Curriculum of Diploma Programme

in

Civil Engineering

Department of Science, Technology and Technical Education (DSTTE), Govt. of Bihar

State Board of Technical Education (SBTE), Bihar

Semester – I
Teaching & Learning Scheme

Course Codes	Category of course	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	**ASC**	**Basic Engg. Mathematics** (ME, ME (Auto), CE, MIE, CSE, AIML, EE, CRE, CHE, ELX, ELX (R))	02	01	-	02	05	04
2400103A	**ASC**	**Applied Chemistry -A** (CE, ME, ME (Auto), MIE, AE, FTS, CRE, CHE)	03	-	04	02	09	06
2425103	**BEC**	**Fundamentals of Mechanical Engg.** (CE, CRE, CHE)	03	-	04	02	09	06
2400104	**HSC**	**Communication Skills (English)** (Common for all Programmes)	03	-	04	02	09	06
2415105	**BEC**	**Engg. Drawing & Graphics** (MIE, AE, CRE, CE, CHE, FTS, TE, EE, ELX, ELX (R))	-	-	04	02	06	03
2425106	**BEC**	**Mechanical Workshop** (ME, ME (Auto), MIE, AE, CRE, CE, CHE)	-	-	04	02	06	03
2400107	**NRC**	**Professional Ethics** (Non-exam course) (CE, CSE, ELX, ELX (R), FTS, ME, AIML, MIE, CHE, CRE, FPP, GT, EE, AE, CACDDM)	01	-	-	-	01	01
2400008	**NRC**	**Sports, Yoga and Meditation** (Common for All Programmes)	-	-	01	01	02	01
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

Course Codes	Category of course	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	**ASC**	**Basic Engg. Mathematics** (ME, ME (Auto), CE, MIE, CSE, AIML, EE, CRE, CHE, ELX, ELX (R))	30	70	20	30	-	-	150
2400103A	**ASC**	**Applied Chemistry-A** (CE, ME, ME (Auto), MIE, AE, FTS, CRE, CHE)	30	70	20	30	20	30	200
2425103	**BEC**	**Fundamentals of Mechanical Engg.** (CE, CRE, CHE)	30	70	20	30	20	30	200
2400104	**HSC**	**Communication Skills (English)** (Common for all Programmes)	30	70	20	30	20	30	200
2415105	**BEC**	**Engg. Drawing & Graphics** (MIE, AE, CRE, CE, CHE, FTS, TE, EE, ELX, ELX (R))	-	-	20	30	20	30	100
2425106	**BEC**	**Mechanical Workshop** (ME, ME (Auto), MIE, AE, CRE, CE, CHE)	-	-	20	30	20	30	100
2400107	**NRC**	**Professional Ethics** (Non-exam course)	25	-	-	-	-	-	25
2400008	**NRC**	**Sports, Yoga and Meditation** (Common for All Programmes)	-	-	10	-	06	09	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:

- 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 the 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)
TSO 1a. Find the solution of a system of equations in three unknowns by applying Cramer's rule. *TSO 1b.* Solve simple given problems based on the Algebra of matrices. *TSO 1c.* Find the inverse of the matrix by applying the concept of Adjoint of the matrix. *TSO 1d.* Find a solution of simultaneous equations in three variables using the concept of the Matrix Inversion method. *TSO 1e.* Solve problems based on the sum, and subtraction of Vectors. *TSO 1f.* Solve simple problems related to Scalar and Vector product of vectors. *TSO 1g.* Solve simultaneous equations by using concepts given in Ancient Indian Mathematics. (IKS)	**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. 1.10 Algebra in Indian Knowledge System: Solution of simultaneous equations (Indian Mathematics). (IKS)	**CO1**
TSO 2a. Define the concept of a function and its types. *TSO 2b.* Solve simple problems based on Domain and range of function. *TSO 2c.* Evaluate problems of limit function based on Indeterminate form. *TSO 2d.* Check the continuity of a function at a point. *TSO 2e.* Find the differentiation of some simple functions (sinx, cosx, tanx, and e^x) by the first principle. *TSO 2f.* Calculate the derivative of given Algebraic, trigonometric, and exponential functions. *TSO 2g.* Find the derivative of the given two functions' sum, product, and quotient. *TSO 2h.* Find the differentiation of given composite functions by applying the concept of the Chain rule.	**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.	**CO2**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 2i. Find the derivative of Logarithmic, Implicit, and Parametric functions. *TSO 2j.* Familiar with the concept of calculus given in Indian Mathematics. (IKS)	2.11 Implicit differentiation. 2.12 Differentiation of Parametric Functions. 2.13 Calculus in Indian Knowledge System: The Discovery of Calculus by Indian Astronomers. (Indian Mathematics). (IKS)	
TSO 3a. Find the second-order derivative of given simple functions. *TSO 3b.* Solve simple problems based on Rolle's Theorem and Mean Value Theorem. *TSO 3c.* Apply the concept of Rate of change to solve simple problems related to velocity, and acceleration. *TSO 3d.* Apply rules of derivative to solve given applied problems related to tangent and normal. *TSO 3e.* 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**
TSO 4a. Calculate the angle between the given two lines and also find the slope. *TSO 4b.* Formulate an equation of straight lines of different forms. *TSO 4c.* Find the perpendicular distance of a straight line from a given point and the perpendicular distance between two parallel lines. *TSO 4d.* Use the geometry given in Sulabasutras to solve the given problems. *TSO 4e.* Solve simple problems related to Circles and Parabola for engineering applications. *TSO 4f.* 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, the 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. 4.5 Geometry in Sulabasutras in Indian Knowledge System (construction of the square, circling the square). (Indian Mathematics). **Conic Section** 4.6 Introduction of Conic-Section. 4.7 Equation of Circle in standard form. 4.8 Standard equation of parabola, ellipse, and hyperbola.	**CO4**
TSO 5a. Compute the probability of given simple problems based on the Addition and Multiplication theorem. *TSO 5b.* Evaluate the Mean, Median, and Mode of the given data for engineering applications. *TSO 5c.* Calculate the Range, Variance, and standard deviation 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. **The measure of Central Tendency** 5.3 Mean, Median, Mode. **Measure of Dispersion**	**CO5**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 5d. Calculate the Coefficient of variance of given data for engineering applications.	5.4 Range, Variance, Standard Deviation. 5.5 Coefficient of Variation.	

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

K) Suggested Tutorials and Outcomes:

Outcomes	S. No.	Tutorials Titles	Relevant COs Number(s)
1.1 Determine the value of the determinant by using available open-source software. 1.2 Determine the inverse of a non-singular matrix by using open-source software. 1.3 Apply the Matrix Inversion method to determine currents through various branches of given electrical networks. 1.4 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
2.1 Geometrically represent the domain and range of the given Modulus function, Signum function, and Floor function. 2.2 Verify geometrically the continuity of a given function at a point. 2.3 Determine the concavity and convexity of a given continuous function for a given engineering application. 2.4 Find the 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. • Branch-specific engineering application of derivative of a parametric function.	CO2
3.1 Determine the maximum height of a projectile trajectory using Roll's theorem. 3.2 Use Lagrange's Mean Value theorem to find the point at which the slope of the tangent becomes equal to the slope of the secant through its endpoints. 3.3 Use the concept of derivative to find the slope of a bending curve for a given engineering problem. 3.4 Use the concept of tangent and normal to solve the given problem of Engineering Drawing. 3.5 Use the concepts of Maxima and Minima to obtain optimum value for a given engineering problem. 3.6 Use the concept of the radius of curvature to solve a 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
4.1 Apply the concept of Gradient to draw graphs in engineering drawing.	4.	• Geometrical interpretation of Gradient.	CO4

Outcomes	S. No.	Tutorials Titles	Relevant COs Number(s)
4.2 Use the given form of a straight line to calculate the speed, distance, and time of a moving object. 4.3 Use the concept of Ellipse to prepare a Model of the path of the Planet and its foci.		• Geometrical Interpretation of lines in various forms. • Geometrical interpretation of the perpendicular distance of a line. • Geometrical representation of conic-section.	
5.1 Use the concept of probability to solve given problems based on Board and playing cards. 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-projects, 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. Solve the simultaneous system of equations in two variables by Matrix Inversion Method. Write down a Mathematical program using any open-source software to verify the result.
2. 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 the moment in terms of structural integrity and mechanical system using open-source software.
3. Represent the Graph of the Trigonometric function and logarithmic function on GeoGebra. Interpret the nature of the graph and Make a pdf file.
4. Find the derivative of $y = x^{sinx}$ and visualize the graph of the function and its derivative using any open-source software geometrically.
5. A window in the form of a rectangle surmounted by a semi-circular opening. The total perimeter of the window to admit maximum light through the whole opening. Prepare a model using the concept of Maxima and Minima for the above problem and verify the result.
6. Find the curvature of $x = 4cost$ and $y = 3sint$, 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.
7. When a double-sided right circular cone is intersected by a plane, different types of conic sections are generated. Represent all these conic sections on GeoGebra and write down their equation.
8. Explain how parabolic reflectors are used in engineering applications such as Satellite Dish Antennas or headlights.
9. By Collecting the Data of the Last 5 IPL series, Calculate the probability of winning a match by any two teams.
10. 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.

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

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO-1a Describe the three subatomic particles in an atom. *TSO-1b* Conclude Rutherford model of atom. *TSO-1c* Apply the different atomic theories and principles for structural illustration. *TSO-1d* Calculate uncertainty in position and momentum. *TSO-1e* Draw the shapes of s, p and d orbitals. *TSO-1f* Write the electronic configuration of different elements. *TSO-1g* Differentiate between ionic, covalent, and coordinate compounds based on the type of chemical bonding. *TSO-1h* Explain the unique behavior of water. *TSO-1i* 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, $CaCl_2$, MgO), Covalent Bond, Polar and Nonpolar Covalent Bonds (H_2. F_2. HF, HCl) & Co-ordinate Bond (CO, NH_4^+, O_3, H_2SO_4),. 1.8 Dipole Moment (NH_3, NF_3), Hydrogen bonding. 1.9 Solution- (solute, solvent) and their strength- Molarity, Normality, Molality. 1.10 Indian Chemistry: -Philosophy of atom by Acharya Kanad. (IKS)	**CO1**
TSO-2a Classify hard and soft water based on their properties. *TSO-2b* List the impurities responsible for hardness. *TSO-2c* Calculate the hardness of water. *TSO-2d* Determine the hardness by EDTA method. *TSO-2e* Apply different water softening techniques to soften the hard water. *TSO-2f* Calculate the amount of lime and soda required for removal of hardness. *TSO-2g* Differentiate between BOD and COD. *TSO-2h* 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 $CaCO_3$ 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**
TSO-3a List ores of metals. *TSO-3b* Describe ore, gangue, matrix. *TSO-3c* Select Appropriate metallurgical processes for concentration, extraction, and purification of given ore. *TSO-3d* Describe alloy with examples. *TSO-3e* Write the constituent of given alloy. *TSO-3f* Write the composition properties and uses of ferrous and non-ferrous alloys. *TSO-3g* Distinguish between homopolymer and copolymer. *TSO-3h* Write the monomers of given polymers. *TSO-3i* Explain vulcanization process. *TSO-3j* Explain cement & its manufacture.	**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, Composition, Properties, and their applications. 3.5 Ancient Indian Metallurgy (IKS) 3.6 Polymers-Homopolymers and Copolymers,	**CO3**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO-3k Differentiate among the different engineering materials based on their chemical composition and composition-based applications.	Natural polymers and synthetic polymers, Addition and Condensation polymerization, Thermoplastic and Thermosetting plastic. 3.7 Monomers, applications, and synthesis of Polythene, PVC, Orlon, Terylene, Nylon 66, Nylon 6, Bakelite. 3.8 Natural Rubber and its vulcanization, advantages of vulcanized rubber. 3.9 Cement, Average composition of Portland cement, Raw material for manufacture of cement, Setting of Cement.	
TSO-4a Classify fuels. *TSO-4b* Describe HCV and LCV. *TSO-4c* Explain knocking, octane number and cetane number. *TSO-4d* Use different gaseous fuels based on their composition, calorific value, and other properties. *TSO-4e* Explain uses of NPK fertilizers. *TSO-4f* Select relevant lubricant based on their composition, calorific value, and other properties. *TSO-4g* Determine viscosity, flash, and fire point of given lubricant for its specific use. *TSO-4h* 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**
TSO-5a. Describe Electrolyte and Nonelectrolyte. *TSO-5b.* Describe Metallic and electrolytic conduction. *TSO-5c.* Explain the faraday law of electrolysis. *TSO-5d.* Calculate the mass of metal deposited after passing a certain amount of current. *TSO-5e.* Calculate the emf at different temperature, pressure, and molar concentration. *TSO-5f.* Predict the feasibility of a cell. *TSO-5g.* Explain the working of a cell. *TSO-5h.* Describe corrosion. *TSO-5i.* 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.”

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:T2425103

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 1a. Explain the role of thermodynamics in engineering. *TSO 1b.* Explain thermodynamics systems and its types. *TSO 1c.* Interpret laws of thermodynamics *TSO 1d.* Describe thermodynamic properties, process and cycle *TSO 1e.* Describe different modes of Heat transfer. *TSO 1f.* Use modes of heat transfer for the given situation.	**Unit-1.0 Introduction to Thermodynamics** 1.1 Role of thermodynamics in engineering and science, 1.2 Types of thermodynamics systems 1.3 Specific volume, enthalpy, pressure, temperature, thermodynamic work thermodynamic equilibrium 1.4 First law, second law and zeroth of thermodynamics 1.5 Enthalpy of wet steam, superheated steam, dryness fraction, degree of superheat 1.6 Modes of heat transfer: conduction-composite walls, combined conduction, convection, radiation, application of heat transfer modes	**CO1**
TSO.2a Differentiate between two stroke and four stroke engines *TSO.2b* Describe construction and working of a given diesel engine. *TSO.2c* Describe construction and working of a given petrol engine *TSO.2d* Calculate brake thermal efficiency of an IC engines. *TSO.2e* Identify simple faults in the given engine. *TSO.2f* Suggest remedial measures to rectify the given fault *TSO.2g* Calculate coefficient of performance and of tonnage capacity of an air conditioning system *TSO.2h* Explain construction and working of a given refrigeration system. *TSO.2i* Describe the troubleshooting procedure of a given refrigeration system and air-conditioning system.	**Unit-2.0 Internal Combustion Engine and Refrigeration** 2.1 Types of internal combustion engines- S.I. and C.I. Engines, 2.2 Construction and working two stroke and four stroke petrol engines and two stroke and four stroke diesel engines 2.3 BP, heat supplied and brake thermal efficiency of IC engines. 2.4 Common faults in IC engines, remedial measures to rectify the faults 2.5 **Air pollution** due to IC engines. 2.6 Heat engine, concept of refrigeration, ton of refrigeration, unit of refrigeration, COP 2.7 Major components of vapor compression systems, heat pump, Carnot cycle, Carnot efficiency, 2.8 Types of refrigerants 2.9 Types of air conditioning systems - window, package, central air-conditioning systems 2.10 Domestic refrigerator. 2.11 Basic fault finding in refrigerator and window air-conditioner. 2.12 Methods of energy saving in refrigeration and air-conditioning systems.	**CO2**
TSO 3a. Classify engineering materials. *TSO 3b.* Select engineering materials as per the given situation	**Unit-3.0 Engineering Materials** Introduction to engineering materials, classification of materials	**CO3**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 3c. Describe different properties of the given material. *TSO 3d.* Identify the properties of a given material. *TSO 3e.* Differentiate between metallic and nonmetallic material	3.1 **Metallic materials** • Ferrous alloys- carbon steel, low-alloy steel, tool steel, stainless steel, cast iron • Aluminum alloys, nickel alloys, copper alloys, titanium alloys, • Magnetic, dielectric and superconducting materials 3.2 **Non-metallic materials** • Ceramics – types and applications • Polymers-thermoplastic polymers, thermosetting polymers, elastomers • Metallic glasses: types, glass forming ability of alloys, melt spinning process • Composites-particulate composites, fibrous composites, laminated composites 3.3 **Mechanical properties** Tensile strength, elasticity, plasticity, hardness, toughness, brittleness, stiffness, ductility, malleability, cohesion, impact strength, fatigue, creep, hooke's law, poisson's ratio 3.4 **Magnetic properties of materials** Intensity of magnetization, magnetic field (h) or magnetic intensity, magnetic susceptibility, retentivity, coercivity 3.5 **Optical properties of materials-** elastic properties of materials, dielectric properties of materials 3.6 **Physical properties of materials** Electrical conductivity, melting temperature of material, semiconductors, thermal conductivity, fusibility, reluctance (as magnetic properties), density, melting point and boiling point.	
TSO.4a Select machine tool as per the given job. *TSO.4b* Use machine tools for the given job. *TSO.4c* Explain different operation performed on the given machine tool. *TSO.4d* Select welding equipment for the given job *TSO.4e* Explain working of arc and gas welding *TSO.4f* Explain brazing and soldering process *TSO.4g* Describe the procedure for casting of given job. *TSO.4h* Explain concept of various metal forming processes. *TSO.4i* Identify metal forming process for the given job.	**Unit-4.0 Manufacturing Processes and Machine Tools** 4.1 Basic machine tools. • Introduction to lathe, drill, milling and grinding machines. • Types of operations / jobs which can be performed on machine tools listed above. 4.2 Metal joining processes. • Welding-types, working set up of arc and gas welding, precautions and safety during arc and gas welding. • Brazing and soldering-general set up, applications. 4.3 Foundry- concept, process of casting a component, applications.	**CO4**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO.4j Prepare a simple job with ABS material using 3D printer *TSO.4k* Select suitable 3D Printer and software for the given application with justification.	4.4 Basic metal forming processes-bending, rolling, forging and extrusion –concept and its application 4.5 Additive manufacturing techniques-introduction to various additive manufacturing processes-stereo-lithography, LOM, FDM, SLS, SLM, Binder Jet technology, Direct Energy Deposition 4.6 FDM based 3D printer, its working and construction, Process parameters	
TSO 5a. Identify different mode of power transmission. *TSO 5b.* Select suitable power transmission mode for given application. *TSO 5c.* Identify the different types of Brake, Clutch and Coupling. *TSO 5d.* Explain with sketches construction and working of given brake, clutch and coupling *TSO 5e.* Explain the types of belts and its velocity ratio.	**Unit-5 Power Transmission** 5.1 Belt drives - flat belt and v– belt drive, ropes and chain, velocity ratio slip, length of the belt, open belt and cross belt drives. Ratio of friction tensions, centrifugal tension in a belt Power transmitted by belts and ropes, Initial tensions in the belt 5.2 Gear drives-classification, simple, compound – reverted and epicyclic gear trains, their selection for different applications, gear trains velocity ratio, velocity ratio, gear ratio, 5.3 Couplings- muff coupling and flange coupling joints-cotter joint and knuckle joint 5.4 Helical springs (closed and open coil) 5.5 Friction clutches: single plate, multi plate, cone clutch, variable speed clutch, positive drive clutches: claw and jaw clutch. (construction and working) 5.6 Brakes: shoe brake, internal expanding and disc brakes. (construction and working) 5.7 Fasteners: keys, nut-bolt connections, screws, rivets	**CO5**

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

K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical: P2425103

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
LSO 1.1. Calculate thermal conductivity for thick & composite slab	*1*	Determine the thermal conductivity of a thick slab	CO1
	2	Determine the thermal conductivity of Composite Wall.	CO1
LSO 2.1. Dismantle and assemble given engines	*3*	Dismantle and Assemble two stroke and four stroke petrol engines.	CO2
LSO 2.2. Identify the various component in IC engines	*4*	Identify the various processes and components of two stroke and four stroke petrol engines.	CO2
LSO 2.3. Use trainer to Design and assemble given circuit	*5*	Design and assemble a circuit that extends and retracts a single acting (spring return) and double acting cylinder on a given trainer.	CO2
LSO 2.4. Determine the properties and coefficient of performance.	*6*	Determine properties of air (Dry bulb temperature, Wet bulb temperature, Humidity)	CO2

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
	7	Determine of coefficient of performance and of tonnage capacity of an Air conditioning system	CO2
LSO 2.5. Identify components of refrigeration system.	*8*	Identify the components of refrigeration system and air conditioning system	CO2
LSO 3.1. Identify the microstructure of different materials	*9*	Use microscope to identify microstructure of material	CO3
LSO 3.2. Use hardness testing machine	*10*	Measure hardness of given material using given hardness tester.	CO3
LSO 3.3. Use tensile testing machine	*11*	Measure tensile strength of given metallic materials using tensile test method.	CO3
	12	Determination of tensile properties of composite	CO3
LSO 3.4. Use compressive testing material	*13*	Determination of compressive properties and shear properties of unidirectional lamina	CO3
LSO 3.5. Use charpy impact machine	*14*	Use the charpy impact test to measure the values of the impact energy (also called notch toughness) of steel samples.	CO3
LSOs 4.1 Use lathe machine	*15*	Prepare a plain turning and taper turning job as per the given drawing.	CO4
LSOs 4.2 Use milling machine	*16*	Prepare a job on the milling machine as per the given drawing.	CO4
LSOs 4.3 Use of gas & arc welding for given metal.	*17*	Perform gas welding operation on the given job.	CO4
	18	Perform arc welding operation on the given job	CO4
LSOs 4.4 Use soldering and brazing equipment	*19*	Perform soldering and brazing operation on the given job.	CO4
LSOs 4.5 Use sheet metal operation for the given job.	*20*	Prepare a sheet metal product (Funnel) and report the various parameters for the various passes during the rolling of the given metal piece.	CO4
LSOs 4.6 Use different foundry tools and equipment.	*21*	Select different foundry tools and equipment for a given job	CO4
LSOs 4.7 Prepare sand mold	*22*	Identify various stages of casting through demonstration of Sand-Casting Process.	CO4
	23	Prepare of a sand mold with a simple pattern	CO4
LSOs 4.8 Prepare solid pattern	*24*	Produce wooden solid pattern as per given drawings.	CO4
LSOs 4.9 Produce a component using available 3D printer	*25*	Print one single component on available 3D printer with PLA/ABS material	CO4
LSO 5.1. Identify the various component in Clutches.	*26*	Dismantle and assemble different clutches as per the given instruction	CO5
LSO 5.2. Select different drives for the given job	*27*	Use belt, chain and gear drive for the given job.	CO5
LSO 5.3. Determine velocity ratio of given drives	*28*	Calculate the velocity ratio for given compound gear train	CO5
	29	Determine the velocity ratio of a flat belt drive.	CO5

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
	30	Determine the velocity ratio of simple gear drive.	CO5
LSO 5.4. Identify the various component in brakes and couplings	*31*	Dismantle and Assemble different brakes and couplings as per the given instruction	CO5

L) Suggested Term Work and Self Learning: S2425103 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.

a. Calculate the refrigeration capacity of a given room in ton.
b. Write 05 uses of sheet metal in detail in our daily life
c. Identify the types of manufacturing process used in a given 10 samples.
d. Select the power transmitting element for the five situations with reason.
e. Draw and Study circuit diagram for starting motor of IC engines and Battery Ignition system.
f. Collect videos, animations showing working of different types of air compressors.
g. Make a troubleshooting chart for Domestic refrigerators.
h. Collect manufacturer's specifications for various refrigeration controls.

b. Micro Projects:

- Print two pieces of same components using ABS and PLA and compare their strength, surface roughness, weight, cost.
- Build model of different gears from cardboard.
- Build model of IC Engine parts from cardboard.
- Prepare cast product with wax material
- Make models of controls demonstrating their functions at least 3 under guidance of instructor/teacher in lab/ workshop.
- Prepare a given product using arc welding/gas welding.
- Market survey on gears and collect information of different types of gear used in machine equipment, prepare a chart showing different gears and its uses.
- Prepare a report on refrigerant used in domestic refrigeration, car refrigeration system etc.
- Prepare a report on emission of petrol engine and diesel engine.

c. Other Activities:

1. Seminar Topics:
   - Refrigerants used in Commercial air conditioning & Refrigeration system
   - Properties of PLA and ABS 3D printing materials.
   - Sheet metal operations and its application.
   - Recent advancement in brake and its advantages.
   - Classification of engineering materials and its properties.
   - Application of solar energy as a power source.
   - Future scope of **renewable energy** source as power generation system.

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) TSO1.a Define communication and its different forms. TSO1.b Explain the elements of communication with Case Studies from Bhagwat Geeta's conversation between Krishna and Arjun before the war. (IKS) TSO1.c Explain the linkages between different stages of communication with the help of a diagram. TSO1.d Apply the principles of effective communication and state two examples of communication from Ramayana (IKS) TSO1.e State eight for explaining different types of barriers to communication Case Studies from Mahabharata - the conversation between Kauravas and Pandavas in the war field (IKS) TSO1.f Identify the barriers to communication. TSO1.g Suggest the ways to overcome/minimize communication barriers.	**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. 1.5 Case Studies from: • Bhagwat Geeta's conversation between Krishna and Arjun before the war (IKS) • Mahabharata the conversation between Kauravas and Pandavas in the war field (IKS)	**CO1** **CO2**
TSO 2a. Distinguish between formal and informal communication Case Studies from Bhagwat Geeta and the different conversations of Krishna and Arjun during the war (IKS). *TSO 2b.* Illustrate the types of Formal Communication with examples. *TSO 2c.* Define verbal & non-verbal communication. *TSO 2d.* Explain the advantages of oral and written Communication. *TSO 2e.* Interpret non-verbal codes from Mahabharata (IKS) *TSO 2f.* Explain the role of tables, charts & graphs in communication. *TSO 2g.* Differentiate Intrapersonal and Interpersonal Communication with Case Studies *TSO 2h.* List the advantages and disadvantages of Group Communication.	**Unit- 2.0 Types of Communication** **2.1** Based on organizational structure: Formal (Vertical, Horizontal, Diagonal), Informal (Grapevine) 2.2 Based on the 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 Based on the number of people involved: Interpersonal, and Group Communication. 2.4 Case Studies from Bhagwat Geeta‘s different conversations with Krishna and Arjun during the war (IKS).	**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.	**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)
TSO 3d. Find out idioms and phrases used in the 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	Units-1.0: सम्प्रेषण सिद्धान्त एवं व्यवहार 1.1 सम्प्रेषण : परिचय , अर्थ एवं परिभाषा 1.2 सम्प्रेषण की प्रक्रिया एवं तत्त्व 1.3 सम्प्रेषण के प्रकार : औपचारिक एवं अनौपचारिक, शाब्दिक एवं अशाब्दिक 1.4 प्रभावशाली सम्प्रेषण के सिद्धांत एवं सम्प्रेषण व्यवधान	**CO1, CO2, CO3**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
अपने वार्तालाप में कर सकेंगे.	कुरुक्षेत्र में श्रीकृष्ण- अर्जुन संवाद महाभारत युद्ध प्रारम्भ होने से पहले कुरुक्षेत्र में श्री कृष्ण ने अर्जुन के प्रश्नों के उत्तर देते हुए जीवन के सूत्र समझाए थे।ये उपदेश श्रीमद्भागव गीता में मिलते	
TSO 2a तकनीकी कौशल एवं व्यवहार कौशल में अन्तर बता पाएँगे . TSO 2b व्यव्हार कौशल का म महत्व स्पष्ट कर पाएँगे . TSO 2c आत्म जागरूकता एवं आत्म विश्लेषण का विवेचन सोदाहरण कर पाएँगे . TSO 2d भावनात्मक बुद्धिमत्ता एवं करुणा, अनुकूलनशीलता एवं लचीलापन का विकास कर पाएँगे. TSO 2e दैनिक जीवन में अनुकूलनशीलता एवं लचीलापन को आत्मसात कर पाएँगे .	Unit-2.0: व्यावसायिक उत्कृष्टता हेतु व्यवहार कौशल 2.1 परिचय : तकनीकी कौशल एवं व्यवहार कौशल 2.2 व्यवहार कौशल का महत्त्व 2.3 जीवन कौशल : आत्म जागरूकता एवं आत्म विश्लेषण 2.4 वनात्मक बुद्धिमत्ता एवं करुणा, अनुकूलनशीलता एवं लचीलापन, व्यवहार कौशल का उपयोग श्रीराम केवट संवाद श्रीराम जब लक्ष्मण और सीता के साथ वन गमन के लिए प्रस्थान करते हैं तब सरयू नदी के पार उतारने लिए केवट से अनुरोध करते हैं।	**CO1**
TSO 3aपठित गद्यांश एवं पद्यांश से प्राप्त नयी शब्दावली विकसित कर पाएँगे TSO 3b दिए गये कहानियों, कविताओं एवं निबंधों का सारांश अपने शब्दों में लिख पाएँगे. TSO 3c दिए गये कहानियों, कविताओं एवं निबंधों में प्रयुक्त मुहावरों एवं अलंकारों को बता पाएँगे . TSO 3d कविताओं का भावार्थ स्पष्ट कर पाएँगे .	Unit-3.0: 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 3.4 नर हो न निराश करो मन को – मैथिलीशरण गुप्त 3.5 कबीर के दोहे -काल्ह करे सो आज कर , जाति न पूछो साधू की , ऐसी वाणी बोलिए	**CO4**
TSO 4a अपनी शाखा से सम्बन्धित तकनीकी शब्दावली का चयन कर पाएँगे . TSO 4b पर्यायवाची एवं विलोम शब्दों से सम्बंधित शब्दावली तैयार कर सकेंगे . TSO 4c दिये गये गद्यांशों में विराम चिह्नों का सही प्रयोग कर पाएँगे .	Unit-4.0: शब्दावली एवं व्याकरण 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**
TSO 5a दिए गये दिए गये गद्यांशों का संक्षेपण कर पाएँगे . TSO 5b विभिन्न प्रकार के पत्रों, आवेदनों ,सूचनाओं, विज्ञप्तियों को लिख पाएँगे . TSO 5c अपनी शाखा से सम्बंधित प्रतिवेदन लेखन कर पाएँगे . TSO 5d अपने संस्थान में हुए आयोजनों का प्रतिवेदन लिख पाएँगे.	Unit-5.0: 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's 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, words, etc.	7	Sounds of minimal pairs, syllables 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 based on stress and intonation marks.	9	Stress and intonation.	CO2
LSO10.a Apply the paralanguage codes in verbal dialogues to show 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, 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 texts aloud with proper pauses 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 jargon 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

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)
TSO 1a. Use Drawing Instruments to prepare 2D drawings manually. *TSO 1b.* Use different lines and annotations for a given situation. *TSO 1c.* Draw engineering scale for the given situation. *TSO 1d.* Choose appropriate scale factor for the drawing as per given situation. *TSO 1e.* Dimension the given geometric figure using IS SP-46 standard. *TSO 1f.* Draw the given regular geometric figure with tangents and normal. *TSO 1g.* 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 IS 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**
TSO 2a. Explain the different types of projections & their uses. *TSO 2b.* Draw the orthographic projections of different objects *TSO 2c.* 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**
TSO 3a. Explain the Isometric Projection, Isometric view and Isometric Scale. *TSO 3b.* Draw isometric dimensioning on the given isometric view. *TSO 3c.* Explain the Methods of constructing isometric drawing *TSO 3d.* Draw Isometric View of the given object containing elements like rectangular,	**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 projection of objects containing rectangular, circular, cylindrical shapes and slots on sloping and plane surfaces.	**CO1, CO3, CO4**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
circular, cylindrical shapes and slots on sloping and plane surfaces. *TSO 3e.* Convert the given orthographic views into isometric View/Projection.	3.5 Conversion of orthographic views into isometric View/projection.	
TSO 4a. Sketch the given straight line, square, rectangle, circle and arc. *TSO 4b.* Sketch the given simple orthographic and isometric views of the given part. *TSO 4c.* 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**
TSO 5a. Use computer aided drafting software for creating the institute Drawing Template. *TSO 5b.* 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**
TSO 6a. Use computer aided drafting software for creating orthographic views of the given object. *TSO 6b.* Use computer aided drafting software for creating isometric views of the given object. *TSO 6c.* 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 views 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)
LSO 1.1. Use manual drawing instruments *LSO 1.2.* 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
LSO 2.1. Draw conic sections using manually drawing instruments. *LSO 2.2.* 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
LSO 3.1. Apply concepts of orthographic projection in drawing the given simple object on drawing sheet. *LSO 3.2.* 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
LSO 4.1. 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
LSO 5.1. 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
LSO 6.1. Visualize the 3D shape of the given object. *LSO 6.2.* Convert the given 2D figures/views into 3D object.	6.	Convert the orthographic views of an object to isometric view. (Two problems)	CO3, CO4
LSO 7.1. 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
LSO 8.1. 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
LSO 9.1. 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
LSO 10.1. Use computer aided drafting software to create and modify a template. *LSO 10.2.* 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)
LSO 10.3. Insert text in the existing AutoCAD drawing			
LSO 11.1. Use computer aided drafting software to create and modify simple 2D entities. *LSO 11.2.* 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
LSO 12.1. 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
LSO 13.1. 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
LSO 14.1. Use computer aided drafting software to create and modify 2D entities. *LSO 14.2.* 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
LSO 15.1. 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.

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J) Theory Session Outcomes (TSOs) and Unit: (Not Applicable)

K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical:P2425106

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
LSO 1.1 Use relevant wood working tools and instruments as per given job. *LSO 1.2* Undertake wood working operations like marking, cutting, plaining and finishing etc. *LSO 1.3* Prepare given wooden joints as per given sketch / drawing.	1.	1.1 Prepare one simple job of wood working comprising of marking, cutting, plaining and finishing as per given drawing/sketch. 1.2 Prepare any two wooden joints safely as per given drawing using suitable tools- - Mortise joint - Dovetail joint - Half lap joint. - Cross joint - Tenon Joint - Bridle joint	CO-1
LSO 2.1 Prepare list of relevant tools, equipment, machines and measuring instruments used in fitting shop as per given situation. *LSO 2.2* Perform marking, cutting, filing, punching, drilling, and finishing operations as per given fitting job safely. *LSO 2.3* Select relevant single point cutting tool and associated parameters for a given turning job. *LSO 2.4* Undertake turning operations economically and safely in a given situation	2.	2.1 Selection of different fitting tools, equipment, machines and measuring instruments in a given situation. 2.2 Prepare one simple fitting job (square of 50 mm side /square of 40 mm side with 5mm drill at Centre) comprising of marking, filing, punching, drilling, and finishing as per given drawing/sketch. 2.3 Prepare given step turning / taper turning job as per given sketch/ drawing.	CO-2
LSO 3.1 Select suitable joining process in a given situation. *LSO 3.2* Use Personal Protective Equipment in welding shop. *LSO 3.3* Perform gas welding operations in a given situation to prepare joint safely. *LSO 3.4* Prepare given welding joint safely using arc welding in a given situation. *LSO 3.5* Carryout soldering / brazing operation(s) as per given job.	3.	3.1 Prepare simple job of joining by using suitable joining process as per given sketch. 3.2 Prepare a Butt joint / lap joint using gas welding as per given sketch / drawing safely. 3.3 Prepare a Butt joint / lap joint by arc welding using suitable welding parameters as per given sketch / drawing economically and safely. 3.4 Prepare simple job using soldering/ brazing operations as per given drawing.	CO-3

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
*LSO 4.1*Select suitable sheet metal tools, machinery / equipment to complete jobs as per requirements. *LSO 4.2* Select suitable sheet metal operations in a given situation. *LSO 4.3* Perform relevant sheet metal operations such as shearing, bending, drawing, squeezing, snipping, riveting, grooving etc.to prepare utility jobs safely as given sketch/ drawing.	4.	4.1 Prepare one sheet metal job using cutting, bending, edging and joining operations as per given drawing. 4.2 Prepare a sheet metal rectangular tray of dimension of 300X100X50 mm. 4.3 Prepare any one utility job of sheet metal using suitable sheet metal tools and operations.	CO-4
*LSO 5.1*Select suitable black smithy tools and operations to complete jobs as per requirements. *LSO 5.2* Perform various operations safely to prepare given black smithy job(s). *LSO 5.3*Follow safety procedures and use personal safety equipment during black smithy.	5.	5.1 Selection of various black smithy tools, equipment, machines and measuring instruments used as per given situations. 5.2 Prepare S shaped hook from given MS rod of length 220 mm and diameter 6 mm in black smithy shop. 5.3 Prepare a garden trowel, sickle, and shovel as per the instruction provided by the instructor	CO-5

L) Suggested Term Work and Self Learning: S2425106 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:

1. Visit different classrooms and prepare a list of wooden joints used in sitting furniture.
2. List the various lathe operations and their applications used in machine repairing shop.
3. Visit nearby welding shop and prepare a list of welding consumables used for various types of welding.
4. Observe small agricultural equipment used nearby you and repair it.
5. Prepare a list of different types of sheets with specification available in market.

c. Other Activities:

1. Seminar Topics:

- Safety practices and use of personal safety equipment in workshops.
- Different types of machines tools and their functions used in workshops.
- Operating precautions and safety norms for various types of machine and tools in workshops

2. Visits:

- Visit any nearby machine shop / carpentry shop / fitting shops /welding shops and sheet metal workshop and prepare a report.
- Make a detailed market survey of local dealers for procurement of workshop tools, equipment machinery and raw materials.

Sustainability, Multidisciplinary aspects, Society connect, Indian Knowledge System (IKS) and others must be integrated appropriately.

II) Theory Session Outcomes (TSOs) and Units: T2400107

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 1a. Define concepts-values and ethics and attitude, development of attitudes *TSO 1b.* Identify situations depicting values such as humanity, honesty, punctuality, respect, peace, empathy *TSO 1c.* Identify situations depicting ethics, healthy competition, integrity, truthfulness,	**Unit-1.0 Values and Ethics in Day to Day Life** 1.1. Values- Definition and examples, Ethics- definition and examples, Concept of attitude and development of attitude 1.2. Importance of values and ethics in day to day activities and at workplace- Ethical ways of communication, environmental considerations in engineering processes, Basic concept of Carbon footprint, ethics at workplace 1.3. Examples of situations depicting values- based decisions and ethical behavior in day to Day life	**CO1**
TSO 2a. Identify the relevance of profession to society and environment *TSO 2b.* Identify the need of values and ethics in profession related activities *TSO 2c.* Identify Ethical conflicts	**Unit-2.0 Values and Ethics in Profession** 2.1 Relevance of profession to society 2.2 ethical principles such as respecting others and ourselves, respecting the rights of others, keeping promises, avoiding unnecessary problems to others, avoiding cheating and dishonesty, showing gratitude towards others and encouraging them to work 2.3 Identification of activities and related ethical and unethical behavior for professional activities in their area of work 2.4 Examples of situations depicting values- based decisions and ethical behavior	**CO1, CO2**

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

K) Suggested Activities and Self-Learning: Reading books related to values and ethics/Epics/ Daily news and discussions in group

a. Assignments: Preparation for group discussion, panel discussion, role play, case study, seminar, skits

b. Micro Projects: Skits development and performance, poster making,

c. Activities: Role Play, Case studies, Debates, Group Discussion,

d. Suggested Seminar/ Debates on Topics such as:

i. charters of professions
ii. Importance of Values and ethics in identified profession
iii. Issues of ethical conflicts- Professional rivalry,
iv. Identified issues from Chanakya Neeti
v. Ethics in scriptures such as Kabir ke Dohe etc.
vi. Lessons on ethics from religious scriptures
vii. Issued based on Happenings reported in Daily news

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J) Theory Session Outcomes (TSOs) and Units:

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO.1a Explain ancient history and development of yoga in India *TSO.1b* Compare the ancient Indian games with the modern games. *TSO.1c* Differentiate between given terms used in sports *TSO.1d* Describe the different aspects of Mental Toughness *TSO.1e* Use Imagery Training for sports *TSO.1f* Apply motivation techniques to motivate students in sports. *TSO.1g* Use concentration techniques for playing and exercising. *TSO.1h* Manage Stress, Anxiety and Arousal during sports. *TSO.1i* Select sports and exercise for healing and developing health and mental wellness *TSO.1j* Describe the impact of parents' involvement in their children's sports activities *TSO.1k* Select sports and exercises for physically challenged as per their need.	**Unit-1.0 Sports and Exercises** 1.1 Historical development of physical activities and sports in India, Indian ancient games- Kho-Kho and Kabaddi, Chariot races, riding elephants and horse, swordsmanship, wrestling, boxing, atyapatya, archery, dancing, dands baithak, malkhamb, lezim, lathi etc 1.2 Origin of traditional sports, 3rd century BCE- martial arts and archery, indoor games like Chess and Snakes & Ladders have origins in ancient India, in the form of games of Chaturanga and Gyan Chauper, 1.3 Dholavira, the world's oldest terraced arena 3000 BC 1.4 Definition of play, game, sports, exercise, psychology, sports psychology and exercise psychology, psychology and common sense. 1.5 Mental toughness- mind, Imagery, use of imagery and imagery in sports, types of imagery (visual, kinesthetic, auditory and olfactory) 1.6 Motivation in sport and goal setting in sports 1.7 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 1.8 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. 1.9 Adaptation of sports and exercises for physically challenged students in all levels.	**CO1, CO4**
TSO.2a Explain ancient history and development of yoga in India *TSO.2b* Identify the physiology of yoga and meditation. *TSO.2c* Evaluate meditation and yoga as a healing modality. *TSO.2d* Select asanas and pranayama as per need. *TSO.2e* Describe the effect of yoga and meditation on ageing, stress and hypertension.	**Unit-2.0 Yoga and Meditation** 2.1 Origin of yoga, History and development of yoga, Adi yogi, evidences of yoga in pre-Vedic period (2700 B.C.), Vedic Period, Pre-Classical Period, Classical Period- Patanjali's period, Modern Period.	**CO2, CO4**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO.2f Select mediation techniques as per the need. *TSO.2g* Explain Bandha, Mudra and Chakra *TSO.2h* Enumerate the steps of Suryanamaskar. *TSO.2i* Select Yoga and Meditation for physically challenged as per their need.	2.2 Yoga practices and the related literature- Vedas (4), Upanishads (108), Smritis, teachings of Buddhism, Jainism, Panini, Epics (2), Puranas (18) 2.3 Importance of Yoga & Mediation, meaning of the term Yoga and Meditation, Fundamentals Principles of Yoga & Fitness training, Eight Limbs of Yoga 2.4 Difference between yoga asana and physical exercises, Difference between yoga and meditation 2.5 Role of Yoga and Meditation in Purificatory Process, in character building, developing concentration, will power and discipline 2.6 Types of Yoga Practices - Asanas, Pranayama, Meditation 2.7 Mindfulness – knowing the mind, training the mind, feeling the mind 2.8 Different Methods of meditation, Physiology of meditation, Mental, physical and emotional benefits of Asanas, Pranayama, Concentration and Meditation 2.9 Bandha, Mudra and Chakra 2.10 Effects of Asanas and pranayama on physiology of human body 2.11 Importance of "Suryanamaskar 2.12 Adaptation of Yoga and meditations for physically challenged students in all levels. 2.13 Yoga Asanas Do's and Don'ts for Beginners	
TSO.3a Explain the ancient Indian ayurvedic methods for fitness and wellness *TSO.3b* Identify the different factors affecting the fitness and wellness in the given situation *TSO.3c* Use different methods to maintain Health and Wellness *TSO.3d* Explain the components of Balance Diet *TSO.3e* Identify the causes of stress and anxiety in the given situation *TSO.3f* Use stress reduction techniques to manage Stress and Anxiety *TSO.3g* Manage Stress, Anxiety and Depression in the given situation *TSO.3h* Select recovery process for energy replenishment after exercise.	**Unit 3.0 Fitness and Wellness** 3.1 Evolution of wellness, 3,000-1,500 BC: Ayurveda –holistic system, Tailored Ayurvedic regimens as per unique constitution of each person (their nutritional, exercise, social interaction and hygiene needs) – with the goal of maintaining a balance that prevents illness. 3.2 Meaning, Importance, Definition and dimensions of Health and Wellness (WHO/Yoga) 3.3 Factors affecting Fitness and Wellness 3.4 Role of Physical Activities and Recreational Games in maintaining physiological and psychological wellbeing. 3.5 Different Methods to Maintain Health, Wellness and to enhance mood 3.6 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 3.7 Anxiety, Stress and Aging-Meaning of Anxiety, Stress and Aging, Types and Causes of Stress, 3.8 Stress, anxiety and depression reduction with exercise, yoga and meditation 3.9 Energy Continuum and Recovery Process, Metabolism and exercise, Recovery from exercise, Replenishment of energy stores during	**CO3, CO4**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
	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)
LSO 1.1. Perform various sports activities for overall growth and development *LSO 1.2.* 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, Kabaddi and cycling to 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.	
LSO 2.1 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	
	11.	Perform following asnas with correct posture: Vakrasana,Chakrasana,Paschimottanasana,Ugrasana,Gomukhasana, Padmasana, Siddhasana, Bhadrasana, Swastikkasana, Vajrasana, Supta-Vajrasana, Yoga-Mudra	
	12.	MUDRAS & SURIYANAMASKAR Brahma-Mudra, Simha-Mudra, Shanmugi Mudra, Viparithakarani-Mudra, Ashwsini-Mudra, Suriyanamaskar	
	13.	BANDHAS Jalandhara-Bandha, Jihva-Banda, 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	

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
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.

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

b. Micro Projects:

i. 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.
ii. Visit different sports club, gyms, and schools and identify various measure taken by them for Fitness and wellness of students/ members
iii. Visit different sports club, gyms, and schools and identify various measure taken by them for Fitness and wellness of physically challenged students/ members
iv. Identify which type of stress, anxiety and depression students are facing and steps and solutions to overcome this.