	Lindley Murray.	London: Wilson and Sons, 1908.
12	Effective Communication Skills	Kulbhushan Kumar	Khanna Publishing House, New Delhi (Revised Edition 2018)
13	Examine your English	Margaret M. Maison	Orient Longman: New Delhi, 1964
14	Collin's English Dictionary	Harper Collins	Harper Collins, Glasgow
15	संप्रेषण कौशल	डॉ प्रवीण कुमार अग्रवाल , डॉ अवनीश कुमार मिश्रा	साहित्य भवन पब्लिकेशन : आगरा
16	आधुनिक हिंदी व्याकरण और रचना	डॉ वासुदेवनंदन प्रसाद	भारती भवन पब्लिकेशन

(b) Online Educational Resources:

1. https://www.academia.edu/37871134/COMMUNICATION_SKILLS_1ST_YR_2_pdf
2. [https://socialsci.libretexts.org/Courses/Butte_College/Exploring_Intercultural_Communication_\(Grothe\)/05%3A_Nonverbal_Processes_in_Intercultural_Communication/5.02%3A_Types_of_Nonverbal_Communication](https://socialsci.libretexts.org/Courses/Butte_College/Exploring_Intercultural_Communication_(Grothe)/05%3A_Nonverbal_Processes_in_Intercultural_Communication/5.02%3A_Types_of_Nonverbal_Communication)
3. <http://muhamadjaelani35.blogspot.com/2014/11/inquiry-letter-order-letter-complaint.html?m=1>
4. <https://www.slideshare.net/sundaredu/barriers-of-communication-53545680>
5. <https://allpoetry.com/where-the-mind-is-without-fear>
6. <https://www.poetryfoundation.org/poems/46561/ode-on-solitude>
7. <https://www.poetryfoundation.org/poems/44644/a-psalm-of-life>
8. <https://www.poetryfoundation.org/poems/42891/stopping-by-woods-on-a-snowy-evening>
9. <https://www.hindisamay.com/content/>
10. <http://kavitakosh.org/>
11. <https://bundelkhand.in/maithilisharan-gupt/nar-ho-na-nirash-karo-man-ko>
12. <https://etc.usf.edu/lit2go/92/up-from-slavery/1575/chapter-3-the-struggle-for-an-education/>
13. <https://oursmartstudy.com/english-chapter-1-class-12-pdf-download/>
14. [https://ve-iitg.vlabs.ac.in/Listening%20Skills\(Procedure\).html](https://ve-iitg.vlabs.ac.in/Listening%20Skills(Procedure).html)
15. <https://nptel.ac.in/courses/109104031>

Note: Teachers are requested to check the creative commons license status/ financial implications of the suggested, online educational resources before use by the students.

(b) Others:

1. <https://nptel.ac.in/courses/>

- A) **Course Code** : **2415105 (P2415105/S2415105)**
- B) **Course Title** : Engineering Drawing & Graphics
(CE, EE, ELX, ELX (R), MIE, FTS, AE, CHE, TE, CRE, EC, MEVLSI)
- C) **Pre- requisite Course(s)** : Knowledge of standard geometries
- D) **Rationale** :

With the emergence of computer-aided drafting and design (CAD) tools the traditional engineering drawing practices has undergone significant change as the emphasis has shifted from drawing board-based engineering practices to Computer aided based drafting and modeling which has the advantages of speed, modification, storage and convenience of drawing complex 2D and 3D entities. Still to develop ability of visualization, understanding of drawing standards and free hand sketching on one side and to take advantage of digital drafting tools on other, this course addresses both the aspects. The course covers the knowledge & application of drawing instruments, familiarizes the learner about Bureau of Indian standards related to engineering drawing, developing the ability to draw and read various engineering curves, projections and dimensioning styles and finally make him able to use computer aided drafting software for developing engineering drawings related to different fields.

- E) **Course Outcomes (COs):** After the completion of the course, teachers are expected to ensure the accomplishment of following course outcomes by the learners. For this, the learners are expected to perform various activities related to three learning domains (Cognitive, Psychomotor and Affective) in classroom/laboratory/workshop/field/ industry.

After completion of the course, the students will be able to-

- CO-1** Use drawing instruments, drawing codes, dimensioning, conventions and symbols as per IS SP-46(2003) in engineering drawing.
- CO-2** Draw geometrical figures, curves and engineering scales.
- CO-3** Draw the views of objects using principles of orthographic projection.
- CO-4** Draw isometric views of components directly or from orthographic projections.
- CO-5** Draw free hand sketches of engineering elements, their orthographic and isometric views.
- CO-6** Use computer aided drafting software to draw 2D and isometric geometric entities.

- F) **Suggested Course Articulation Matrix (CAM):**

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)	
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2
CO-1	3	-	-	3	2	1	-		
CO-2	3	-	-	3	-	1	-		
CO-3	3	1	1	3	-	1	2		
CO-4	3	1	1	3	-	1	2		
CO-5	3	-	1	3	-	-	2		
CO-6	3	-	1	3	2	1	3		

Note: Prefix will be added to Course Code if applicable (T for theory Paper, P for Practical Paper and S for Term work)

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional

G) Teaching & Learning Scheme:

Board of Study	Course Code	Course Title	Scheme of Study (Hours/Week)					
			Classroom Instruction (CI)		Lab Instruction (LI)	Notional Hours (TW+ SL)	Total Hours (CI+LI+TW+SL)	Total Credits (C)
			L	T				
	2415105	Engineering Drawing and Graphics	-	-	04	02	06	03

Note: Prefix will be added to Course Code if applicable (T for theory Paper, P for Practical Paper and S for Term work)

Legend:

CI: Classroom Instruction (Includes different instructional/implementation strategies i.e. Lecture (L), Tutorial (T), Case method, Demonstrations, Video demonstration, Problem based learning etc. to deliver theoretical concepts)

LI: Laboratory Instruction (Includes experiments/practical performances /problem-based experiences in laboratory, workshop, field or other locations using different instructional/Implementation strategies)

Notional Hours: Hours of engagement by learners, other than the contact hours for ensuring learning.

TW: Term Work (includes assignments, seminars, micro projects, industrial visits, any other student activities etc.)

SL: Self Learning, MOOCs, spoken tutorials, online educational resources etc.

C: Credits= (1 x CI hours) + (0.5 x LI hours) + (0.5 x Notional hours)

Note: TW and SL have to be planned by the teacher and performed by the learner under the continuous guidance and feedback of teacher to ensure outcome of learning.

H) Assessment Scheme:

Board of Study	Course Code	Course Title	Assessment Scheme (Marks)						Total Marks (TA+TWA+LA)
			Theory Assessment (TA)		Term Work& Self-Learning Assessment (TWA)		Lab Assessment (LA)		
			Progressive Theory Assessment (PTA)	End Theory Assessment (ETA)	Internal	External	Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)	
	2415105	Engineering Drawing and Graphics	-	-	20	30	20	30	100

Legend:

PTA: Progressive Theory Assessment in class room (includes class test, mid-term test and quiz using online/offline modes)

PLA: Progressive Laboratory Assessment (includes process and product assessment using rating Scales and rubrics)

TWA: Term work & Self Learning Assessment (Includes assessment related to student performance in assignments, seminars, micro projects, industrial visits, self-learning, any other student activities etc.)

Note:

- Separate passing is must for progressive and end semester assessment for both theory and practical.
- ETA & ELA are to be carried out at the end of the term/ semester.
- Term Work is to be done by the students under the guidance of internal faculty but its assessment will be done **internally (40%)** as well as **externally (60%)**. Assessment related to planning and execution of Term Work activities like assignment, micro project, seminar and self-learning is to be done by internal faculty (Internal Assessment) whereas assessment of output/product/presentation related to these activities will be carried out by external faculty/expert (External Assessment). However, criteria of internal as well as external assessment may vary as per the requirement of respective course. For valid and reliable assessment, the internal faculty should prepare checklist & rubrics for these activities.

I) **Course Curriculum Detailing:** This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (CI), Laboratory Instruction (LI), Term Work (TW) and Self Learning (SL). Students are expected to demonstrate the attainment of Theory Session Outcomes (TSOs) and Lab Session Outcomes (LSOs) leading to attainment of Course Outcomes (COs) upon the completion of the course. While curriculum detailing, NEP 2020 related reforms like Green skills, Sustainability, Multidisciplinary aspects, Society connect, Indian Knowledge System (IKS) and others must be integrated appropriately.

J) **Theory Session Outcomes (TSOs) and Units:**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
<i>TSO 1a.</i> Use Drawing Instruments to prepare 2D drawings manually. <i>TSO 1b.</i> Use different lines and annotations for a given situation. <i>TSO 1c.</i> Draw engineering scale for the given situation. <i>TSO 1d.</i> Choose appropriate scale factor for the drawing as per given situation. <i>TSO 1e.</i> Dimension the given geometric figure using IS SP-46 standard. <i>TSO 1f.</i> Draw the given regular geometric figure with tangents and normal. <i>TSO 1g.</i> Draw selected engineering curve.	Unit-1.0 Basic Elements of Drawing 1.1 Methods to use different Drawing Instruments and supporting materials. 1.2 Different lines and conventions in engineering drawing. 1.3 Engineering scales and applications: Reduced, enlarged & full size (only Plain scale) 1.4 Dimensioning techniques: types and applications of chain, parallel and coordinate dimensioning as per SP-46. 1.5 Regular Geometrical figures, Tangency constructions. 1.6 Engineering Curves: only Ellipse and Parabola using concentric circle method, rectangular method and Eccentricity method when focus and directrix are given.	CO1, CO2
<i>TSO 2a.</i> Explain the different types of projections & their uses. <i>TSO 2b.</i> Draw the orthographic projections of different objects <i>TSO 2c.</i> Convert pictorial views into orthographic views	Unit-2.0 Orthographic Projections 2.1 Concept and applications of Orthographic, Perspective, Isometric and Oblique Projections. 2.2 Orthographic Projection: First and Third angle 2.3 Draw orthographic views of simple 3D entities containing lines, circles and arcs with axis/orientation parallel and/or perpendicular to the projection planes only. Problems should be restricted up to three views Front view/Elevation, Top view/Plan and Side views only using First Angle Method only. 2.4 Conversion of simple pictorial views into orthographic views. (Domain specific illustrative problems to be given by the teacher)	CO1, CO2, CO3
<i>TSO 3a.</i> Explain the Isometric Projection, Isometric view and Isometric Scale. <i>TSO 3b.</i> Draw isometric dimensioning on the given isometric view. <i>TSO 3c.</i> Explain the Methods of constructing isometric drawing	Unit-3.0 Isometric Projection 3.1 Introduction to isometric projection. 3.2 Isometric scale and Natural Scale. 3.3 Isometric view and isometric projection. 3.4 Illustrative problems limited to Isometric	CO1, CO3, CO4

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
<i>TSO 3d.</i> Draw Isometric View of the given object containing elements like rectangular, circular, cylindrical shapes and slots on sloping and plane surfaces. <i>TSO 3e.</i> Convert the given orthographic views into isometric View/Projection.	projection of objects containing rectangular, circular, cylindrical shapes and slots on sloping and plane surfaces. 3.5 Conversion of orthographic views into isometric View/projection.	
<i>TSO 4a.</i> Sketch the given straight line, square, rectangle, circle and arc. <i>TSO 4b.</i> Sketch the given simple orthographic and isometric views of the given part. <i>TSO 4c.</i> Sketch the given domain specific engineering element/component.	Unit-4.0 Free Hand Sketches of Engineering Elements 4.1 Materials for Sketching. 4.2 General Guidelines for Freehand Sketching. 4.3 Freehand sketching of straight lines, square, rectangle, circles and arcs. 4.4 Free hand sketches of orthographic views. 4.5 Free hand sketches of isometric views. 4.6 Freehand sketching of domain specific engineering elements/components (e.g. Bolt, Nut, Washer, Stud, Screw, simple machine parts, etc. in case of mechanical, production, automobile, electrical engineering).	CO5
<i>TSO 5a.</i> Use computer aided drafting software for creating the institute Drawing Template. <i>TSO 5b.</i> Use computer aided drafting software for creating the given simple 2D entity.	Unit-5.0 Basic Computer aided Drafting 5.1 Basics of AutoCAD or any other drafting software—interface, screen layout, starting commands from menus, command line. 5.2 Coordinate system, Angular measurements, Point specification. 5.3 Drawing aids - Grid, Snap, Ortho, Osnap, Units, Limits, Layers, Linetype. 5.4 Opening and Saving drawing files. 5.5 Creating User Defined Templates. 5.6 Methods of Selecting and deleting Objects. 5.7 Undo and Redo. 5.8 Creating basic drawings objects - lines, arc, circles, ellipses, polyline and polygons.	CO1, CO2, CO6
<i>TSO 6a.</i> Use computer aided drafting software for creating orthographic views of the given object. <i>TSO 6b.</i> Use computer aided drafting software for creating isometric views of the given object. <i>TSO 6c.</i> Print the given drawing (using institute template) on A4/A3 sheet.	Unit-6.0 Advanced Computer aided Drafting 6.1 Modify commands - erase, copy, move, rotate, scale, stretch, 6.2 Array: concept and applications. 6.3 Controlling Drawing display 6.4 Text and Dimensioning 6.5 Layers: concept and application 6.6 Drawing orthographic vies using drafting software with principles mentioned in Unit 2. 6.7 Drawing isometric views using drafting software with principles mentioned in Unit 3. 6.8 Printing and plotting of drawings.	CO1, CO2, CO3, CO4, CO6

Note: One major TSO may require more than one Theory session/Period.

K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical: P2415105

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
<i>LSO 1.1.</i> Use manual drawing instruments <i>LSO 1.2.</i> Draw simple 2D entities using manually drawing instruments.	1.	Geometric Construction: • Draw set of lines with different conditions (two problems). • Draw circle and arcs with different geometric conditions and constraints (two problems). • Draw polygons by general methods (Triangle, square, pentagon, hexagon, heptagon) (Three problems).	CO1, CO2
<i>LSO 2.1.</i> Draw conic sections using manually drawing instruments. <i>LSO 2.2.</i> Use different methods of construction of ellipse and parabola.	2.	• Construct ellipse using four center method, arc of circle method and rectangle method. • Construct parabola using rectangular method, and parallelogram method.	CO2
<i>LSO 3.1.</i> Apply concepts of orthographic projection in drawing the given simple object on drawing sheet. <i>LSO 3.2.</i> Visualize the three views related to the given object based on its shape and orientation.	3.	Draw Orthographic projections of following using first angle method: • A pentagonal pyramid is placed in first quadrant with its axis parallel to H.P. and V.P • A frustum of a hexagonal is placed in first quadrant with its axis perpendicular to H.P. and parallel to V.P • Different objects having cylindrical surfaces, ribs. (three views of each object, total six problems)	CO3
<i>LSO 4.1.</i> Apply concepts of orthographic projection to draw three views of given domain specific object/component.	4.	Draw Orthographic projections of domain specific objects (three views of each object) (Two problems).	CO3
<i>LSO 5.1.</i> Use concepts of Isometric projection to draw the given simple object with slant surface.	5.	Draw Isometric view of simple objects having plain and slanting surface by using natural scale. (Three problems)	CO4
<i>LSO 6.1.</i> Visualize the 3D shape of the given object. <i>LSO 6.2.</i> Convert the given 2D figures/views into 3D object.	6.	Convert the orthographic views of an object to isometric view. (Two problems)	CO3, CO4
<i>LSO 7.1.</i> Draw free hand sketches of the given domain specific object/component	7.	Draw free hand sketches/conventional representation of your domain specific components (Six problems)	CO5
<i>LSO 8.1.</i> Draw 3D free hand sketches from the given isometric shape.	8.	Draw free hand sketch of isometric drawings (prepared in Sr. No. 05) without using any instruments.	CO5
<i>LSO 9.1.</i> Draw 3D free hand sketches of the given real object/component.	9.	Given the 3D model of an object, student will try to imagine the three views and draw them with free hand in the sketch book.	CO5
<i>LSO 10.1.</i> Use computer aided drafting software to create and modify a template. <i>LSO 10.2.</i> Insert any picture in the existing AutoCAD drawing	10.	Prepare a template for your institute of A-4 size with title block and institute logo.	CO6

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
<i>LSO 10.3.</i> Insert text in the existing AutoCAD drawing			
<i>LSO 11.1.</i> Use computer aided drafting software to create and modify simple 2D entities. <i>LSO 11.2.</i> Use computer aided drafting software to create and modify circles and arcs with different geometric conditions and constraints	11.	Computer Aided Drafting: Use the software to draw following simple 2-D entities using Draw commands individually • Draw circle and arcs with different geometric conditions and constraints (two problems). • Draw polygons (Triangle, square, pentagon, hexagon, heptagon) (Three problems).	CO6
<i>LSO 12.1.</i> Use computer aided drafting software to calculate Area, Perimeter, and Centroid of the given 2D entity	12.	Use the software to estimate Area, Perimeter, and Centroid for the given 2D entities like Circle, Pentagon, Trapezium, hexagon and 2D entity with arcs and spline curves using 'Enquiry' and 'List' commands.	CO6
<i>LSO 13.1.</i> Use computer aided drafting software to draw complex 2D entities.	13.	Use the software to draw four domain specific complex 2-D entities assigned by the teacher using Draw, Edit and Modify commands	CO6
<i>LSO 14.1.</i> Use computer aided drafting software to create and modify 2D entities. <i>LSO 14.2.</i> Use computer aided drafting software to create and modify the given orthographic views.	14.	Use the software to draw orthographic views of • A pentagonal pyramid is placed in first quadrant with its axis parallel to H.P. and V.P • A frustum of a hexagonal is placed in first quadrant with its axis perpendicular to H.P. and parallel to V.P • Different objects having cylindrical surfaces, ribs. (three views of each object, total six problems)	CO3, CO6
<i>LSO 15.1.</i> Use computer aided drafting software to create and modify the given isometric entities.	15.	Use the software to draw isometric views of three 3D objects containing lines, arcs, circles, holes, ribs and slots	Co4, CO6

L) **Suggested Term Work and Self Learning: S2415105** Some sample suggested assignments, micro project and other activities are mentioned here for reference.

a. Assignments:

1. Sketch progressive and parallel dimensioning.
2. Prepare a list of industrial and household components in which conic curves are used and justify the utility of these curves.
3. Write the equations for parabola in different quadrants and observe the effect of changing eccentricity in case of parabola.
4. Exercises on drawing orthographic views of engineering domain specific simple parts.
5. Exercise on drawing isometric views of different objects.
6. Exercises on converting the orthographic views of an object to isometric view.
7. Exercise on missing views.
8. Exercises on creating simple digital drawings, orthographic views and isometric views.
9. Each student should explain at least one problem for construction and method of drawing in sheet/computer to all batch colleagues. Teacher will assign the problem of particular sheet to be explained to each student batch.
10. Each student will assess at least one sheet of other students (May be a group of 5-6 students identified by teacher can be taken) and will note down the mistakes committed by them. Student will also guide the students for correcting the mistakes, if any.

b. Micro Projects:

1. Through experimentation, justify that the eccentricity of an ellipse is 1.
2. Cut a Cardboard/Thermocole cone with various section planes to get circle, ellipse, parabola and hyperbola.
3. Explore the applications of engineering curves in different fields of engineering and prepare a short report.
4. List the shapes and curves you are observing around you in real life with name of place and item. (For Ex. ellipse, parabola, hyperbola, cycloid, epicycloids, hypocycloid, involute, spiral helix).
5. Cut triangular, square, rectangular and circular shaped Cardboard/Thermocole pieces and observe them by placing in different positions with respect to the projection planes.
6. Take a medium sized hexagonal nut and draw its isometric projection.
7. The teacher will assign one set of orthographic projections and ask the student to develop 3D Thermocol models of the same.
8. Prepare an A4 digital drawing template of your institute with title block and institute logo.
9. Each batch will collect 5 components/circuits/items specific to their branch and draw their orthographic views using AutoCAD software.
10. Download 5 videos on shortcuts used in AutoCAD, watch them and write a report to detail out the steps involved, Commands used.

c. Other Activities:

1. Seminar Topics:
 - Standard symbol and conventions used in engineering drawings related to your branch/domain.
 - Commercially available other Computer Aided Drafting Software.
 - Compatibility of AutoCAD drawings compared to Conventional Drawing.
2. Visits: Collect production/construction/circuit drawings from nearby industries/shop/builders and observe the type of orthographic projection, symbol of projection and various views used.
3. Self-learning topics:
 - Types of lines and dimensioning in engineering drawing.
 - Different methods of drawing Arcs and Circles in AutoCAD software.

M) Suggested Course Evaluation Matrix: The course teacher has to decide and use appropriate assessment strategy and its weightage in theory, laboratory and Term Work for ensuring CO attainment. The response/performance of each student in each of these designed activities is to be used to calculate **CO attainment**.

COs	Course Evaluation Matrix						
	Theory Assessment (TA)**		Term Work Assessment (TWA)			Lab Assessment (LA)#	
	Progressive Theory Assessment (PTA) Class/Mid Sem Test	End Theory Assessment (ETA)	Term Work& Self Learning Assessment			Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)
			Assignments	Micro Projects	Other Activities*		
CO-1	-	-	05%	-	-	05%	16%
CO-2	-	-	05%	20%	20%	05%	16%
CO-3	-	-	20%	20%	20%	15%	16%
CO-4	-	-	20%	20%	20%	15%	16%
CO-5	-	-	15%	20%	20%	20%	16%
CO-6	-	-	35%	20%	20%	40%	17%
Total Marks	-	-	20	20	10	20	30
			50				

Legend:

*: Other Activities include self- learning, seminar, visits, surveys, product development, software development etc.

**.: Mentioned under point- (N)

#: Mentioned under point-(O)

Note:

- The percentage given are approximate
- In case of Micro Projects and End Laboratory Assessment (ELA), the achieved marks will be equally divided in all those COs mapped with total experiments.
- For CO attainment calculation indirect assessment tools like course exit survey need to be used which comprises of questions related to achievement of each COs.

N) Suggested Specification Table for End Semester Theory Assessment: (Not Applicable)**O) Suggested Assessment Table for Laboratory (Practical):**

S. No.	Laboratory Practical Titles	Relevant COs Number(s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
1.	Geometric Construction: • Draw set of lines with different conditions (two problems). • Draw circle and arcs with different geometric conditions and constraints (two problems). • Draw polygons by general methods (Triangle, square, pentagon, hexagon, heptagon) (Three problems).	CO1, CO2	30	60	10
2.	• Construct ellipse using four center method, arc of circle method and rectangle method • Construct parabola using rectangular method, and parallelogram method	CO2	30	60	10
3.	Draw Orthographic projections of following using first angle method: • A pentagonal pyramid is placed in first quadrant with its axis parallel to H.P. and V.P • A frustum of a hexagonal is placed in third quadrant with its axis parallel to H.P. and V.P • Different objects having cylindrical surfaces, ribs. (three views of each object, total six problems)	CO3	30	60	10
4.	Draw Orthographic projections of domain specific objects (three views of each object) (Two problems).	CO3	30	60	10
5.	Draw Isometric view of simple objects having plain and slanting surface by using natural scale. (Three problems)	CO4	30	60	10
6.	Convert the orthographic views of an object to isometric view (Two problems)	CO3, CO4	30	60	10
7.	Draw free hand sketches/conventional representation of your domain specific components (Six problems)	CO5	30	60	10
8.	Draw free hand sketch of all above isometric drawings (prepared in Sr. No. 06) without using any instruments.	CO5	30	60	10
9.	Given the 3D model of an object, student will try to imagine the three views and draw them with free hand in the sketch book.	CO5	40	50	10
10.	Prepare a template for your institute of A-4 size with title block and institute logo.	CO6	40	50	10
11.	Computer Aided Drafting: Use the software to draw following simple 2-D entities using Draw commands individually • Draw circle and arcs with different geometric conditions and constraints (two problems). • Draw polygons (Triangle, square, pentagon, hexagon, heptagon) (Three problems).	CO6	40	50	10
12.	Use the software to estimate Area, Perimeter, and Centroid for the given 2D entities like Circle, Pentagon, Trapezium, hexagon	CO6	40	50	10

S. No.	Laboratory Practical Titles	Relevant COs Number(s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
	and 2D entity with arcs and spline curves using 'Enquiry' and 'List' commands.				
13.	Use the software to draw four domain specific complex 2-D entities assigned by the teacher using Draw, Edit and Modify commands	CO6	40	50	10
14.	Use the software to draw orthographic views of - A pentagonal pyramid is placed in first quadrant with its axis parallel to H.P. and V.P - A frustum of a hexagonal is placed in first quadrant with its axis perpendicular to H.P. and parallel to V.P - Different objects having cylindrical surfaces, ribs. (three views of each object, total six problems)	CO3, CO6	40	50	10
15.	Use the software to draw isometric views of three 3D objects containing lines, arcs, circles, holes, ribs and slots	CO4, CO6	40	50	10

Legend:

PRA*: Process Assessment

PDA**: Product Assessment

Note: This table can be used for both end semester as well as progressive assessment of practical. Rubrics need to be prepared by the course teacher for each experiment/practical to assess the student performance.

P) Suggested Instructional/Implementation Strategies: Different Instructional/ Implementation Strategies may be appropriately selected, as per the requirement of the content/outcome. Some of them are Improved Lecture, Tutorial, Case Method, Group Discussion, Industrial visits, Industrial Training, Field Trips, Portfolio Based, Learning, Role Play, Live Demonstrations in Classrooms, Lab, Field Information and Communications Technology (ICT)Based Teaching Learning, Blended or flipped mode, Brainstorming, Expert Session, Video Clippings, Use of Open Educational Resources (OER), MOOCs etc.

Q) List of Major Laboratory Equipment, Tools and Software:

S. No.	Name of Equipment, Tools and Software	Broad Specifications	Relevant Experiment/Practical Number
1.	Drawing Table with Drawing Board	Drawing Table with Drawing Board of Full Imperial/ A1 size.	1 to 9
2.	Models and Charts	Normal and cut sectioned Models and Charts of objects for orthographic / isometric projections	1 to 9
3.	Drawing equipments and instruments	Drawing equipments and instruments for class room teaching-large size: - T-square or drafter (Drafting Machine). - Set squares (450 and 300-600) - Protector. - Drawing instrument box (containing set of compasses and dividers). - Drawing sheets, Drawing pencils, Eraser. - Drawing pins / clips	1 to 9
4.	Sample production/construction drawings	From nearby industries, construction companies and developed by senior teachers of the state	All
5.	Interactive board (165 x 130 cm)	Supports dual touch, dual write and intuitive gestures, such as toss, rotate and zoom with multitouch operating systems, such	All

S. No.	Name of Equipment, Tools and Software	Broad Specifications	Relevant Experiment/Practical Number
		as Windows®	
6.	Computer aided drafting software like AutoCAD	Latest educational licensed network version	9 to 15
7.	CAD workstations	latest configuration Processor Intel Core i7 with Open GL Graphics Card, RAM 32 GB, DDR3/DDR4, HDD 500 GB, Graphics Card NVIDIA OpenGL 4 GB, OS Windows 10	9 to 15
8.	Printer/plotter	A3 size	9 to 15

R) Suggested Learning Resources:

(a) Books:

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Engineering Drawing	N.D. Bhatt	Charotar Publishing House, Anand, Gujrat 2010; ISBN: 978-93- 80358-17-8.
2.	Engineering Drawing	R.K. Dhawan	S. Chand and Company, New Delhi; ISBN: 81-219-1431-0.
3.	Engineering Drawing	P.J. Shah	S. Chand & Company, New Delhi, 2008, ISBN:81-219-2964-4.
4.	Engineering Graphics with AutoCAD	A.K. Sarkar, A.P. Rastogi, D.M. Kulkarni	PHI Learning Private Limited-New Delhi (2010); ISBN: 978-8120337831.
5.	Engineering Drawing and Graphics using AutoCAD	T. Jeyapoovan	Vikas Publishing House Pvt. Ltd, Noida, 2011; ISBN: 978-8125953005.
6.	Engineering Graphics	S. K. Pradhan K.K. Jain	Khanna Book Publishing Company Pvt. Ltd., New Delhi ASIN : B0BM5BMMXT ISBN-10 : 9355381891 ISBN-13 : 978-9355381897

(b) Online Educational Resources:

1. Scales: <https://youtu.be/YSEzu3Ch26k>
2. Dimensioning: https://youtu.be/_OSY04TnIEM
3. Simple Orthographic Projections: <https://youtu.be/DW7dpKdxVrA>
4. Orthographic Projections of objects with slant and curved surfaces: <https://youtu.be/dCWjBvZBpjM>
5. Illustrative Example: <https://youtu.be/MR5de9EC940>
6. Illustrative Example: <https://youtu.be/mahh-WONNHA>
7. Isometric Projection of 3D objects: <https://youtu.be/OK-5URiyi50>
8. Isometric Projection-Object with slant surfaces: <https://youtu.be/qSPJOiXKv98>
9. Isometric Projection-Object with curved surfaces: <https://youtu.be/qSPJOiXKv98>
10. Missing lines and missing views: <https://nptel.ac.in/courses/105/104/105104148/>
11. Launching AutoCAD and Opening drawing: <https://youtu.be/aoo-t0-gEfw>
12. AutoCAD Main Screen: <https://youtu.be/D0YyEiCjwpk>
13. Draw and Modify Toolbars: https://youtu.be/T_RN_RBfK7o
14. Illustrative Example-1: https://youtu.be/_Bheo9MzeVk

- | | |
|---------------------------------------|---|
| 15. Block creation: | https://youtu.be/ZguZZVjxaeK |
| 16. Rectangular and Polar array : | https://youtu.be/YgYZgbrUJ_M |
| 17. Illustrative Example-2: Array: | https://youtu.be/yJf_IsWX4gM |
| 18. Dimensioning: | https://youtu.be/sEiRsi14u0U |
| 19. Use of layers: | https://youtu.be/fdQqNdDtOI8 |
| 20. Illustrative Example 3: Flywheel: | https://youtu.be/AU-Vsd2T0DA |

Note: Teachers are requested to check the creative commons license status/ financial implications of the suggested, online educational resources before use by the students.

(c) Others:

1. Bureau of Indian Standards, Engineering Drawing Practice for Schools and Colleges IS: SP-46, BIS, Government of India, Third Reprint, October 1998; ISBN: 81-7061-091-2.
2. AutoCAD e manual

- A) **Course Code** : **2418107 (P2418107/S2418107)**
- B) **Course Title** : **ICT Tools**
(CE, ME, ME (Auto), FTS, CSE, AIML, MIE, CRE, CHE, FPP, TE, CACDDM, GT, AI)
- C) **Pre-requisite Course(s)** :
- D) **Rationale** :

Besides working in technical environment in their profession, diploma pass outs may also get involved in routine office task related to creating business documents, perform data analysis and its graphical representations, making presentations. In order to carry-out these works, the students need to learn various desk-top based and internet-based software tools such as- office automation applications like word processing, spreadsheets and presentation tools. They also need to use these tools for making their project reports and presentations during their graduation Programme. The objective of this course is to develop the basic competency in students for using these office automation tools to accomplish the job.

- E) **Course Outcomes (Cos):** After the completion of the course, teachers are expected to ensure the accomplishment of following course outcomes by the learners. For this, the learners are expected to perform various activities related to three learning domains (Cognitive, Psychomotor and Affective) in classroom/ laboratory/ workshop/ field/ industry.

After completion of the course, the students will be able to-

- CO-1** Prepare business document using word processing tool.
- CO-2** Manipulate data and represent it graphically using spreadsheet.
- CO-3** Prepare professional slide-based presentations.
- CO-4** Work effectively with Internet and basic web services

- F) **Suggested Course Articulation Matrix (CAM):**

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)	
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2
CO-1	1	2	2	2	-	2	-		
CO-2	2	2	2	2	-	1	-		
CO-3	1	2	2	2	-	-	-		
CO-4	1	2	2	2	3	1	2		

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional

- G) **Teaching and Learning Scheme:**

Board of Study	Course Code	Course Title	Scheme of Study (Hours/Week)					
			Classroom Instruction (CI)		Lab Instruction (LI)	Notional Hours (TW+ SL)	Total Hours (CI+LI+TW+SL)	Total Credits (C)
			L	T				
Artificial Intelligence and Machine Learning	2418107	ICT Tools	-	-	04	02	06	03

Note: Prefix will be added to Course Code if applicable (T for theory Paper, P for Practical Paper and S for Term work)

Legend:

- CI: Classroom Instruction (Includes different instructional/implementation strategies i.e. Lecture (L), Tutorial (T), Case method, Demonstrations, Video demonstration, Problem based learning etc. to deliver theoretical concepts)
- LI: Laboratory Instruction (Includes experiments/practical performances /problem-based experiences in laboratory, workshop, field or other locations using different instructional/Implementation strategies)
- Notional Hours: Hours of engagement by learners, other than the contact hours for ensuring learning.
- TW: Term Work (includes assignments, seminars, micro projects, industrial visits, any other student activities etc.)
- SL: Self Learning, MOOCs, spoken tutorials, online educational resources etc.
- C: Credits = (1 x CI hours) + (0.5 x LI hours) + (0.5 x Notional hours)
- Note:** TW and SL have to be planned by the teacher and performed by the learner under the continuous guidance and feedback of teacher to ensure outcome of learning.

H) Assessment Scheme:

Board of Study	Course Code	Course Title	Assessment Scheme (Marks)						Total Marks (TA+TWA+LA)
			Theory Assessment (TA)		Term Work & Self Learning Assessment (TWA)		Lab Assessment (LA)		
			Progressive Theory Assessment (PTA)	End Theory Assessment (ETA)	Internal	External	Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)	
Artificial Intelligence and Machine Learning		ICT Tools	-	-	20	30	20	30	100

Note: Prefix will be added to Course Code if applicable (T for theory Paper, P for Practical Paper and S for Term work)

Legend:

- PTA: Progressive Theory Assessment in class room (includes class test, mid-term test and quiz using online/offline modes)
- PLA: Progressive Laboratory Assessment (includes process and product assessment using rating Scales and rubrics)
- TWA: Term work & Self Learning Assessment (Includes assessment related to student performance in assignments, seminars, micro projects, industrial visits, self-learning, any other student activities etc.)

Note:

- Separate passing is must for progressive and end semester assessment for both theory and practical.
- ETA & ELA are to be carried out at the end of the term/ semester.
- Term Work is to be done by the students under the guidance of internal faculty but its assessment will be done **internally (40%)** as well as **externally (60%)**. Assessment related to planning and execution of Term Work activities like assignment, micro project, seminar and self-learning is to be done by internal faculty (Internal Assessment) whereas assessment of output/product/ presentation related to these activities will be carried out by external faculty/expert (External Assessment). However, criteria of internal as well as external assessment may vary as per the requirement of respective course. For valid and reliable assessment, the internal faculty should prepare checklist & rubrics for these activities.

- I) Course Curriculum Detailing:** This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (CI), Laboratory Instruction (LI), Term Work (TW) and Self Learning (SL). Students are expected to demonstrate the attainment of Theory Session Outcomes (TSOs) and Lab Session Outcomes (LSOs) leading to attainment of Course Outcomes (COs) upon the completion of the course. While curriculum detailing, NEP 2020 related reforms like Green skills, Sustainability, Multidisciplinary aspects, Society connect, Indian Knowledge System (IKS) and others must be integrated appropriately.

J) Theory Session Outcomes (TSOs) and Units:

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
–	Unit-1.0 Word Processing 1.0 Word Processing: Overview of Word processor Basics of Font type, size, colour, Effects like Bold, italic, underline, Subscript and superscript, Case changing options, previewing a document, saving a document, closing a document and exiting application. 1.1 Editing a Document: Navigate through a document, Scroll through text, Insert and delete text, Select text, Undo and redo commands, Use drag and drop to move text, Copy, cut and paste, Use the clipboard, Clear formatting, Format and align text, Formatting Paragraphs, Line and paragraph spacing, using FIND and REPLACE, Setting line spacing, add bullet and numbers in lists, add borders and shading, document views, Page settings and margins, Spelling and Grammatical checks 1.2 Changing the Layout of a Document: Adjust page margins, change page orientation, Create headers and footers, Set and change indentations, Insert and clear tabs. 1.3 Inserting Elements to Word Documents: Insert and delete a page break, Insert page numbers, Insert the date and time, Insert special characters (symbols), Insert a picture from a file, Resize and reposition a picture 1.4 Working with Tables: Insert a table, Convert a table to text, Navigate and select text in a table, Resize table cells, Align text in a table, Format a table, Insert and delete columns and rows, Borders and shading, Repeat table headings on subsequent pages, Merge and split cells. 1.5 Working with Columned Layouts and Section Breaks: a Columns, Section breaks, Creating columns, Newsletter style columns, Changing part of a document layout or formatting, Remove section break, Add columns to remainder of a document, Column widths, Adjust column spacing, Insert manual column breaks.	CO-1
–	Unit-2.0 Spreadsheets 2.1 Working with Spreadsheets: Overview of workbook and worksheet, Create Worksheet Entering data, Save, Copy Worksheet, Delete Worksheet, Close and open Workbook. 2.2 Editing Worksheet: Insert data, adjust row height and column width, delete, move data, insert new rows and columns, Copy and Paste content, Find and Replace, Spell Check, sheet view Zoom In-Out, insert Special Symbols, Insert Comments, Add Text Box, Undo-redo Changes, - Freeze Panes, hiding/unhiding rows and columns. 2.3 Formatting Cells and sheet: Setting Cell Type, Setting Fonts, Text options, Rotate Cells, Setting Colors, Text Alignments, Merge and Wrap, apply Borders and Shades, Sheet Options, Adjust Margins, Page Orientation, insert Header and Footer, Insert Page Breaks, Set Background.	CO-2

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
	2.4 Working with Formula: Creating Formula, absolute and relative cell references, Copying and pasting Formula, Common spreadsheet Functions such as sum, average, min, max, date, In, And, or, mathematical functions such as sqrt, power, statistical functions, applying conditions using IF. 2.5 Working with Charts: Introduction to charts, overview of different types of charts, Bar, Pie, Line charts, creating and editing charts. Using different chart options: chart title, axis title, legend, data labels, Axes, grid lines, moving chart in a separate sheet. 2.6 Advanced Operations: Applying Conditional Formatting, Data Filtering, Data Sorting, Using Ranges, Data Validation, Adding Graphics, Printing Worksheets, print area, margins, header, footer and other page setup options.	
—	Unit-3.0 Presentation Tool 3.1 Creating a Presentation: Outline of an effective presentation, Identify the elements of the User Interface, Starting a New Presentation Files, Creating a Basic Presentation, Working with textboxes, Apply Character Formats, Format Paragraphs, View a Presentation, Saving work, creating new Slides, Changing a slide Layout, Applying a theme, Changing Colours, fonts and effects, apply custom Colour and font theme, changing the background, Arrange Slide sequence, 3.2 Inserting Media elements: Adding and Modifying Graphical Objects to a Presentation - Insert Images into a Presentation, insert audio clips, video/animation, Add Shapes, Add Visual Styles to Text in a Presentation, Edit Graphical Objects on a Slide, Format Graphical Objects on a Slide, Group Graphical Objects on a Slide, Apply an Animation Effect to a Graphical Object, Add Transitions, Add Speaker Notes, Print a Presentation. 3.3 Working with Tables: Insert a Table in a Slide, Format Tables, and Import Tables from Other Office Applications. 3.4 Working with Charts: Insert Charts in a Slide, modify a Chart, Import Charts from Other Office Applications.	CO-3
—	Unit-4.0 Basics of Internet 4.1 World Wide Web: Introduction, Internet, Intranet, URL, web servers, basic settings of web browsers- history, extension, default page, default search engine, privacy and security, creating and retrieving bookmarks, use search engines effectively for searching the content. 4.2 Web Services: Cloud- software as service (SAS), Google docs, slides, sheets, Form, Web Sites, web pages, e-Mail, Chat, Video Conferencing, e-learning, e-shopping, e-Reservation, e-Groups, Social Networking	CO-4

Note: One major TSO may require more than one Theory session/Period.

K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical: P2418107

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant Cos Number(s)
LSO 1.1. Perform fundamental word processing operations to create a document	1.	a) Create, edit and save document: apply formatting features on the text – line, paragraph b) Use bullets, numbering, page formatting, header, footer, margin, layout	CO-1
LSO 2.1. Work with images/shapes in a document	2.	Insert and edit images and shapes, resizing, cropping, colour, background, group/ungroup	CO-1
LSO 3.1. Organize data in tabular form in a document	3.	Insert table and apply various table formatting features on it.	CO-1
LSO 4.1. Perform Document proofing operations in a document	4.	Review features such as Spelling, grammar, Thesaurus, translate, language, word count, comments	CO-1
LSO 5.1. Organize and print Document	5.	Apply page layout features i. Print layout, web layout, show ruler, gridline, page zoom, split ii. Themes, page background, paragraph, page setup iii. Create multicolumn page iv. Use different options to print the documents	CO-1
LSO 6.1. Create batch of documents with tailored variable information using mail merge	6.	Use mail merge operation with options.	CO-1
Spreadsheets			
LSO 7.1. Create a worksheet LSO 7.2. Format sheet/cell	7.	Create, open and edit worksheet i. Enter data and format it, adjust row height and column width ii. Insert and delete cells, rows and columns. iii. Apply Format cell, wrap text, number format, orientation feature on cell.	CO-2
LSO 8.1. Perform fundamental calculation operations in a worksheet	8.	Insert formulas, absolute and relative cell reference, "IF" conditions, built-in functions and named ranges in worksheet.	CO-2
LSO 9.1. Filter the given data set LSO 9.2. Validate data based on criteria LSO 9.3. Sort the data in given order	9.	Apply conditional formatting, data Sorting, Data Filter and Data Validation features.	CO-2
LSO 10.1. Create various types of charts to represent data in graphical form	10.	Create different charts, apply various chart options.	CO-2
LSO 11.1. Print worksheet as per given layout	11.	Apply Page setup and print options on worksheet to print the worksheet.	CO-2
Presentation Tools			
LSO 12.1. Create electronic slide show containing text, image, shape, table, charts objects	12.	Create slide presentation i. Apply design themes to the given presentation ii. Add new slides and insert text, pictures/images, shapes iii. Add tables and charts in the slides	CO-3

LSO 13.1. Run slide presentation in different modes	13.	i. Run slide presentation in customize form/modes	CO-3
LSO 13.2. Print slide presentation		ii. Print slide presentation as sheet, handouts using various print options	
LSO 16.1. Apply given animation effects to the text and slides.	14.	Apply different animation effects to the text and slides with given options.	CO-3
LSO 15.1. Add audio and video files in the presentation	15.	Add some sample audio and video files in the presentation and format the same with various options available.	CO-3
Internet Basics			
LSO 16.1. Configure internet and browser setting	16.	a) Configure Internet connection b) Configure browser settings and use browsers	CO-4
LSO 17.1. Use different internet services	17.	a) Use internet for different web services, such as, chat, email, video conferencing, etc.	CO-4
LSO 18.1. Work with Google Doc	18.	Work with Google Doc for creating collaborative documents on cloud	CO-4
LSO 19.1. Work with google sheet	19.	Work with google sheet for creating collaborative spreadsheets on cloud	CO-4
LSO 20.1. Work with google slides	20.	Work with google slides for creating collaborative slide presentation on cloud	CO-4
LSO 21.1. Create google form	21.	a) Create google form for a sample survey b) Through google forms collect user's response, download it in csv format, analyze it and represent data/trend through graphs and present it.	CO-4, CO3

L) **Suggested Term Work and Self Learning: S2418107** Some sample suggested assignments, micro project and other activities are mentioned here for reference.

a. **Assignments:** Questions/Problems/Numerical/Exercises to be provided by the course teacher in line with the targeted COs.

b. **Micro Projects:**

- I. **Word documents:** prepare documents such as Time Table, Application, Notes, Reports. (Subject teacher shall assign a document to be prepared by each student)
- II. **Slide Presentations:** Prepare slides with all Presentation features such as: content presentation, presentation about department, presentation of reports. (Subject teacher shall assign a presentation to be prepared by each student).
- III. **Spreadsheets:** Prepare statements such as Pay bills, tax statement, student's assessment record using spreadsheet- perform statistical analysis, sorting and filtering operations, represent data through various types of charts. (Teacher shall assign a spreadsheet to be prepared by each student).

c. **Other Activities: ---**

- M) Suggested Course Evaluation Matrix:** The course teacher has to decide and use appropriate assessment strategy and its weightage in theory, laboratory and sessional work for ensuring CO attainment. The response/performance of each student in each of these designed activities is to be used to calculate **CO attainment**.

COs	Course Evaluation Matrix						
	Theory Assessment (TA)**		Term Work Assessment (TWA)			Lab Assessment (LA)#	
	Progressive Theory Assessment (PTA) Class/Mid Sem Test	End Theory Assessment (ETA)	Term Work & Self Learning Assessment			Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)
			Assignments	Micro Projects	Other Activities*		
CO-1	-	-	15%	-	-	20%	20%
CO-2	-	-	10%	25%	-	10%	20%
CO-3	-	-	15%	25%	33%	15%	20%
CO-4	-	-	30%	25%	33%	15%	20%
CO-5	-	-	30%	25%	34%	40%	20%
Total Marks	-	-	20	20	10	20	30
			50				

Legend:

*: Other Activities include self- learning, seminar, visits, surveys, product development, software development etc.

**: Mentioned under point- (N)

#: Mentioned under point-(O)

Note:

- The percentage given are approximate
- In case of Micro Projects and End Laboratory Assessment (ELA), the achieved marks will be equally divided in all those COs mapped with total experiments.
- For CO attainment calculation indirect assessment tools like course exit survey need to be used which comprises of questions related to achievement of each COs.

- N) Suggested Specification Table for End Semester Theory Assessment: (Not Applicable)**

- O) Suggested Assessment Table for Laboratory (Practical):**

S. No.	Laboratory Practical Titles	Relevant COs Number(s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
1.	a) Create, edit and save document: apply formatting features on the text - line, paragraph b) Use bullets, numbering, page formatting, header, footer, margin, layout	CO-1	60	30	10
2.	Insert and edit images and shapes, resizing, cropping, colour, background, group/ungroup	CO-1	60	30	10
3.	Insert table and apply various table formatting features on it.	CO-1	60	30	10
4.	Review features such as Spelling, grammar, Thesaurus, translate, language, word count, comments	CO-1	70	20	10
5.	Apply page layout features i. Print layout, web layout, show ruler, gridline, page zoom, split ii. Themes, page background, paragraph, page setup iii. Create multicolumn page iv. Use different options to print the documents	CO-1	60	30	10

S. No.	Laboratory Practical Titles	Relevant COs Number(s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
6.	Use mail merge operation with options.	CO-1	60	30	10
7.	Create, open and edit worksheet i. Enter data and format it, adjust row height and column width ii. Insert and delete cells, rows and columns. iii. Apply Format cell, wrap text, number format, orientation feature on cell.	CO-2	60	30	10
8.	Insert formulas, absolute and relative cell reference, "IF" conditions, built-in functions and named ranges in worksheet.	CO-2	60	30	10
9.	Apply conditional formatting, data Sorting, Data Filter and Data Validation features.	CO-2	60	30	10
10.	Create different charts, apply various chart options.	CO-2	30	60	10
11.	Apply Page setup and print options on worksheet to print the worksheet.	CO-2	30	60	10
12.	Create slide presentation i. Apply design themes to the given presentation ii. Add new slides and insert text, pictures/images, shapes iii. Add tables and charts in the slides	CO-3	40	50	10
13.	i. Run slide presentation in customize form/modes ii. Print slide presentation as sheet, handouts using various print options	CO-3	30	60	10
14.	Apply different animation effects to the text and slides with given options.	CO-3	60	30	10
15.	Add some sample audio and video files in the presentation and format the same with various options available.	CO-3	60	30	10
16.	a) Configure Internet connection b) Configure browser settings and use browsers	CO-4	70	20	10
17.	Use internet for different web services, such as, chat, email, video conferencing, etc.	CO-4	70	20	10
18.	Work with Google Doc for creating collaborative documents on cloud	CO-4	60	30	10
19.	Work with google sheet for creating collaborative spreadsheets on cloud	CO-4	60	30	10
20.	Work with google slides for creating collaborative slide presentation on cloud	CO-4	60	30	10
21.	i. Create google form for a sample survey ii. Through google forms collect user's response, analyze it and represent data/trend through graphs and present it.	CO-4, CO-3	60	30	10

Legend:

PRA*: Process Assessment

PDA**: Product Assessment

Note: This table can be used for both end semester as well as progressive assessment of practical. Rubrics need to be prepared by the course teacher for each experiment/practical to assess the student performance.

- P) Suggested Instructional/Implementation Strategies:** Different Instructional/ Implementation Strategies may be appropriately selected, as per the requirement of the content/outcome. Some of them are Improved Lecture, Tutorial, Case Method, Group Discussion, Industrial visits, Industrial Training, Portfolio Based Learning, Role Play, Live Demonstrations in Classrooms, Lab, Field, Information and Communications Technology (ICT) Based Teaching Learning, Blended or flipped mode, Brainstorming, Expert Sessions, Video Clippings, Use of Open Educational Resources (OER), MOOCs etc.

Q) List of Major Laboratory Equipment, Tools and Software:

S. No.	Name of Equipment, Tools and Software	Broad Specifications	Relevant Experiment/Practical Number
1.	Computer system with internet connection	(Any computer system with basic configuration)	All
2.	Office application	Such as- Microsoft Office 365/ Microsoft Office 2019 or latest	All

R) Suggested Learning Resources:

(a) Books:

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Microsoft Office 2019 For Dummies Paperback – 1 January 2018	Wallace Wang	Wiley (1 January 2018), ISBN-10: 8126578556 ISBN-13: 978-8126578559
2.	Office 2019 In Easy Steps	Michael Price	BPB Publications; First edition (1 January 2019) ISBN-10: 938851114X ISBN-13: 978-9388511148
3.	MS OFFICE 2016 ADVANCED LEVEL Basic Computer Concept In Hindi A Complete Book For MS OFFICE 2016 IN Hindi Language	Rakesh Sangwan	ASCENT PRIME PUBLICATION; 2022nd edition (1 January 2021)

(b) Online Educational Resources:

1. Gain essential skills in Office 2019 and 365: (<https://edu.gcfglobal.org/en/topics/office/>)
2. Microsoft 365 basics video training: (<https://support.microsoft.com/en-us/office/microsoft-365-basics-video-training-396b8d9e-e118-42d0-8a0d-87d1f2f055fb>)

Note: Teachers are requested to check the creative commons license status/ financial implications of the suggested, online educational resources before use by the students.

- A) **Course Code** : **2400008 (P2400008/S2400008)**
 B) **Course Title** : Sports, Yoga and Meditation (Common for all Programmes)
 C) **Pre-requisite Course(s)** :
 D) **Rationale**

Sports or Physical Education, Yoga and Meditation is an integral part of a person's overall well-being and is imperative for a healthy mind and body balance. So, it is necessary that every educational institutes should lay ample emphasis on including sports, yoga and meditation as a necessary part of education, however, it depends on how it is introduced in the curriculum makes all the difference. Sports, Yoga and Meditation plays a very important role in overall Well-being for a good personality, develops value system, sense of friendliness, feeling of togetherness thereby developing team spirit and mutual cooperation. Its also plays a major role in reducing level of stress/anxiety and add to the mental toughness. Looking to the ample benefits there is need to inculcate sports, Yoga and meditation as a day to day habit and imparting education related to physical education is more critical than ever before.

- E) **Course Outcomes (COs):** After the completion of the course, teachers are expected to ensure the accomplishment of following course outcomes by the learners. For this, the learners are expected to perform various activities related to three learning domains (Cognitive, Psychomotor and Affective) in classroom/ laboratory/ workshop/ field/ industry.

After completion of the course, the students will be able to-

CO-1 Select appropriate physical activities to maintain healthy lifestyle.

CO-2 Apply basic principles and practices of Yoga and meditation for overall growth & development.

CO-3 Use fitness and wellness techniques for optimal health and wellbeing

- F) **Suggested Course Articulation Matrix (CAM):**

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)	
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2
CO-1	3	3	3	-	1	-	2		
CO-2	3	3	3	-	1	-	2		
CO-3	3	3	3	-	1	-	2		

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional

- G) **Teaching & Learning Scheme:**

Board of Study	Course Code	Course Title	Scheme of Study (Hours/Week)					
			Classroom Instruction (CI)		Lab Instruction (LI)	Notional Hours (TW+ SL)	Total Hours (CI+LI+TW+SL)	Total Credits (C)
			L	T				
	2400008	Sports, Yoga and Meditation	-	-	01	01	02	01

Note: Prefix will be added to Course Code if applicable (T for theory Paper, P for Practical Paper and S for Term work)

Legend:

CI: Classroom Instruction (Includes different instructional/implementation strategies i.e. Lecture (L), Tutorial (T), Case method, Demonstrations, Video demonstration, Problem based learning etc. to deliver theoretical concepts)

LI: Laboratory Instruction (Includes experiments/practical performances /problem-based experiences in laboratory, workshop, field or other locations using different instructional/Implementation strategies)

Notional Hours: Hours of engagement by learners, other than the contact hours for ensuring learning.

TW: Term Work (includes assignments, seminars, micro projects, industrial visits, any other student activities etc.)

SL: Self Learning, MOOCs, spoken tutorials, online educational resources etc.

C: Credits = (1 x CI hours) + (0.5 x LI hours) + (0.5 x Notional hours)

Note: TW and SL have to be planned by the teacher and performed by the learner under the continuous guidance and feedback of teacher to ensure outcome of learning.

H) Assessment Scheme:

Board of Study	Course Code	Course Title	Assessment Scheme (Marks)						Total Marks (TA+TWA+LA)
			Theory Assessment (TA)		Term Work & Self-Learning Assessment (TWA)		Lab Assessment (LA)		
			Progressive Theory Assessment (PTA)	End Theory Assessment (ETA)	Internal	External	Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)	
	2400008	Sports, Yoga and Meditation	-	-	10	-	06	09	25

Note: Prefix will be added to Course Code if applicable (T for theory Paper, P for Practical Paper and S for Term work)

Legend:

PTA: Progressive Theory Assessment in class room (includes class test, mid-term test and quiz using online/offline modes)

PLA: Progressive Laboratory Assessment (includes process and product assessment using rating Scales and rubrics)

TWA: Term work & Self Learning Assessment (Includes assessment related to student performance in assignments, seminars, micro projects, industrial visits, self-learning, any other student activities etc.)

Note:

- Separate passing is must for progressive and end semester assessment for both theory and practical.
- ETA & ELA are to be carried out at the end of the term/ semester.
- Term Work is to be done by the students under the guidance of internal faculty but its assessment will be done **internally (40%)** as well as **externally (60%)**. Assessment related to planning and execution of Term Work activities like assignment, micro project, seminar and self-learning is to be done by internal faculty (Internal Assessment) whereas assessment of output/product/presentation related to these activities will be carried out by external faculty/expert (External Assessment). However, criteria of internal as well as external assessment may vary as per the requirement of respective course. For valid and reliable assessment, the internal faculty should prepare checklist & rubrics for these activities.

- I) Course Curriculum Detailing:** This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (CI), Laboratory Instruction (LI), Term Work (TW) and Self Learning (SL). Students are expected to demonstrate the attainment of Theory Session Outcomes (TSOs) and Lab Session Outcomes (LSOs) leading to attainment of Course Outcomes (COs) upon the completion of the course. While curriculum detailing, NEP 2020 related reforms like Green skills, Sustainability, Multidisciplinary aspects, Society connect, Indian Knowledge System (IKS) and others must be integrated appropriately.

J) Theory Session Outcomes (TSOs) and Units:

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
<i>TSO.1a</i> Differentiate between given terms used in sports <i>TSO.1b</i> Discuss the different aspects of Mental Toughness <i>TSO.1c</i> Use Imagery Training for sports <i>TSO.1d</i> Apply motivation techniques to motivate students in sports. <i>TSO.1e</i> Use concentration techniques for playing and exercising. <i>TSO.1f</i> Manage Stress, Anxiety and Arousal during sports. <i>TSO.1g</i> Select sports and exercise for healing and developing health and mental wellness <i>TSO.1h</i> Discuss the impact of parents' involvement in their children's sports activities <i>TSO.1i</i> Select sports and exercises for physically challenged as per their need.	Unit-1.0 Sports and Exercises 1.1 Definition of play, game, sports, exercise, psychology, sports psychology and exercise psychology, psychology and common sense. 1.2 Mental toughness- mind, Imagery, use of imagery and imagery in sports, types of imagery (visual, kinesthetic, auditory and olfactory) 1.3 Motivation in sport and goalsetting in sports 1.4 Arousal regulation – self-awareness of regulation, anxiety reduction techniques- somatic anxiety reduction techniques, cognitive Anxiety reduction, multimodal anxiety reduction, coping with stress. Arousal - inducing techniques. Arousal and anxiety measurement factors, Arousal and anxiety signs recognition 1.5 Nutrition and rehabilitation, Importance of concentration and attentional focus in sports and training, Impact of health on healing from physical athletic injuries. Impact of exercise to increase mental wellness, Role of coach in sports, parents' involvement in their children's sports activities. 1.6 Adaptation of sports and exercises for physically challenged students in all levels.	CO1
<i>TSO.2a</i> Identify the physiology of yoga and meditation. <i>TSO.2b</i> Evaluate meditation and yoga as a healing modality. <i>TSO.2c</i> Select asanas and pranayama as per need. <i>TSO.2d</i> Discuss the effect of yoga and meditation on ageing, stress and hypertension. <i>TSO.2e</i> Select mediation techniques as per the need. <i>TSO.2f</i> Discuss Bandha, Mudra and Chakra <i>TSO.2g</i> Discuss the steps of Suryanamaskar. <i>TSO.2h</i> Select Yoga and Meditation for physically challenged as per their need.	Unit-2.0 Yoga and Meditation 2.1 Importance of Yoga & Mediation in daily life, Definition and meaning of the term Yoga and Meditation, Fundamentals Principles of Yoga & Fitness training 2.2 Difference between yoga asana and physical exercises, Difference between yoga and meditation 2.3 Role of Yoga and Meditation in Purificatory Process, in character building, developing concentration, will power and discipline 2.4 Types of Yoga Practices - Asanas, Pranayama, Meditation 2.5 Mindfulness – knowing the mind, training the mind, feeling the mind 2.6 Different Methods of meditation, Physiology of meditation, Mental, physical and emotional benefits of Asanas, Pranayama, Concentration and Meditation 2.7 Bandha, Mudra and Chakra 2.8 Effects of Asanas and pranayama on physiology of human body 2.9 Importance of “Suryanamaskar 2.10 Adaptation of Yoga and meditations for physically challenged students in all levels. 2.11 Yoga Asanas Do's and Don'ts for Beginners	CO2
<i>TSO.3a</i> Identify the different factors affecting the fitness and wellness in the given situation	Unit 3.0 Fitness and Wellness 3.1 Meaning, Importance, Definition and dimensions of Health and Wellness (WHO/Yoga)	CO3

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
<i>TSO.3b</i> Use different methods to maintain Health and Wellness <i>TSO.3c</i> Discuss the components of Balance Diet <i>TSO.3d</i> Identify the causes of stress and anxiety in the given situation <i>TSO.3e</i> Use stress reduction techniques to manage Stress and Anxiety <i>TSO.3f</i> Manage Stress, Anxiety and Depression in the given situation <i>TSO.3g</i> Select recovery process for energy replenishment after exercise.	3.2 Factors affecting Fitness and Wellness 3.3 Role of Physical Activities and Recreational Games in maintaining physiological and psychological wellbeing. 3.4 Different Methods to Maintain Health, Wellness and to enhance mood 3.5 Nutrition for Health & Wellness, Relationship between Diet and Fitness Components of Balance Diet and its importance – Carbohydrates, Protein, Fat, Vitamins & Minerals, Water, Healthy Lifestyle through Diet and Fitness 3.6 Anxiety, Stress and Aging-Meaning of Anxiety, Stress and Aging, Types and Causes of Stress, 3.7 Stress, anxiety and depression reduction with exercise, yoga and meditation 3.8 Energy Continuum and Recovery Process, Metabolism and exercise, Recovery from exercise, Replenishment of energy stores during recovery process, Removal of excess lactic acid produced during exercise	

Note: One major TSO may require more than one Theory session/Period.

K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical: P2400008

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
<i>LSO 1.1.</i> Perform various sports activities for overall growth and development <i>LSO 1.2.</i> Select suitable sport activities as per your need.	1.	Track & Field: Running, Jumping, walking and Throwing, Cycling Event to develop Endurance, Speed, Strength, Agility, Flexibility etc.	CO1
	2.	Aerobics and Gymnastics to develop Strength, Agility and Flexibility	
	3.	Net/Wall Sports – Volleyball and Basketball to develop Endurance, Speed, Strength, Agility and Flexibility	
	4.	Striking & Fielding sports like Cricket, bowling, Hockey, Football Baseball etc. to develop Endurance, Speed, Strength, Agility, Flexibility and Coordination	
	5.	Racket Game- Tennis, Badminton, Table tennis etc to develop Endurance, Speed, Strength, Agility and Flexibility	
	6.	Outdoor games: Kho-Kho and Kabaddi and cycling develop Endurance, Speed, Strength, Agility and Flexibility	
	7.	Indoor games: Chess and Carrom, Swimming, Boxing, Karate Weightlifting, Power Lifting, Physique Training, Archery, Roller Skating etc to develop concentration.	
	8.	Prepare and organize Adapted Sports for various levels of physically challenged and impairments.	
<i>LSOs 2.1</i> Perform various yogic techniques for internal purification and development.	9.	Shat Karmas: Tratakam, Jala-Neti, Sutra-Neti, Vamana Dhauti, Danda Dhauti, Agnisara, Nauli	CO2
	10.	Perform following asanas with correct posture: Ardha-Padmasana [virasana], Ardha-Halasana, Pavana-Muktasana, Naukasana, Ardha-shalabhasana, Shalabhasana, Makarasan, Bhujangasana, Dhanurasana	

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
	11.	Perform following asanas with correct posture: Vakrasana, Chakrasana, Paschimottanasana, Ugrasana, Gomukhasana, Padmasana, Siddhasana, Bhadrasana, Swastikasana, Vajrasana, Supta-Vajrasana, Yoga-Mudra	
	12.	MUDRAS & SURIYANAMASKAR Brahma-Mudra, Simha-Mudra, Shanmugi Mudra, Viparithakarani-Mudra, Ashwini-Mudra, Suriyanamaskar	
	13.	BANDHAS Jalandhara-Bandha, Jihva-Bandha, Uddiyana Bandha, Moola-Bandha	
	14.	PRANAYAMAS Nadi-Shuddhi, Nadi-Shodhana, Suryabhadana, Ujjayi, Bhastrika Pranayama, Bhramari Pranayama, Sitkari, Sitali, Kapalabhati	
	15.	MEDITATION -Silent Meditation	
	16.	MEDITATION – Mantra Meditation	
LSO 3.1. Prepare diet chart for optimal health and wellbeing	17.	Prepare a diet chart for the given sport.	CO3
LSO 3.2. Use health monitoring device	18.	Measure heart rate and heart function with health monitoring device	
	19.	Measure blood sugar and blood pressure	
LSO 3.3. Use different equipment's	20.	Use massage therapy equipment, Hot and cold therapy equipment, Ultrasound therapy equipment	
LSO 3.4. Identify your own threshold and identification level for different taste Stimulations	21.	Determine the taste threshold for three different sensations- sweet salty and sour	
LSO 3.5. Check the given sample for conformance to the standard for moisture content.	22.	Determine the moisture content in the given sample of oil/fat	
LSO 3.6. Purity tests of oils/fats	23.	Determine the impurities in the given sample of oil.	
LSO 3.7. Acidity test in given sample of fat/oil	24.	Determines the acid value and free fatty acids in the given sample of oil/fat.	
LSO 3.8. Check whether any given samples of oils/fats conform to the standard.	25.	Determine the peroxide value in the given sample of fat or oil.	

L) **Suggested Term Work/ Activities and Self Learning: S2400008** Some sample suggested assignments, micro project and other activities are mentioned here for reference.

a. **Assignments:** Questions/Problems/Numerical/Exercises to be provided by the course teacher in line with the targeted COs.

- Calculate your Body Composition (BMI) and Cardiovascular Assessment
- Assessment for Muscular Endurance, Muscular Strength,
- Flexibility, Cardio-respiratory Endurance, Body Composition
- Rules and Regulations of different indoor and outdoor games.

b. Micro Projects:

- Identify and synthesize the factors that influence health in various situations (05 situations). Prepare a report with details of situations and solutions to remove the factors.
- Visit different sports club, gyms, and schools and identify various measure taken by them for Fitness and wellness of students/ members
- Visit different sports club, gyms, and schools and identify various measure taken by them for Fitness and wellness of physically challenged students/ members
- Identify which type of stress, anxiety and depression students are facing and steps and solutions to overcome this.

c. Other Activities:**1. Seminar Topics:**

- Identify the health-related challenges in current time and able to apply the preventive measures.
- Role of peers, community and media in health and wellbeing in each level
- Knowledge and skills required to preserve community health and well-being
- Effect of yoga and meditation in maintaining fitness.
- Methods to involve physically challenged students /members in all levels in sports, yoga and meditation in community.
- Counselling techniques to counsel players in matters of handling success and failure.

2. **Visits:** Visit nearby sports complex, Gyms, stadium etc and prepare a report on hygiene maintenance, medical facilities available, facilities available for physically challenged members, facilities available for old aged members, tools and equipment available and training facilities.

3. Self-learning topics:

- Anatomy and physiology of human being
- Role of Yoga and Meditation in Purificatory Process, in character building, developing concentration, will power and discipline
- Mindfulness
- Different Methods to Maintain Health, Wellness and to enhance mood
- Diet and Nutrition
- Metabolic adaptations to exercise
- Cardio-respiratory changes

M) Suggested Course Evaluation Matrix: The course teacher has to decide and use appropriate assessment strategy and its weightage in theory, laboratory and Term Work for ensuring CO attainment. The response/performance of each student in each of these designed activities is to be used to calculate **CO attainment**.

COs	Course Evaluation Matrix						
	Theory Assessment (TA)**		Term Work Assessment (TWA)			Lab Assessment (LA)#	
	Progressive Theory Assessment (PTA) Class/Mid Sem Test	End Theory Assessment (ETA)	Term Work & Self Learning Assessment			Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)
			Assignments	Micro Projects	Other Activities*		
CO-1	-	-	35%	35%	35%	35%	35%
CO-2	-	-	35%	35%	35%	35%	35%
CO-3	-	-	30%	30%	30%	30%	30%
Total Marks	-	-	10	10	05	10	15
			25				

Legend:

*: Other Activities include self- learning, seminar, visits, surveys, product development, software development etc.

**: Mentioned under point- (N)

#: Mentioned under point-(O)

Note:

- The percentage given are approximate
- In case of Micro Projects and End Laboratory Assessment (ELA), the achieved marks will be equally divided in all those COs mapped with total experiments.
- For CO attainment calculation indirect assessment tools like course exit survey need to be used which comprises of questions related to achievement of each COs.

N) Suggested Specification Table for End Semester Theory Assessment: (Not Applicable)**O) Suggested Assessment Table for Laboratory (Practical):**

S. No.	Laboratory Practical Titles	Relevant COs Number(s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
1.	Track & Field: Running, Jumping, walking and Throwing, Cycling Event to develop Endurance, Speed, Strength, Agility, Flexibility etc	CO1	30	60	10
2.	Aerobics and Gymnastics to develop Strength, Agility and Flexibility		30	60	10
3.	Net/Wall Sports – Volleyball and Basketball to develop Endurance, Speed, Strength, Agility and Flexibility		30	60	10
4.	Striking & Fielding sports like Cricket, bowling, Hockey, Football Baseball etc. to develop Endurance, Speed, Strength, Agility, Flexibility and Coordination		30	60	10
5.	Racket Game- Tennis, Badminton, Table tennis etc to develop Endurance, Speed, Strength, Agility and Flexibility		30	60	10
6.	Outdoor games: Kho-Kho and Kabaddi and cycling develop Endurance, Speed, Strength, Agility and Flexibility		30	60	10
7.	Indoor games: Chess and Carrom, Swimming, Boxing, Karate Weightlifting, Power Lifting, Physique Training, Archery, Roller Skating etc to develop concentration.		30	60	10
8.	Prepare and organize Adapted Sports for various levels of physically challenged and impairments.		30	60	10
9.	Shat Karmas Tratakam, Jala-Neti, Sutra-Neti, Vamana Dhauti, Danda Dhauti, Agnisara, Nauli	CO2	40	50	10
10.	Perform following asanas with correct posture: Ardha-Padmasana [virasana], Ardha-Halasanana, Pavana-Muktasana, Naukasana, Ardha-shalabhasana, Shalabhasana, Makarasan, Bhujangasana, Dhanurasana		40	50	10
11.	Perform following asanas with correct posture: Vakrasana, Chakrasana, Paschimottanasana, Ugrasana, Gomukhasana, Padmasana, Siddhasana, Bhadrasana, Swastikasana, Vajrasana, Supta-Vajrasana, Yoga-Mudra		40	50	10
12.	MUDRAS & SURIYANAMASKAR Brahma-Mudra, Simha-Mudra, Shanmugi Mudra, Viparithakarani-Mudra, Ashwini-Mudra, Suriyanamaskar		40	50	10
13.	BANDHAS Jalandhara-Bandha, Jihva-Bandha, Uddiyana Bandha, Moola-Bandha		40	50	10
14.	PRANAYAMAS Nadi-Shuddhi, Nadi-Shodhana, Suryabhadana, Ujjayi, Bhastrika Pranayama, Bhramari Pranayama, Sitkari, Sitali, Kapalabhati		40	50	10
15.	MEDITATION -Silent Meditation		40	50	10

S. No.	Laboratory Practical Titles	Relevant COs Number(s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
16.	MEDITATION - Mantra Meditation	CO3	40	50	10
17.	Prepare a diet chart for the given sport.		40	50	10
18.	Measure heart rate and heart function with health monitoring device		40	50	10
19.	Measure blood sugar and blood pressure		40	50	10
20.	Use massage therapy equipment, Hot and cold therapy equipment, Ultrasound therapy equipment		40	50	10
21.	Determine the taste threshold for three different sensations- sweet salty and sour		40	50	10
22.	Determine the moisture content in the given sample of oil/fat		40	50	10
23.	Determine the impurities in the given sample of oil.		40	50	10
24.	Determines the acid value and free fatty acids in the given sample of oil/fat.		40	50	10
25.	Determine the peroxide value in the given sample of fat or oil.		40	50	10

Note: -All the above Games can be selected from the list of SGFI/AIU/IOA

Legend:

PRA*: Process Assessment

PDA**: Product Assessment

Note: This table can be used for both end semester as well as progressive assessment of practical. Rubrics need to be prepared by the course teacher for each experiment/practical to assess the student performance.

P) Suggested Instructional/Implementation Strategies: Different Instructional/ Implementation Strategies may be appropriately selected, as per the requirement of the content/outcome. Some of them are Improved Lecture, Tutorial, Case Method, Group Discussion, Industrial visits, Industrial Training, Field Trips, Portfolio Based, Learning, Role Play, Live Demonstrations in Classrooms, Lab, Field Information and Communications Technology (ICT)Based Teaching Learning, Blended or flipped mode, Brainstorming, Expert Session, Video Clippings, Use of Open Educational Resources (OER), MOOCs etc.

Q) List of Major Laboratory Equipment, Tools and Software:

S. No.	Name of Equipment, Tools and Software	Broad Specifications	Relevant Experiment/ Practical Number
1.	High end computers for record keeping	Processor Intel Core i7 with Open GL Graphics Card, RAM 32 GB, DDR3/DDR4, HDD 500 GB, Graphics Card NVIDIA OpenGL 4 GB, OS Windows 10	All
2.	Aerobics and Gymnastic	Basic facilities and equipment's – Balance Beams, Gymnastic Ball, Gymnastic Chalk, Gymnastic Clubs, Flex Floor Systems, High Bars, Hoops, Horizontal Bars, Leotards, Music, Parallel Bar, Pommel Horses, Ribbons, Rings, Ropes, Single Bar Trainer, Spotting Blocks, Streamers, Trampoline, Tumble Track, Uneven Bar, Vault, Vault Spring Board Gymnastic Accessories – Chalk, Grips, Wrist Supports, Mat, Tape, Socks Singlets, Pants Shoes, Shorts Aerobics- Resistance bands, Jump rope, Step bench or box, Abdominal wheel, Exercise mat, Gliding discs, dumbbells, fitness	2

S. No.	Name of Equipment, Tools and Software	Broad Specifications	Relevant Experiment/ Practical Number
		trampolines, hoops	
3.	Striking & Fielding sports	Complete Cricket Kit, Football Kit, Bowling Kit, Hockey Kit	4
4.	Net/Wall Sports	Complete Volley Ball and basketball kit	3
5.	Racket Game	Complete Tennis Kit, Table Tennis Kit and badminton kit	5
6.	Outdoor games	Complete Kho-Kho and Kabaddi and cycling kit	6
7.	Indoor games	Complete Chess kit, Carrom kit, Swimming kit, Boxing kit, Karate kit, Weightlifting kit, Power Lifting kit, Archery kit and Roller-Skating kit	7
8.	Physique Training	Cardio Machines- Treadmills, Elliptical Trainers, Exercise Bikes, Rowing Machines, Indoor Bikes, Vibration Machines, Steppers Recumbents Dumbbells, Multi-Purpose Bench, power rack, Adjustable Dumbbell Set 2 x 3-10 kg, Exercise mat, resistance band, balance trainer	7
9.	Sports and wellbeing equipment's for physically challenged and impairments.	Fusion Wheel – all-in-one portable wheelchair gym, Pedal exerciser, Deluxe hand exerciser, Greeper sports shoelaces, Active Hands, Ramble Tag Guidance Aid, Cat Tongue Grip Tape Adaptive Cycling- Straps, Leg/ Foot Adapters, Prosthetics, Steering Dampener, Handlebar Adapters, HANDCYCLING-Wheelchairs, Bike-On Handcycles, Trikes, Racing Wheelchairs, Trikes, Recumbent Bikes, All-terrain Handcycles, Mono Cycling, Hand Bikes - Off-Road, Cross Country, Racing, Downhill Archery - Field Tripod and Quad Mounts (Archery & Gun), In-Line Draw-Loc, Mounts (Archery & Gun), Stands (Gun), Mounts (Archery & Gun) Binoculars and Rests (Gun), Crossbows (Archery), Wheelchair Platform Stabilizing Crutch Poles, Dampeners, Crossbows (Archery), Hands free shooting rest (Gun) Bowling: ramp, roll assist Fitness: Anti-Gravity Treadmill, LapMat for Wheelchairs, Strike Assist, Adaptive Treadmill	8
10.	Yoga	Yoga Mats, Yoga Rollers, Yoga Blocks, Aero Yoga Clothing Blankets, cloth Straps, Bolsters, Wheels	9-16
11.	Fitness and wellbeing equipment's	Health monitoring devices for overall health- Personal health monitor for heart health, Blood sugar monitoring device, Wireless blood pressure device, Smart watch to track heart function, Hot and cold therapy equipment, Massage therapy equipment, Ultrasound therapy equipment	18-20
12.	Taste kit -To test three different sensations- sweet salty and sour	Salt solution (%) -0.5, 0.8, 1.0, 1.2, 1.5, Sugar solution (%) - 0.05, 0.5, 0.7, 1.0, 1.2, Citric acid (%) - 0.02, 0.04, 0.1, 0.5, 1.0 Spoons, Bowls, Beakers, Plain distilled water	21
13.	Test kit to measure peroxide value in the oil	Reagents: Acetic acid-chloroform solution, Saturated potassium iodide solution, Sodium thiosulphate solution- 0.1 N, Starch solution (1%) Apparatus: Pipette 1ml capacity, Conical flask	25
14.	Test kit to measure acid value and free fatty acids in the oil	Sample of oil/fats namely any refined oil or hydrogenated fat. Reagents - ethyl alcohol (95%), phenolphthalein indicator solution, standard aqueous sodium or potassium hydroxide solution (0.1 N or 0.5 N), Pipette (10 ml), Conical flask	24
15.	Test kit to measure impurities in the oil	Sample of Oil/fat, Oven-electric, maintained at $100 \pm 1^{\circ}\text{C}$., Desiccator, Weighing balance, Filter paper	23

S. No.	Name of Equipment, Tools and Software	Broad Specifications	Relevant Experiment/ Practical Number
16.	Test kit to measure moisture content in the oil	Sample of oil/fat, Moisture dish-made of porcelain, silica, glass or aluminum, Oven-electric, maintained at $105 \pm 1^\circ\text{C}$., Desiccator Weighing balance	22

R) Suggested Learning Resources:**(a) Books:**

S. No.	Titles	Author(s)	Publisher with ISBN
1.	Practical Applications in Sports Nutrition	Heather Hedrick Fink, Alan E. Mikesky	Jones & Bartlett Learning (2020) ISBN No: 978-1284181340
2.	Massage and Medical Gymnastics,	Lace, M. V.	London: J & A Churchill Ltd. ASIN: B000RY4YB0
3.	ACSM's Guidelines for Exercise Testing and Prescription	Gary Liguori	LWW; (2021) ISBN-13: 978-1975150198
4.	Essentials of Strength Training and Conditioning	Javair Gillett	Human Kinetics, (2021) ISBN-13: 978-1718210868
5.	Practical Applications in Sports Nutrition	Heather Hedrick Fink, Alan E. Mikesky	Jones & Bartlett Learning, (2017) ISBN-13: 978-1284101393
6.	Health Fitness Management	Mike Bates, Mike Spezzano, Guy Danhoff	Human Kinetics, (2019) ISBN-13: 978-1450412230
7.	Yoga for Every Body: A beginner's guide to the practice of yoga postures, breathing exercises and meditation	Luisa Ray, Angus Sutherland	Vital Life Books (2022) ISBN-13: 978-1739737009
8.	Science of Yoga: Understand the Anatomy and Physiology to Perfect Your Practice	Ann Swanson	DK Publisher, (2019) ISBN-13: 978-1465479358
9.	Mudras for Modern Living: 49 inspiring cards to boost your health, enhance your yoga and deepen your meditation Cards	Swami Saradananda	Watkins Publishing (2019) ISBN-13: 978-1786782786
10.	Principles and Methods of Adapted Physical Education & Recreation	Kristi Roth, Laurie Zittel, Jean Pyfer, David Auxter	Jones & Bartlett Learning, (2016) ISBN-13: 978-1284077810
11.	Adapted Physical Education and Sport Sixth Edition	Joseph P. Winnick, David L. Porretta	Human Kinetics, (2016) ISBN-13: 978-1492511533
12.	Counselling Skills in Applied Sport Psychology: Learning How to Counsel	Paul McCarthy, Zoe Moffat	Routledge, (2023) ISBN-13: 978-1032592589
13.	Basic Counselling Skills: A Helper's Manual	Richard Nelson Jones	Sage Publication 2012, New Delhi.
14.	Advancements in Mental Skills Training (ISSP Key Issues in Sport and Exercise Psychology)	Maurizio Bertollo, Edson Filho, Peter Terry	Routledge, (2020) ISBN-13: 978-0367111588
15.	The Relaxation and Stress Reduction Workbook	Martha Davis, Elizabeth Robbins, Matthew McKay, Eshelman MSW	A New Harbinger Self-Help Workbook (2019)
16.	Patanjalis Yoga Sutras	Swami Vivekananda	Fingerprint Publishing (2023) Prakash Books India Pvt Ltd, New Delhi ISBN-13: 978-9354407017

(b) Online Educational Resources:

1. https://onlinecourses.swayam2.ac.in/aic19_ed28/preview- introduction to Yoga and Applications of Yoga
2. https://onlinecourses.swayam2.ac.in/aic23_ge09/preview- Yoga for Creativity
3. https://onlinecourses.swayam2.ac.in/aic23_ge05/preview- Yoga for concentration
4. https://onlinecourses.swayam2.ac.in/aic23_ge06/preview- yoga for memory development
5. https://onlinecourses.nptel.ac.in/noc21_hs29/preview-Psychology of Stress, Health and Well-being
6. https://onlinecourses.swayam2.ac.in/nce19_sc04/preview- Food Nutrition for Healthy Living - Course – Swayam
7. <https://www.classcentral.com/course/swayam-fitness-management-17608>- Fitness Management from Swayam
8. https://onlinecourses.swayam2.ac.in/nce19_sc04/preview-Food Nutrition for Healthy Living
9. https://onlinecourses.swayam2.ac.in/cec21_ed02/preview Health Education and Recreation
10. https://onlinecourses.swayam2.ac.in/cec22_ed31/preview Sports Administration and Management

Note: Teachers are requested to check the creative commons license status/ financial implications of the suggested, online educational resources before use by the students.

(c) Others:

1. <https://www.yogajournal.com/yoga-101/philosophy/good-read>
2. <http://hdl.handle.net/123456789/38171>- Yoga Philosophy
3. <https://yoga.ayush.gov.in>

- A) **Course Code** : **T2400009**
- B) **Course Title** : Open Educational Resources (OER) (Non-Exam Course)/KYP/CISCO/ST
(FTS, CHE, CSE, EE, ME, ME (Auto), MIE, ELX, AIML, CRE, CACDDM, FPP, GT, CS, Comp.E, IT)
- C) **Pre- requisite Course(s)** :
- D) **Rationale** :

Open educational resources (OER) are openly-licensed, freely available educational materials that can be modified and redistributed by users. Learning about Open Educational Resources (OER), copyright, and Creative Commons licenses is a valuable endeavor for content creators, users, and anyone interested in sharing knowledge and creative works. Creative Commons licenses, offer a standardized way to grant permissions for the use and sharing of creative works. Learning about OER, copyright, and Creative Commons licenses is an ongoing process. As these fields evolve, it's important to stay informed and continue exploring new resources and practices.

After going through this course, students will at first place have reasonable idea to explore and use various OERs useful for their course of study and secondly, be motivated for fair use of resources available to them on various platform by understanding the restrictions and legal issues related to copyright and other licensing policies.

- E) **Course Outcomes (COs):** After the completion of the course, teachers are expected to ensure the accomplishment of following course outcomes by the learners. For this, the learners are expected to perform various activities related to three learning domains (Cognitive, Psychomotor and Affective) in classroom/ laboratory/ workshop/ field/ industry.

After completion of the course, the students will be able to-

CO-1 Use Open Educational Resources (OER) after their evaluation

CO-2 Use copyright material appropriately.

CO-3 Implement suitable Creative Common License.

- F) **Suggested Course Articulation Matrix (CAM):**

Course Outcomes (COs)	Programme Outcomes(POs)							Programme Specific Outcomes* (PSOs)	
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2
CO-1	-	2	-	-	3	-	3		
CO-2	-	2	-	-	3	-	3		
CO-3	-	3	-	-	3	-	3		

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional

- G) **Teaching & Learning Scheme:**

Course Title	Scheme of Study (Hours/Week)				
	Classroom Instruction (CI)		Notional Hours (TW/ Activities+ SL)	Total Hours (CI+TW/ Activities)	Total Credits (C)
	L	T			
Open Educational Resources	01	-	-	01	01

Legend:

CI: Classroom Instruction (Includes different instructional/implementation strategies i.e. Lecture (L), Tutorial (T), Case method, Demonstrations, Video demonstration, Problem based learning etc. to deliver theoretical concepts)

LI: Laboratory Instruction (Includes experiments/practical performances /problem-based experiences in laboratory, workshop, field or other locations using different instructional/Implementation strategies)

Notional Hours: Hours of engagement by learners, other than the contact hours for ensuring learning.

TW: Term Work (includes assignments, seminars, micro projects, industrial visits, any other student activities etc.)

SL: Self Learning, MOOCs, spoken tutorials,online educational resources etc.

C: Credits = (1 x CI hours) + (0.5 x LI hours) + (0.5 x Notional hours)

Note: TW and SL have to be planned by the teacher and performed by the learner under the continuous guidance and feedback of teacher to ensure outcome of learning.

H) Course Curriculum Detailing: This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (CI), Laboratory Instruction (LI), Term Work (TW) and Self Learning (SL). Students are expected to demonstrate the attainment of Theory Session Outcomes (TSOs) and Lab Session Outcomes (LSOs) leading to attainment of Course Outcomes (COs) upon the completion of the course. While curriculum detailing, NEP 2020 related reforms like Green skills, Sustainability, Multidisciplinary aspects, Society connect, Indian Knowledge System (IKS) and others must be integrated appropriately.

I) Theory Session Outcomes (TSOs) and Units: T2400009

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
<i>TSO 1a.</i> Explain the difference between OER and other free educational materials. <i>TSO 1b.</i> Describe the challenges and benefits of using OER in a class. <i>TSO 1c.</i> Apply various aspects of evaluating OER before use <i>TSO 1d.</i> Explain necessity to assess an OER's adaptability. <i>TSO 1e.</i> Use preliminary search for open educational resource. <i>TSO 1f.</i> Find OER using various resources.	Unit-1.0 Open Educational Resources 1.1 OER - definition 1.2 What is NOT OER. 1.3 Benefits of using OER – Benefits to Students - Access to Quality Education 1.4 OER - Benefits to Faculty - Use, Improve and Share, Network and collaborate with peers, Lower Cost, Improve access to information 1.5 Challenges of Using OER – Subject Availability, Format and Material type availability, Time and Support availability 1.6 Evaluating OER – a) Clarity, Comprehensibility, and Readability, b) Content and Technical Accuracy, c) Adaptability and Modularity, d) Appropriateness and Fit, e) Accessibility 1.7 Finding Open Content - OER Search Scenario Filter by Usage Rights in Google, Repositories and Search Tools, Subject-specific Repositories	CO1
<i>TSO 2a.</i> Explain benefits of copyright protection for creator <i>TSO 2b.</i> Explain exceptions and limitations to copyright law <i>TSO 2c.</i> List rights granted to copyright holders. <i>TSO 2d.</i> Explain Exceptions and limitations to copyright law <i>TSO 2e.</i> Explain Fair use/fair dealing apply to copyright <i>TSO 2f.</i> Elaborate Public domain and how does it relate to copyright	Unit-2.0 Copyright and Open Licensing 2.1 Copyright and what it does protect, benefits of copyright protection for creators, duration of copyright protection last, rights granted to copyright holders. 2.2 Exceptions and limitations to copyright law, fair use/fair dealing apply to copyright 2.3 Public domain and its relation to copyright.	CO2

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
<i>TSO 2g.</i> Elaborate penalties for copyright infringement. <i>TSO 2h.</i> Explain copyright for digital content and the internet. <i>TSO 2i.</i> Explain use of copyrighted works in education <i>TSO 2j.</i> Explain the use of free licenses	2.4 Penalties for copyright infringement 2.5 Apply copyright to digital content and the internet 2.6 Use of copyrighted works in education. 2.7 Open Licenses – GNU – Free Documentation license, Free Art License 2.8 Why Free Licenses – Retain, Reuse, Revise, Remix, Redistribute	
<i>TSO 3a.</i> Describe the four different Creative Commons License components. <i>TSO 3b.</i> Explain the reason some CC-licensed content might not be considered OER. <i>TSO 3c.</i> Explain the Strength and weakness of four Open CC Licenses <i>TSO 3d.</i> Choose the right Creative Commons license for work. <i>TSO 3e.</i> Apply a Creative Commons license to existing work. <i>TSO 3f.</i> Use of Creative Commons licenses for commercial purposes. <i>TSO 3g.</i> Modify a work licensed under Creative Commons. <i>TSO 3h.</i> Revoke a Creative Commons license, combine works with different Creative Commons licenses <i>TSO 3i.</i> Differentiate between Attribution and Citation	Unit-3.0 Creative Common Licenses 3.1 Alternatives to copyright as Creative Commons licenses. 3.2 Four components of creative common Licenses – Attribution, Share- Alike, Non – commercial, No Derivatives 3.3 Choosing a Creative common licenses – Wiley’s 5 Rs and Creative Common Licenses 3.4 Four Open CC Licenses and Their Strengths and Weaknesses – (a) CC BY (b) CC BY SA (c) CC BY NC (d) CC BY NC SA 3.5 Attribution Vs Citation - Creative Commons licensed work without giving attribution 3.6 Apply a CC License - choose the right Creative Commons license for work, apply a Creative Commons license to existing work, Creative Commons licenses be used for commercial purposes, modify a work licensed under Creative Commons, revoke a Creative Commons license, combine works with different Creative Commons licenses	CO3

Note: One major TSO may require more than one Theory session/Period.

J) Suggested Term Work/ Activities and Self Learning: Some sample suggested assignments, micro project and other activities are mentioned here for reference.

a. Assignments:

Related to Open Educational Resources – CO1

- i. OER help to reduce the cost of education for students. Justify?
- ii. Explain why it is necessary to assess an OER’s adaptability?
- iii. Identify four search tools for finding open educational resources?
- iv. Identify at least two search tools for finding openly licensed media?

Related to Copyright – CO2

- i. Explain copyright and what does it protect
- ii. Explain the rights granted to copyright holders
- iii. Describe the exceptions and limitations to copyright law
- iv. Elaborate the way fair use/fair dealing apply to copyright?
- v. Describe the public domain and its relationship with copyright
- vi. Elaborate the penalties for copyright infringement?
- vii. Explain copyright apply to digital content and the internet
- viii. Explain the way copyright law address the use of copyrighted works in education

Related to Creative Common Licenses – CO3

- i. Explain various Creative Commons licenses
- ii. Describe, how can you apply a Creative Commons license to your existing work?
- iii. Explain the benefits of using Creative Commons licenses?
- iv. Elaborate, how you can modify a work licensed under Creative Commons?
- v. Are Creative Commons licenses valid worldwide?
- vi. Elaborate how Creative Commons license can be revoked, once it has been applied to your work?
- vii. Explain, how anyone use a Creative Commons licensed work without giving attribution?
- viii. Explain the limitations/restrictions while using works with Creative Commons licenses?

b. Micro Projects:

1. Collect information on the impact of OER on cost savings and student engagement.
2. Search at least four OER related to topic of your Engineering Discipline over Internet. Evaluate the material based on the relevance, accuracy and usability.
3. Explore the different types of resources under creative Commons licenses (e.g., CC BY, CC BY-SA, CC BY-NC, etc.) and their specific permissions and restrictions.
4. Create a comparative analysis chart or infographic that visually represents the key characteristics of each license.
5. Select minimum 5 real-world examples from different domains (such as music, art, literature, or education) where creators have used Creative Commons licenses.

c. Other Activities:

1. Seminar Topics:
 - OER Quality Assurance
 - OER Repositories and Platforms
 - Creative Commons and Digital Media
 - Creative Commons in the Visual Arts
 - Examine the legal implications of using Creative Commons licenses, including the obligations and responsibilities of both creators and users and present it.
2. Self-learning topics:
 - Open Licensing and Copyright: Understanding the Legal Framework for OER
 - Creative Commons and the future of Copyright
 - Copyright and Open Access Publishing
 - Copyright and Software

K) Suggested Instructional/Implementation Strategies: Different Instructional/ Implementation Strategies may be appropriately selected, as per the requirement of the content/outcome. Some of them are Improved Lecture, Tutorial, Case Method, Group Discussion, Portfolio Based, Learning, Role Play, Live Demonstrations in Classrooms, Field Information and Communications Technology (ICT)Based Teaching Learning, Blended or flipped mode, Brainstorming, Expert Session, Video Clippings, Use of Open Educational Resources (OER), MOOCs etc.

L) List of Major Laboratory Equipment, Tools and Software: (If Any)

S. No.	Name of Equipment, Tools and Software	Broad Specifications
1.	Computers	Desktop computer with word processing and presentation facility
2.	Internet	Internet Connectivity

M) Suggested Learning Resources:**(a) Books:**

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	The OER Starter Kit.	Abbey Elder - 2019	IA: Iowa State University Digital Press, available under a Creative Commons Attribution 4.0 International License. Retrieved from iastate.pressbooks.pub/oerstarterkit
2.	A Brief History of Open Educational Resources	Bliss, T J and Smith, M. - 2017	In: Jhangiani, R S and Biswas-Diener, R. (Eds.) Open: The Philosophy and Practices that are Revolutionizing Education and Science (pp. 9–27). London: Ubiquity Press. DOI: https://doi.org/10.5334/bbc.b .

Note: Above listed books are available in soft form and can be downloaded as given respective link

(b) Online Educational Resources:

1. OER for Empowering Teachers Instructional Material by P. Malliga is licensed under a Creative Commons Attribution 4.0 International License.
2. William & Flore Hewlett Foundation. (n.d.). OER defined. Retrieved from <https://hewlett.org/strategy/open-educational-resources/>
3. Free Software Foundation. (2008). GNU Free Documentation License. Retrieved from <https://www.gnu.org/licenses/fdl.html>
4. Copyleft Attitude. (2007). Free Art License 1.3. Retrieved from <http://artlibre.org/licence/lal/en/>
5. Free Software Foundation. (n.d.). What is copyleft? Retrieved from <https://www.gnu.org/copyleft/copyleft.html>

Note: Teachers are requested to check the creative commons license status/ financial implications of the suggested, online educational resources before use by the students.
