# Curriculum of Diploma Programme

# in

# Electrical 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 |
| **2400102B** | **ASC** | **Applied Physics -B** (CSE, AIML, EE, ELX, ELX (R)) | 03 | - | 04 | 02 | 09 | 06 |
| **2420104** | **PCC** | **Basic Electrical Engg.** | 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 |
| **2418105** | **BCC** | **Fundamentals of IT and C Programming** (ELX, ELX (R), AE, FCT, EE) | 03 | - | 04 | 02 | 09 | 06 |
| **2420105** | **BEC** | **Electrical & Electronics Workshop** (EE, ELX, CSE, AIML) | - | - | 04 | 02 | 06 | 03 |
| **2400008** | **NRC** | **Sports, Yoga and Meditation** (Common for All Programmes) | - | - | 01 | 01 | 02 | 01 |
| **2400009** | **NRC** | **Open Educational Resources** | 01 | - | - | - | 01 | 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 ofcourse | 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** | 30 | 70 | 20 | 30 | - | - | 150 |
| **2400102B** | **ASC** | **Applied Physics –B** (CSE, AIML, EE, ELX, ELX (R)) | 30 | 70 | 20 | 30 | 20 | 30 | 200 |
| **2420104** | **PCC** | **Basic Electrical Engg.** | 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 |
| **2418105** | **BCC** | **Fundamentals of IT and C Programming** | 30 | 70 | 20 | 30 | 20 | 30 | 200 |
| **2420105** | **BEC** | **Electrical & Electronics Workshop** (EE, ELX, CSE, AIML) | - | - | 20 | 30 | 20 | 30 | 100 |
| **2400008** | **NRC** | **Sports, Yoga and Meditation** (Common for All Programmes) | - | - | 10 | - | 06 | 09 | 25 |
| **2400009** | **NRC** | **Open Educational Resources** | 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:**

- 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.<br>*TSO 1b.* Solve simple given problems based on the Algebra of matrices.<br>*TSO 1c.* Find the inverse of the matrix by applying the concept of Adjoint of the matrix.<br>*TSO 1d.* Find a solution of simultaneous equations in three variables using the concept of the Matrix Inversion method.<br>*TSO 1e.* Solve problems based on the sum, and subtraction of Vectors.<br>*TSO 1f.* Solve simple problems related to Scalar and Vector product of vectors.<br>*TSO 1g.* Solve simultaneous equations by using concepts given in Ancient Indian Mathematics. (IKS) | **Unit-1.0 Algebra Determinant**<br>1.1 Concept and properties of determinant.<br>1.2 Solutions of simultaneous equations in three Unknowns by Cramer's rule.<br>**Matrices**<br>1.3 Algebra of matrices (Addition, Subtraction, Multiplication by Scalar, and Multiplication of Two matrices).<br>1.4 Transpose, Adjoint and Inverse of Matrix.<br>1.5 Solutions of simultaneous equations of a Matrix of order 3 x3 by Inversion method.<br>**Vectors**<br>1.6 Position vector.<br>1.7 Algebra of Vectors (Addition, Subtraction, Scalar Multiplication with vector).<br>1.8 Scalar product.<br>1.9 Vector product.<br>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.<br>*TSO 2b.* Solve simple problems based on Domain and range of function.<br>*TSO 2c.* Evaluate problems of limit function based on Indeterminate form.<br>*TSO 2d.* Check the continuity of a function at a point.<br>*TSO 2e.* Find the differentiation of some simple functions (sinx, cosx, tanx, and e^x) by the first principle.<br>*TSO 2f.* Calculate the derivative of given Algebraic, trigonometric, and exponential functions.<br>*TSO 2g.* Find the derivative of the given two functions' sum, product, and quotient.<br>*TSO 2h.* Find the differentiation of given composite functions by applying the concept of the Chain rule. | **Unit-2.0 Differential Calculus**<br>**Function and Limit**<br>2.1 Concept of function.<br>2.2 Different type of functions.<br>2.3 Domain and Range of Function.<br>2.4 Concept of Limits and its evaluation.<br>**Continuity**<br>2.5 Concept of continuity with simple problems.<br>**Differentiation**<br>2.6 Differentiation by First Principle.<br>2.7 Differentiation of Algebraic, trigonometric, Exponential, and Logarithmic functions.<br>2.8 Differentiation of sum, product, and quotient of two functions.<br>2.9 Differentiation of composite functions by Chain Rule.<br>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.<br>*TSO 2j.* Familiar with the concept of calculus given in Indian Mathematics. (IKS) | 2.11 Implicit differentiation.<br>2.12 Differentiation of Parametric Functions.<br>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.<br>*TSO 3b.* Solve simple problems based on Rolle's Theorem and Mean Value Theorem.<br>*TSO 3c.* Apply the concept of Rate of change to solve simple problems related to velocity, and acceleration.<br>*TSO 3d.* Apply rules of derivative to solve given applied problems related to tangent and normal.<br>*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**<br>3.1 Successive differentiation up to second order.<br>3.2 Rolle's Theorem and Mean Value Theorem (without proof) with examples.<br>3.3 Rate of change of quantities.<br>3.4 Equation of Tangent and Normal.<br>3.5 Maxima and Minima.<br>3.6 Radius of curvature. | **CO3** |
| *TSO 4a.* Calculate the angle between the given two lines and also find the slope.<br>*TSO 4b.* Formulate an equation of straight lines of different forms.<br>*TSO 4c.* Find the perpendicular distance of a straight line from a given point and the perpendicular distance between two parallel lines.<br>*TSO 4d.* Use the geometry given in Sulabasutras to solve the given problems.<br>*TSO 4e.* Solve simple problems related to Circles and Parabola for engineering applications.<br>*TSO 4f.* Solve given simple problems related to Ellipse for engineering applications. | **Unit-4.0 Co-ordinate Geometry**<br>**Co-ordinate systems**<br>4.1 Introduction of Co-ordinate Systems.<br>**Straight lines**<br>4.2 Slope of a line, the angle between two lines.<br>**Various forms of Straight Lines**<br>4.3 Point-slope form, Two-point form, Slope intercept form, Intercept form, Normal form, General form.<br>4.4 Perpendicular distance of a line from a point, perpendicular distance between two parallel lines.<br>4.5 Geometry in Sulabasutras in Indian Knowledge System (construction of the square, circling the square). (Indian Mathematics).<br>**Conic Section**<br>4.6 Introduction of Conic-Section.<br>4.7 Equation of Circle in standard form.<br>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.<br>*TSO 5b.* Evaluate the Mean, Median, and Mode of the given data for engineering applications.<br>*TSO 5c.* Calculate the Range, Variance, and standard deviation of given data for engineering applications. | **Unit-5.0 Probability and Statistics**<br>**Probability**<br>5.1 Concept of Probability.<br>5.2 Addition and multiplication theorems of Probability.<br>**The measure of Central Tendency**<br>5.3 Mean, Median, Mode.<br>**Measure of Dispersion**<br>5.4 Range, Variance, Standard Deviation. | **CO5** |

| Major Theory Session Outcomes (TSOs) | Units | Relevant COs Number(s) |
|---|---|---|
| *TSO 5d.* Calculate the Coefficient of variance of given data for engineering applications. | 5.5 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.<br>1.2 Determine the inverse of a non-singular matrix by using open-source software.<br>1.3 Apply the Matrix Inversion method to determine currents through various branches of given electrical networks.<br>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.<br>• Inverse of the non-singular matrix using open-source software.<br>• Calculation of current in electrical networks by Matrix Inversion method.<br>• 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.<br>2.2 Verify geometrically the continuity of a given function at a point.<br>2.3 Determine the concavity and convexity of a given continuous function for a given engineering application.<br>2.4 Find the acceleration of the given moving body at a time t. | 2. | • Geometrical interpretation of domain and range of a function.<br>• Geometrical interpretation of limit and continuity.<br>• Branch-specific engineering application of derivative.<br>• 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.<br>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.<br>3.3 Use the concept of derivative to find the slope of a bending curve for a given engineering problem.<br>3.4 Use the concept of tangent and normal to solve the given problem of Engineering Drawing.<br>3.5 Use the concepts of Maxima and Minima to obtain optimum value for a given engineering problem.<br>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.<br>• Geometrical Interpretation of Lagrange's Mean Value theorem.<br>• Branch-specific engineering application of rate of change of quantities.<br>• Branch-specific engineering applications of tangent and normal.<br>• Branch-specific engineering applications of maxima and minima.<br>• Engineering applications of Radius of curvature. | CO3 |
| 4.1 Apply the concept of Gradient to draw graphs in engineering drawing.<br>4.2 Use the given form of a straight line to calculate the speed, distance, and time of a moving object. | 4. | • Geometrical interpretation of Gradient.<br>• Geometrical Interpretation of lines in various forms.<br>• Geometrical interpretation of the perpendicular distance of a line. | CO4 |

| Outcomes | S. No. | Tutorials Titles | Relevant COs Number(s) |
|---|---|---|---|
| 4.3 Use the concept of Ellipse to prepare a Model of the path of the Planet and its foci. | | • Geometrical representation of conic-section. | |
| 5.1 Use the concept of probability to solve given problems based on Board and playing cards.<br>5.2 Calculate the Standard Deviation for Concrete with the given data. | 5. | • Applications of Probability and related theorems.<br>• 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.

**b. Micro Projects:**

1. Prepare charts displaying the properties of determinants and Matrices.
2. Prepare a chart for the use of Vector algebra to solve problems of the rate of change of the mass of a fluid flow.
3. Draw the graph of functions like $x^2$, $sinx$, $cosx$, $tanx$, and $e^x$ etc analytically on graph paper and verify using suitable open-source software like Sage Math, Math3d, GeoGebra, Wolfram Alpha, and Dplot and prepare a pdf file.

**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: T2400102B

| Major Theory Session Outcomes (TSOs) | Units | Relevant COs Number(s) |
|---|---|---|
| *TSO 1a.* Distinguish between fundamental and derived physical quantity.<br>*TSO 1b.* Estimate the errors in the measurement of given physical quantity.<br>*TSO 1c.* Derive dimensional formula of given physical quantity.<br>*TSO 1d.* Apply dimensional analysis for inter conversion of units.<br>*TSO 1e.* Establish relation among physical quantities using dimensional analysis.<br>*TSO 1f.* Use dimensional analysis to check the correctness of a given equation. | **Unit-1.0 Unit and Measurements**<br>1.1 Physical quantities, fundamentals and derived units and system of units<br>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<br>1.3 Dimensions and dimensional formulae of physical quantities, Principle of homogeneity of dimension in an equation<br>1.4 Applications of dimensions: conversion from one system of units to other, corrections of equations and derivation of simple equations.<br>1.5 Ancient astronomical instruments: Chakra, Dhanuryatra , Yasti and Phalaka yantra . (IKS) | **CO1** |
| *TSO 2a.* Explain the various terms related to SHM.<br>*TSO 2b.* Distinguish between mechanical and electromagnetic waves with examples.<br>*TSO 2c.* Differentiate between longitudinal and transverse waves with examples.<br>*TSO 2d.* Find the relation between the terms used to describe wave motion.<br>*TSO 2e.* Explain the principle of Superposition of waves | **Unit-2.0 Simple Harmonic and Wave Motion**<br>2.1 Periodic and Oscillatory Motion<br>2.2 Simple Harmonic Motion (SHM): Displacement, velocity, acceleration, time period, frequency and their interrelation<br>2.3 Types of waves: Mechanical and Electromagnetic, Transverse and longitudinal waves, wave velocity, frequency and wave length and their relationship, wave equation, amplitude, phase, phase difference, Superposition of waves | **CO2** |
| *TSO 3a.* Derive an expression for electric field experienced by electric charge in the vicinity of another electric charge(s).<br>*TSO 3b.* Differentiate between electric potential and potential difference.<br>*TSO 3c.* Apply Gauss' law to find the electric field intensity due to charge bodies.<br>*TSO 3d.* Describe factors affecting the capacitance of a given capacitor.<br>*TSO 3e.* Find the expression for magnetic field caused by current carrying circular wire at the center. | **Unit-3.0 Electrostatics, Electromagnetism and Electric Current**<br>3.1 Electric Charge, Coulomb's law, Electric field, Electric lines of force and their properties, Electric flux, Electric potential and potential difference, Electric dipole<br>3.2 Gauss' law, electric field intensity due to straight charged conductor, charged plane sheet and charged sphere<br>3.3 Dielectric, Capacitance of capacitor (parallel plate), Factor affecting capacitance of capacitors<br>3.4 Magnetic field and its units, Biot Savart Law Magnetic field due to current caring wire: | **CO3** |

| Major Theory Session Outcomes (TSOs) | Units | Relevant COs Number(s) |
|---|---|---|
| *TSO 3f.* Explain Faraday's law of electromagnetic induction and Lenz's with applications.<br>*TSO 3g.* Explain the terms required to describe the AC current | straight and circular wire, Lorentz force (force on moving charge in magnetic field)<br>3.5 Magnetic flux, Faraday's law of electromagnetic induction, Lenz's law, Self and Mutual induction, eddy current, motional emf<br>3.6 DC and AC currents, Average, rms and Peak value of AC current | |
| *TSO 4a.* Distinguish material on the basis of band gap.<br>*TSO 4b.* Explain the various terms related to movement of charge carrier inside the semiconductors.<br>*TSO 4c.* Explain the formation of depletion layer in a given pin junction.<br>*TSO 4d.* Use V-I characteristic of explain the working of given p-n junction device. | **Unit-4.0 Semiconductor Physics**<br>4.1 Energy band and band gap, insulator, semi-conductor, conductor<br>4.2 Intrinsic and Extrinsic semiconductors, Drift velocity, drift and diffusion current, Mobility, current density, law of mass action.<br>4.3 Depletion layer and barrier Potential, p-n junction and V-I characteristics, Half wave and full wave rectifier<br>4.4 Photocells, Solar cells; working principle and engineering applications. | **CO4** |
| *TSO 5a.* Apply the concept of photoelectric effect to explain the of photonic devices.<br>*TSO 5b.* Explain Laser, components of laser and its various engineering applications.<br>*TSO 5c.* Explain propagation of light in optical fiber and applications of optical fiber.<br>*TSO 5d.* Describe the properties of nanomaterials and its various applications. | **Unit-5.0 Modern Physics**<br>5.1 Photoelectric effect; threshold frequency, work function, Stopping Potential, Einstein's photoelectric equation.<br>5.2 Lasers: Energy levels, ionization and excitation potentials; spontaneous and stimulated emission; population inversion, pumping methods, types of lasers): He Ne Laser, p-n junction diode laser, engineering and medical applications of lasers.<br>5.3 Optical fibers: Total internal reflection, acceptance angle and numerical aperture, Optical fiber types, applications in telecommunication, medical and sensors.<br>5.4 Nanotechnology: Properties (optical, magnetic and dielectric properties) of Nanomaterials and its application, Bhasma (Ancient Ayurveda, IKS) | **CO5** |

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

## K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical: P2400102B

| Practical/Lab Session Outcomes (LSOs) | S. No. | Laboratory Experiment/Practical Titles | Relevant COs Number(s) |
|---|---|---|---|
| *LSO 1.1.* Use Vernier caliper to measure the known and unknown dimensions of a given small object.<br>*LSO 1.2.* Estimate the mean absolute error up to two significant figures. | 1. | Vernier caliper | CO1 |
| *LSO 2.1.* Use screw gauge to measure the diameter/ thickness of a given object.<br>*LSO 2.2.* Estimate the mean absolute, relative and percentage errors up to three significant figures. | 2. | Screw gauge | CO1 |
| *LSO 3.1.* Use Spherometer to measure radius of curvature of given convex and concave mirror/surface. | 3. | Spherometer | CO1 |

| Practical/Lab Session Outcomes (LSOs) | S. No. | Laboratory Experiment/Practical Titles | Relevant COs Number(s) |
|---|---|---|---|
| *LSO 3.2.* Estimate errors in the measurement. | | | |
| *LSO 4.1.* Measure the variation of Time period with Mass of a given spring Oscillator.<br>*LSO 4.2.* Determine the spring constant of a given spring. | 4. | Spring Oscillator | CO2 |
| *LSO 5.1.* Determine the time period of oscillation of given bar pendulum. | 5. | Bar Pendulum | CO2 |
| *LSO 6.1.* Determine the V-I characteristics of a given p-n junction device. | 6. | p-n junction diode | CO4 |
| *LSO 7.1.* Determine the capacitance of a given parallel plate capacitor. | 7. | Parallel Plate capacitor | CO3 |
| *LSO 8.1.* Determine the inverse square law relation between the distance of photocell and light source v/s intensity of light source. | 8. | Photo-electric cell | CO5 |
| *LSO 9.1.* Determine the Numerical Aperture (NA) of a given step index optical fiber. | 9. | Numerical Aperture of an optical fiber. | CO5 |
| *LSO 10.1.* Measure wavelength of a He-Ne/diode laser by using a plane diffraction grating. | 10. | He-Ne/diode laser | CO5 |
| *LSO 11.1.* Determine the V-I characteristics of given solar cell under various illumination condition | 11. | Solar cell (virtual experiment) | CO4 |
| *LSO 12.1.* Determine the V-I characteristics of a given p-n junction device under various temperature conditions. | 12. | p-n junction diode (virtual experiment) | CO4 |
| *LSO 13.1.* Plot the graph between KE of Photo electron v/s frequency of incident light<br>*LSO 13.2.* Determine the value of Plank's Constant (*h*) from the graph between KE v/s frequency of incident light.<br>*LSO 13.3.* Determine the variation of stopping potential w.r.t frequency of incident photon | 13. | Photo electric effect (virtual lab experiment) | CO5 |
| *LSO 14.1.* Determine the wavelength of different spectral lines of Hydrogen spectra | 14 | Emission Spectra of Hydrogen (virtual lab experiment) | CO5 |
| *LSO 15.1.* Find the variation in magnitude and direction of emf induced in a coil due to change in magnetic flux. | 15 | Electromagnetic induction (virtual lab experiment) | CO4 |

**L) Suggested Term Work and Self Learning: S2400102B** 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. Check the correctness of given equations, using dimensional analysis.
2. Find phase difference between particles executing SHM with different initial conditions.
3. Determine the magnitude and direction of the net electrostatics force acting on any one charge, when 'n' point charges of charge q are placed at the vertices of given polygon with sides 'a' cm.
4. Find the electric field intensity at point due to different type of distribution of charges.
5. Two concentric conducting spheres have radii of r1 and r2 (r1<r2). The inner sphere has charge q1 and the outer sphere has charge q2. Calculate electric field between the two spheres.
6. Explain the significance of determining the forward and reverse bias V-I characteristics of any p-n junction diode with example.

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## J) Theory Session Outcomes (TSOs) and Units: T2420104

| Major Theory Session Outcomes (TSOs) | Units | Relevant COs Number (s) |
|---|---|---|
| TSO 1a. Explain the concept of AC and DC currents.<br>TSO 1b. Identify practical and Ideal current sources.<br>TSO 1c. Explain the concept of DC and AC Voltage.<br>TSO 1d. Distinguish practical and Ideal voltage sources.<br>TSO 1e. Calculate equivalent resistance of the given electric circuit.<br>TSO 1f. Explain the given effect of the electric current with a relevant application.<br>TSO 1g. Calculate work, power, and energy for the given circuit. | **Unit-1.0 Basic Concepts of Electrical Engineering**<br>1.1 Electrical Charge and flow of Charges<br>1.2 Current (D.C/A.C): Concept of Ideal & Practical current sources<br>1.3 Voltage (D.C /A.C):<br>• Concept of E.M.F.<br>• Potential difference<br>• Terminal voltage.<br>• Concept of Ideal & Practical voltage sources<br>1.4 Resistor.<br>• Properties.<br>• Classification of resistors<br>• Practical application of resistors.<br>• Commonly used resistance material.<br>• Effect of temperature on resistance.<br>• Series and parallel combination of resistances<br>1.5 Heating Effect, Magnetic effect, Chemical effect of electric current.<br>1.6 Electrical work, power and Energy | **CO1** |
| TSO 2a. Explain the concept of Capacitance.<br>TSO 2b. Calculate energy stored in the given capacitor.<br>TSO 2c. Deduce Voltage and Current equation of a Capacitor.<br>TSO 2d. Calculate equivalent capacitance in the given series and parallel capacitive circuit.<br>TSO 2e. Explain effect of the given dielectric media on capacitance.<br>TSO 2f. Describe the process of charging and discharging of capacitor.<br>TSO 2g. Explain the behavior of a Capacitor in the given circuit.<br>TSO 2h. State the criteria for the Selection of type of the capacitors for the given applications.<br><br>**Inductors** | **Unit-2.0 Energy Storing Elements**<br><br>**Capacitors**<br>2.1 Capacitance formation, Expression for capacitance<br>2.2 Capacitive reactance.<br>2.3 Energy stored in a Capacitor.<br>2.4 Voltage and Current equation for capacitor.<br>2.5 Series & Parallel combination of capacitors.<br>2.6 Effect of dielectric media on capacitance.<br>• Electric field strength<br>• Electric flux density.<br>• Permittivity.<br>2.7 Charging and discharging of capacitors. | **CO1, CO2** |

| Major Theory Session Outcomes (TSOs) | Units | Relevant COs Number (s) |
|---|---|---|
| TSO 2i. Explain Self & mutual Inductance and Inductive reactance.<br>TSO 2j. Explain the behavior of inductor to AC and DC sources.<br>TSO 2k. Calculate energy stored in the given inductor.<br>TSO 2l. Deduce voltage and current equation of an Inductor.<br>TSO 2m. Explain the behavior of current and voltage in an inductor.<br>TSO 2n. Describe the process for Selection of the Inductors for the given applications. | 2.8 Initial and Final Conditions in a capacitor-rise of current and voltage (No derivation, numerical only)<br>2.9 Leading power factor behavior of a capacitor<br>2.10 A.C./D.C. capacitors and Applications.<br><br>**Inductors**<br>2.11 Self and mutual inductance, Inductive Reactance<br>2.12 Behavior of inductor to AC and DC sources<br>2.13 Energy stored in an inductor.<br>2.14 Voltage and current equations of inductor.<br>2.15 Initial and final conditions in an Inductor - rise of current and voltage (No derivation, numerical only).<br>2.16 Inductor types and their applications. | |
| TSO 3a. Apply Ohm's law to calculate internal resistance of the given circuit.<br>TSO 3b. Identify the given circuit elements.<br>TSO 3c. Apply concept of node, branch, loop, mesh in the given circuit.<br>TSO 3d. Apply Kirchhoff's laws to determine current and voltage in the given circuit.<br>TSO 3e. Explain various quantities related to A.C.<br>TSO 3f. Calculate RMS and Average value of the given waveform.<br>TSO 3g. Represent given A.C quantities in rectangular and polar form.<br>TSO 3h. Draw phasor diagram for series R-L and R-C circuit.<br>TSO 3i. Determine Voltage and Current in a simple series R-L and R-C circuit. | **Unit-3.0 Basics of D.C & A.C Circuits**<br><br>**D.C Circuits;**<br>3.1 Ohm's Law<br>3.2 Internal resistance of source<br>3.3 Internal voltage drops, Terminal voltage.<br>3.4 Active & Passive elements.<br>3.5 Linear & Non-linear circuit.<br>3.6 Unilateral and Bilateral circuit element.<br>3.7 Node, Branch, Loop, Mesh<br>3.8 Kirchhoff's Current Law (KCL).<br>3.9 Kirchhoff's Voltage law (KVL).<br><br>**A.C Circuits**<br>3.10 Frequency, Time period, Amplitude, Angular Velocity, RMS Value, Average Value, Form factor, Peak factor, power factor.<br>3.11 Representation of AC quantities in rectangular and polar form and conversion.<br>3.12 Phasor representation of alternating quantities.<br>3.13 Phasor representation of sinusoidal quantities.<br>3.14 Voltage and current response in R-L and R-C circuit. | **CO2, CO3** |
| TSO 4a. Define the given terms related to a magnetic circuit.<br>TSO 4b. Calculate various parameters of the given magnetic circuit.<br>TSO 4c. Interpret B-H curve and Hysteresis loop of the given magnetic material.<br>TSO 4d. Compare the characteristics of the given electric and magnetic circuit. | **Unit-4.0 Magnetic Circuits**<br><br>4.1 Terms related to magnetic circuit;<br><br>● Magnetic flux<br>● Magnetomotive force<br>● Magnetic field strength<br>● Permeability<br>● Reluctance.<br>● Magnetic leakage, leakage coefficient | **CO3, CO 4** |

| Major Theory Session Outcomes (TSOs) | Units | Relevant COs Number (s) |
|---|---|---|
| | (Simple numerical on above)<br>4.2 Magnetic circuits;<br>● Uniform magnetic circuits.<br>● Series & parallel circuits<br>4.3 Magnetic Hysteresis, Hysteresis loop.<br>4.4 Magnetization (B-H) Curve and its Applications.<br>4.5 Comparison of Electric and Magnetic circuits | |
| TSO 5a. Explain the phenomenon of production of induced e.m.f and current in the given equipment.<br>TSO 5b. Differentiate between statically and dynamically induced emf.<br>TSO 5c. Apply principles of Faraday's law to calculate induced e.m.f in the given circuit.<br>TSO 5d. Apply principles of the given Laws and rules in the given magnetic circuit.<br>TSO 5e. Calculate self-inductance and mutual inductance in the given magnetic circuit.<br>TSO 5f. Identify the given types of coupling. | **Unit-5.0 Electromagnetism**<br>5.1 Electromagnetic induction, Induced e.m.f and current.<br>5.2 Statically and dynamically induced emf.<br>5.3 Farady's Laws of Electromagnetic Induction.<br>5.4 Lenz's Law, Fleming's R.H. rule; direction of induced E.M.F, Fleming's L.H. rule, Ampere's Law.<br>5.5 Self and mutual inductances.<br>5.6 Co-efficient of mutual inductance (M), Co-efficient of coupling.<br>5.7 Interaction between two or more magnetic field. | **CO4, CO5** |

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

## K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical: P2420104

| Practical/Lab Session Outcomes (LSOs) | S. No. | Laboratory Experiment/Practical Titles | Relevant COs Number(s) |
|---|---|---|---|
| *LSO 1.1.* Identify the Resistor Component available in the Laboratory. | 1. | Identification of Resistor | CO1 |
| *LSO 1.2.* Plot the terminal voltage of a source starting from no load to different load (Current) conditions. | 2. | Effect of different load conditions on terminal voltage of a source | CO1 |
| *LSO 1.3.* Measure current and voltage in a branch of the given electric circuit | 3. | Measurement of current and voltage in a branch of the given electric circuit | CO1 |
| LSO 1.4 Connect resistors in series and parallel combination on bread board and measure resistance using digital multimeter. | 4. | Measurement of resistances in series and combination in an electric circuit | CO1 |
| LSO 1.5 Calculate the value of color-coded resistor and verify it by measuring the value of resistor using digital multimeter | 5. | Value of color-coded resistor | CO1 |
| LSO 2.1 Calculate the value of equivalent Inductance in series and parallel combination and verify by measuring the value of capacitance using suitable meter (Digital Multimeter/LCR Meter). | 6. | Measurement of the value of Inductor in series and parallel combination in a circuit | CO1, CO2 |

| Practical/Lab Session Outcomes (LSOs) | S. No. | Laboratory Experiment/Practical Titles | Relevant COs Number(s) |
|---|---|---|---|
| LSO 2.2 Calculate the value of equivalent capacitance in series and parallel combination and verify it by measuring the value of capacitance using suitable meter (Digital Multimeter/LCR Meter). | 7. | Measurement of the value of capacitor in series and parallel combination in a circuit | CO1, CO2 |
| LSO 2.3 Verify the Phase difference (Lag)between current and voltage waveform for an inductor connected to an AC source with respect to time (using CRO). | 8. | Phase difference(lag) between voltage and current waveform in a given inductor | CO1, CO2 |
| LSO 3.1 Calculate voltage across each element in a given circuit applying principles of ohm's law. | 9. | Voltage across each element in a given linear circuit | CO2, CO3 |
| LSO 3.2 Determine currents in a given electric circuit using KCL and verify it by conducting experiment. | 10. | Measurement of current in the given electric circuit. | CO2, CO3 |
| LSO 3.3 Determine voltages in a given electric circuit using KVL and verify it by conducting experiment | 11. | Measurement of voltage in a given electric circuit | CO2, CO3 |
| LSO 3.4 Verify the Phase difference(lead) between current and voltage waveform for a capacitor connected to an AC source with respect to time (using CRO). | 12. | Phase difference(lead) between voltage and current waveform in a given capacitor. | CO2, CO3 |
| LSO 4.1 Demonstrate self and mutual inductance using experimental set up available in the Laboratory. | 13. | Demonstration of self and mutual inductance. | CO2, CO4 |
| LSO 4.2 Plot BH curve of a magnetic material | 14. | BH curve of a magnetic material | CO4 |
| LSO 4.3 Demonstrate statically and dynamically induced emf. | 15. | Demonstration of statically and dynamically induced emf. | CO4 |
| LSO 5.1 Demonstrate Faraday's laws of electromagnetism | 16. | Demonstration of Faraday's laws of electromagnetism. | CO4, CO5 |
| LSO 5.2 Demonstrate Flemings right hand and left-hand rules | 17. | Demonstration of Flemings right hand and left-hand rules. | CO4, CO5 |
| LSO 5.3 Demonstrate Lenz's law | 18. | Demonstration of Lenz's law. | CO5 |

**L) Suggested Term Work and Self Learning: S2420104** 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. Prepare a report on types of resistors, their power ratings and relevant applications.
2. Take a sample resistor component and calculate resistance value based on color codes and verify its value using multimeter and submit report on it.
3. Prepare a chart showing range of resistances used for electrical insulating materials.
4. Sketch a plot of BH curve for soft and hard magnetic materials respectively.
5. Collect the information regarding various types of inductors used in different domestic appliances.
6. Prepare a chart of different types of capacitors used with their applications.
7. Prepare a chart illustrating an example to differentiate between useful and leakage flux.

**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.<br>*TSO 1b.* Use different lines and annotations for a given situation.<br>*TSO 1c.* Draw engineering scale for the given situation.<br>*TSO 1d.* Choose appropriate scale factor for the drawing as per given situation.<br>*TSO 1e.* Dimension the given geometric figure using IS SP-46 standard.<br>*TSO 1f.* Draw the given regular geometric figure with tangents and normal.<br>*TSO 1g.* Draw selected engineering curve. | **Unit-1.0 Basic Elements of Drawing**<br>1.1 Methods to use different Drawing Instruments and supporting materials.<br>1.2 Different lines and conventions in engineering drawing.<br>1.3 Engineering scales and applications: Reduced, enlarged & full size (only Plain scale)<br>1.4 Dimensioning techniques: types and applications of chain, parallel and coordinate dimensioning as per SP-46.<br>1.5 Regular Geometrical figures, Tangency constructions.<br>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.<br>*TSO 2b.* Draw the orthographic projections of different objects<br>*TSO 2c.* Convert pictorial views into orthographic views | **Unit-2.0 Orthographic Projections**<br>2.1 Concept and applications of Orthographic, Perspective, Isometric and Oblique Projections.<br>2.2 Orthographic Projection: First and Third angle<br>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.<br>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.<br>*TSO 3b.* Draw isometric dimensioning on the given isometric view.<br>*TSO 3c.* Explain the Methods of constructing isometric drawing<br>*TSO 3d.* Draw Isometric View of the given object containing elements like rectangular, | **Unit-3.0 Isometric Projection**<br>3.1 Introduction to isometric projection.<br>3.2 Isometric scale and Natural Scale.<br>3.3 Isometric view and isometric projection.<br>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.<br>*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.<br>*TSO 4b.* Sketch the given simple orthographic and isometric views of the given part.<br>*TSO 4c.* Sketch the given domain specific engineering element/component. | **Unit-4.0 Free Hand Sketches of Engineering Elements**<br>4.1 Materials for Sketching.<br>4.2 General Guidelines for Freehand Sketching.<br>4.3 Freehand sketching of straight lines, square, rectangle, circles and arcs.<br>4.4 Free hand sketches of orthographic views.<br>4.5 Free hand sketches of isometric views.<br>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.<br>*TSO 5b.* Use computer aided drafting software for creating the given simple 2D entity. | **Unit-5.0 Basic Computer aided Drafting**<br>5.1 Basics of AutoCAD or any other drafting software–interface, screen layout, starting commands from menus, command line.<br>5.2 Coordinate system, Angular measurements, Point specification.<br>5.3 Drawing aids - Grid, Snap, Ortho, Osnap, Units, Limits, Layers, Linetype.<br>5.4 Opening and Saving drawing files.<br>5.5 Creating User Defined Templates.<br>5.6 Methods of Selecting and deleting Objects.<br>5.7 Undo and Redo.<br>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.<br>*TSO 6b.* Use computer aided drafting software for creating isometric views of the given object.<br>*TSO 6c.* Print the given drawing (using institute template) on A4/A3 sheet. | **Unit-6.0 Advanced Computer aided Drafting**<br>6.1 Modify commands - erase, copy, move, rotate, scale, stretch,<br>6.2 Array: concept and applications.<br>6.3 Controlling Drawing display<br>6.4 Text and Dimensioning<br>6.5 Layers: concept and application<br>6.6 Drawing orthographic vies using drafting software with principles mentioned in Unit 2.<br>6.7 Drawing isometric views using drafting software with principles mentioned in Unit 3.<br>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<br>*LSO 1.2.* Draw simple 2D entities using manually drawing instruments. | 1. | Geometric Construction:<br>• Draw set of lines with different conditions (two problems).<br>• Draw circle and arcs with different geometric conditions and constraints (two problems).<br>• Draw polygons by general methods (Triangle, square, pentagon, hexagon, heptagon) (Three problems). | CO1, CO2 |
| *LSO 2.1.* Draw conic sections using manually drawing instruments.<br>*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.<br>• 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.<br>*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:<br>• A pentagonal pyramid is placed in first quadrant with its axis parallel to H.P. and V.P<br>• A frustum of a hexagonal is placed in first quadrant with its axis perpendicular to H.P. and parallel to V.P<br>• Different objects having cylindrical surfaces, ribs.<br>(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)<br>(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.<br>(Three problems) | CO4 |
| *LSO 6.1.* Visualize the 3D shape of the given object.<br>*LSO 6.2.* Convert the given 2D figures/views into 3Dobject. | 6. | Convert the orthographic views of an object to isometric view.<br>(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.<br>*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.<br>*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<br>• Draw circle and arcs with different geometric conditions and constraints (two problems).<br>• 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.<br>*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<br>• A pentagonal pyramid is placed in first quadrant with its axis parallel to H.P. and V.P<br>• A frustum of a hexagonal is placed in first quadrant with its axis perpendicular to H.P. and parallel to V.P<br>• Different objects having cylindrical surfaces, ribs.<br>(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.

**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: T2418105

| Major Theory Session Outcomes (TSOs) | Units | Relevant COs Number(s) |
|---|---|---|
| *TSO 1a.* Describe the anatomy of the Computer System.<br>*TSO 1b.* List the different Input and Output devices.<br>*TSO 1c.* Identify the different types of memory in computer systems.<br>*TSO 1d.* Explain communication process between different components of a computer.<br>*TSO 1e.* Describe the functionalities of a computer system.<br>*TSO 1f.* Use Internet digital Platforms | **Unit-1.0 Basics of Computer System**<br><br>1.1 Computer System and its Components.<br>- Generation of Computer<br>- Anatomy of Computer Systems<br>- Input and output device<br>- Motherboard<br>- Peripherals<br>- Backend and Front end of System Unit<br>1.2. Storage device in Computer System<br>- Primary Storage<br>- Secondary Storage<br>1.3. CPU Components<br>- Register<br>- Control Unit<br>- ALU<br>1.4. Types of Bus<br>- Address Bus<br>- Data Bus<br>- Control Bus<br>1.5 Search Engine<br>- Introduction<br>- Search Query<br>- Applications of Internet Digital Platforms (BHIM, Digi-Locker, m-paravian, NPTEL etc.) | **CO-1** |
| *TSO 2a.* Compare various computer network topologies<br>*TSO 2b.* Differentiate types of networks.<br>*TSO 2c.* Compare internet and intranet<br>*TSO 2d.* Explain IP addressing system.<br>*TSO 2e.* Explain functions of Networking Devices. | **Unit 2.0 Basic Network Concepts**<br><br>2.1 Network Topologies<br>Bus, Mesh, Star, Ring, Hybrid<br>2.2 Types of Computer Networks<br>LAN, WAN<br>2.4 Internet & Intranet<br>IP Addressing system and URL, Internet, Intranet, Comparison between Intranet & Internet<br>2.3 DNS<br>- Introduction, Need<br>- Domain Names & its types<br>2.5 Networking Devices (Types and use)<br>Switch, Router, Gateway, Modem, Repeater, Wireless Access Point, NIC | **CO-2** |
| *TSO 3a.* Write Algorithm to solve the given problem. | **Unit 3.0 Basics of 'C' Programming and control structures** | **CO-3** |

| Major Theory Session Outcomes (TSOs) | Units | Relevant COs Number(s) |
|---|---|---|
| *TSO 3b.* Write simple 'C' program to solve the given arithmetic expressions<br>*TSO 3c.* Write a simple 'C' Program demonstrating the given data type conversion<br>*TSO 3d.* Write I/O Statements for the given data.<br>*TSO 3e.* Write a 'C' program using a decision-making structure for two-way branching to solve the given problem.<br>*TSO 3f.* Write a 'C' program using a decision-making structure for multi-way branching to solve the given problem.<br>*TSO 3g.* Apply loop statements to solve the given iterative problem in 'C' program.<br>*TSO 3h.* Use appropriate statements to change the program flow in the given loop. | 3.1 Fundamentals of algorithms: Notion of an algorithm. Pseudo-code conventions like assignment statements and basic control structures.<br>3.2 Flowchart: Flowchart, Symbols of flowchart, Guidelines for preparing Flowchart<br>3.3 Introduction to C:<br>General Structure of a 'C' program<br>Data Concepts: Character set, tokens, keywords, Identifiers, Variables, Constant, data types, C operators, Arithmetic operators, Arithmetic expression, declaring variables, and data type conversion.<br>3.4 Basic Input output: Input and Output statements, using printf() and scanf(), character input/output statements, Input/output formatting, Use of comments<br>3.5 Decision making and branching**:** Relational and logical operators, if statement, if else statement, nested if-else, if-else ladder' The switch statement<br>3.6 Looping: While loop, Do… While loop For loop, Go to statement, Use of break and continue statements | |
| *TSO 4a.* Write statements to read, write the given array.<br>*TSO 4b.* Manipulate the given array of characters and numbers.<br>*TSO 4c.* Use pointers to access memory locations for solving the given problem. | **Unit 4.0 Array and Pointer**<br>4.1 Characteristics of an array, One dimension and two-dimension arrays, Array declaration and Initialization<br>4.2 Array of characters, Operation on array<br>Character and String input/output<br>**Concepts of pointers: declaring, initializing, accessing.** | **CO-4** |
| *TSO 5a.* Use the given Library function.<br>*TSO 5b.* Develop user defined functions for the given problem.<br>*TSO 5c.* Write 'C' codes to pass the given function parameters using "call by value" and "call by reference" approach.<br>*TSO 5d.* Write recursive function for the given problem. | **Unit 5.0 Concept and Need of Functions**<br>Library functions: Math functions, String handling functions, other miscellaneous functions.<br>Writing User defined functions, scope of variables.<br>Parameter passing: call by value, call by reference.<br>Recursive functions | **CO-5** |

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

## K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical: P2418105

| Practical/Lab Session Outcomes (LSOs) | S. No. | Laboratory Experiment/Practical Titles | Relevant COs Number(s) |
|---|---|---|---|
| *LSO 1.1.* install device driver.<br>*LSO 1.2.* Install given software on your system.<br>*LSO 1.3.* Perform Registration process of digital India platform. | 1. | 1.1 Identify specifications of various types of computer systems available in your institute.<br>1.2 Install Printer, scanner driver.<br>1.3 Install any two freeware or open-source software/tool by using web browser<br>1.4 Use Digital India Platforms: BHIM, Dig-Locker, m-parivahan, NPTEL. | **CO-1** |
| *LSO 2.1.* List various types of networking devices in your Institute.<br>*LSO 2.2.* make a small local area network. | 2. | 2.1 Connect two/three computers to form a network using wire/wireless connectivity and configure it. | **CO-2** |
| *LSO 3.1.* Write and execute simple 'C' program.<br>*LSO 3.2.* Use scanf() and printf() functions in 'C' programs.<br>*LSO 3.3.* Write C Program using Decision Making and two-way branching statements.<br>*LSO 3.4.* Write C Program using "switch-case" statement for multi-way branching.<br>*LSO 3.5.* Use the "if" and "Switch" statements appropriately for decision making in C Program.<br>*LSO 3.6.* Write and execute C programs using various types of loop statements to solve iterative problems. | 3. | 3.1 Write 3 different C –Program to demonstrate use of Arithmetic expression, constant, variable and Increment/ decrement operators.<br>3.2 Write a program to-<br>a. Determine whether a given year is a leap year or not.<br>b. Determine whether a string is palindrome.<br>c. Find the greatest of the three numbers using conditional operators.<br>d. Find if a given character is vowel (use if-else ladder).<br>3.3 Using switch statement-<br>Write program to:<br>Print day of week by taking number from 1 to 7.<br>3.4 Write Program to:<br>a. Find sum of digits of a given number.<br>b. Find Fibonacci series for given number.<br>c. Write a program to produce the following output:<br>1<br>2 3<br>4 5 6<br>7 8 9 10 | **CO-3, CO-4** |
| *LSO 4.1.* Write and execute C programs using one-dimension array.<br>*LSO 4.2.* Write and execute C program using two-dimensional array. | 4 | 4.1 Develop a Program to:<br>a. Sort list of 10 numbers.<br>b. Perform addition of 3x3 matrix. | **CO-5** |
| *LSO 5.1.* Write C program using different types of library functions to solve given problem.<br>*LSO 5.2.* Write C program to Create and use user defined functions | 5. | 5.1 Develop Program to demonstrate:<br>a. Use of String handling functions.<br>b. Use of Mathematical functions.<br>c. Use of other miscellaneous functions.<br>5.2 Develop a Program to: | **CO-6** |

| Practical/Lab Session Outcomes (LSOs) | S. No. | Laboratory Experiment/Practical Titles | Relevant COs Number(s) |
|---|---|---|---|
| | | a. Create a function to find GCD of given number. Call this function in a program.<br>5.3 Find Factorial of given number using recursion. | |

**L)** **Suggested Term Work and Self Learning: S2418105** 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. Identify specifications of various types of computer systems in your Institute .
2. Prepare a report on computer peripherals and its usage of your computer lab.
3. Prepare a presentation on network topology.
4. Prepare a survey report to identify various types of networking devices available in your Institute.
5. Make a calculator using 'C' programming.

**c. Other Activities:**

1. Seminar Topics: -
   - "Future of IT"
   - "Scope of 'C' programming in other Engineering disciplines"
2. Prepare a poster presentation on Computer hardware and peripherals.
3. Prepare a report on Open Source software available for Electronics Engineering.
4. Product Development: Development of projects for real life problem solution using 'C' programming.

d.

e. Self-Learning Topics:

1. System and application software.
2. Scope of 'C' programming in real world.

**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** | 10% | 10% | 10% | 100% | 100% | 10% | - |
| **CO-2** | 10% | 10% | 10% | | | 10% | - |
| **CO-3** | 10% | 10% | 15% | | | 25% | **30%** |
| **CO-4** | 25% | 25% | 25% | | | 25% | **40%** |
| **CO-5** | 25% | 25% | 20% | | | 15% | **30%** |
| **CO-6** | 20% | 20% | 20% | | | 15% | |
| **Total Marks** | **30** | **70** | **20** | **20** | **10** | **20** | **30** |
| | | | **50** | | | | |

**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: (Not Applicable)

## K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical: P2420105

| Practical/Lab Session Outcomes (LSOs) | S. No. | Laboratory Experiment/Practical Titles | Relevant COs Number(s) |
|---|---|---|---|
| LSO 1.1. List various measuring tools and instruments.<br>LSO 1.2. Use suitable measuring unit and its conversion.<br>LSO 1.3. Select suitable measuring devices in a given situation.<br>LSO 1.4. Measure the given job using suitable instruments. | 1. | 1.1 Identify different types of measuring tools available in workshop.<br>1.2 Use suitable Marking and hand tools in a given situation.<br>1.3 Measure the given job using suitable measuring Devices. | CO-1 |
| LSO 2.1 List various wood working tools with major specifications.<br>LSO 2.2 Select wood working tools as per given job.<br>LSO 2.3 Perform various wood working operations as per given drawing/sketch.<br>LSO 2.4 Follow the right procedure to prepare given type of joint. | 2. | 2.1 Prepare one simple job of wood working comprises of marking, cutting, plaining and finishing as per given drawing/sketch.<br>2.2 Prepare switch board as per given sample.<br>2.3 Prepare simple wooden joint as per given sketch / drawing. | CO-2 |
| LSO 3.1 Choose appropriate joining method in a given situation. .<br>LSO 3.2 Select suitable welding method as per job requirement.<br>LSO 3.3 Carryout suitable welding procedure as per given sketch / drawing.<br>LSO 3.4 Perform brazing operation in a given situation. | 3. | 3.1 Operate gas welding apparatus to generate different types of flames.<br>3.2 Prepare lap joint using gas welding as per given drawing safely.<br>3.3 Prepare butt joint using arc welding as per given drawing safely.<br>3.4 Join the given sheets by using brazing. | CO-3 |
| *LSO 4.1* Select various electrical and electronic components.<br>*LSO 4.2* Identify various given electrical tools and measuring instruments.<br>*LSO 4.3* Describe the steps to use the given type of meters.<br>*LSO 4.4* Test the given components using Multimeter.<br>*LSO 4.5* Use the suitable procedure of mounting electrical and electronic components on given PCB.<br>*LSO 4.6* Identify terminals of a given transistor using suitable measuring instrument**.** | 4. | 4.1 Categorize different active and passive components available in the workshop.<br>4.2 Identify different types of measuring instruments used for voltage, current and wattmeter.<br>4.3 Measure resistance of different types of resistors using Multimeter.<br>4.4 Identify terminals of diodes and transistors.<br>4.5 Measure voltage and current for single and three phase Supply using multimeter and clip on meter.<br>4.6 Perform continuity test of given component using Multimeter. | CO-4 |

| Practical/Lab Session Outcomes (LSOs) | S. No. | Laboratory Experiment/Practical Titles | Relevant COs Number(s) |
|---|---|---|---|
| *LSO 4.7* Perform soldering operation in a given situation. | | 4.7 Identify three terminals of a transistor using digital Multimeter.<br>4.8 Solder various resistors, capacitors and inductors and electronic components on Printed Circuit Board (PCB). | |
| *LSO 5.1* Select the fire extinguisher to extinguish the given type of fire.<br>*LSO 5.2* Describe the procedure to use the given firefighting equipment.<br>*LSO 5.3* List the materials used for first Aid.<br>*LSO 5.4* Describe the ways to maintain good housekeeping in the given situation. | 5. | 5.1 Conduct mock artificial respiration and first Aid exercises to learn about safety procedures of first Aid in case of electrical hazards.<br>5.2 Use Fire Extinguisher to extinguish the fire in a given situation. | CO-5 |

**L) Suggested Term Work and Self Learning: S2420105** Some sample suggested assignments, micro project and other activities are mentioned here for reference.

**a. Assignments**:

i. Select any engineering object / part / drawing and perform the measurement using suitable measuring instrument / device.
ii. Select any (Minimum 3 finished jobs) different wood working / carpentry/welding/metal joining jobs and prepare list of materials and joints used in selected objects.
iii. Select any two joining method and prepare their engineering field of application.
iv. Draw symbols of various electrical components.
v. Draw symbols of various electronic components.
vi. List specifications of various electrical and electronic components

**b. Micro Projects:**

1. Visit nearby mechanical/electrical workshop and collect information about operation performed by identified workshop and prepare the list of tools and equipment along with specification.
2. Make a wooden job as per given drawing and specifications of material.
3. Prepare any utility job like lab stool structure by using suitable welding process with list of tools and equipment along with specification.
4. Visit any organization /field agency and submit a report on safety practices followed in the identified organization /field agency.

**c. Other Activities:**

**1. Seminar Topics:**

- Safety practices and use of personal safety equipment in workshops.
- Different types of digital instruments and their functions used in workshops.
- Recent developments in various machines and instruments used in workshop.

2. **Visits:**

- Visit any wood working shop / welding shops/electrical and electronics workshop and firefighting station and prepare a report.
- Make a detailed market survey of local dealers for procurement of workshop tools, electrical and electronics equipment /components and raw materials.

**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* Explain ancient history and development of yoga in India<br>*TSO.1b* Compare the ancient Indian games with the modern games.<br>*TSO.1c* Differentiate between given terms used in sports<br>*TSO.1d* Describe the different aspects of Mental Toughness<br>*TSO.1e* Use Imagery Training for sports<br>*TSO.1f* Apply motivation techniques to motivate students in sports.<br>*TSO.1g* Use concentration techniques for playing and exercising.<br>*TSO.1h* Manage Stress, Anxiety and Arousal during sports.<br>*TSO.1i* Select sports and exercise for healing and developing health and mental wellness<br>*TSO.1j* Describe the impact of parents' involvement in their children's sports activities<br>*TSO.1k* Select sports and exercises for physically challenged as per their need. | **Unit-1.0 Sports and Exercises**<br>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<br>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,<br>1.3 Dholavira, the world's oldest terraced arena 3000 BC<br>1.4 Definition of play, game, sports, exercise, psychology, sports psychology and exercise psychology, psychology and common sense.<br>1.5 Mental toughness- mind, Imagery, use of imagery and imagery in sports, types of imagery (visual, kinesthetic, auditory and olfactory)<br>1.6 Motivation in sport and goalsetting in sports<br>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<br>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.<br>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<br>*TSO.2b* Identify the physiology of yoga and meditation. | **Unit-2.0 Yoga and Meditation**<br>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 | **CO2, CO4** |

| Major Theory Session Outcomes (TSOs) | Units | Relevant COs Number(s) |
|---|---|---|
| *TSO.2c* Evaluate meditation and yoga as a healing modality.<br>*TSO.2d* Select asanas and pranayama as per need.<br>*TSO.2e* Describe the effect of yoga and meditation on ageing, stress and hypertension.<br>*TSO.2f* Select mediation techniques as per the need.<br>*TSO.2g* Explain Bandha, Mudra and Chakra<br>*TSO.2h* Enumerate the steps of Suryanamaskar.<br>*TSO.2i* Select Yoga and Meditation for physically challenged as per their need. | Period, Classical Period- Patanjali's period, Modern Period.<br>2.2 Yoga practices and the related literature- Vedas (4), Upanishads (108), Smritis, teachings of Buddhism, Jainism, Panini, Epics (2), Puranas (18)<br>2.3 Importance of Yoga & Mediation, meaning of the term Yoga and Meditation, Fundamentals Principles of Yoga & Fitness training, Eight Limbs of Yoga<br>2.4 Difference between yoga asana and physical exercises, Difference between yoga and meditation<br>2.5 Role of Yoga and Meditation in Purificatory Process, in character building, developing concentration, will power and discipline<br>2.6 Types of Yoga Practices - Asanas, Pranayama, Meditation<br>2.7 Mindfulness – knowing the mind, training the mind, feeling the mind<br>2.8 Different Methods of meditation, Physiology of meditation, Mental, physical and emotional benefits of Asanas, Pranayama, Concentration and Meditation<br>2.9 Bandha, Mudra and Chakra<br>2.10 Effects of Asanas and pranayama on physiology of human body<br>2.11 Importance of "Suryanamaskar<br>2.12 Adaptation of Yoga and meditations for physically challenged students in all levels.<br>2.13 Yoga Asanas Do's and Don'ts for Beginners | |
| *TSO.3a* Explain the ancient Indian ayurvedic methods for fitness and wellness<br>*TSO.3b* Identify the different factors affecting the fitness and wellness in the given situation<br>*TSO.3c* Use different methods to maintain Health and Wellness<br>*TSO.3d* Explain the components of Balance Diet<br>*TSO.3e* Identify the causes of stress and anxiety in the given situation<br>*TSO.3f* Use stress reduction techniques to manage Stress and Anxiety<br>*TSO.3g* Manage Stress, Anxiety and Depression in the given situation<br>*TSO.3h* Select recovery process for energy replenishment after exercise. | **Unit 3.0 Fitness and Wellness**<br>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.<br>3.2 Meaning, Importance, Definition and dimensions of Health and Wellness (WHO/Yoga)<br>3.3 Factors affecting Fitness and Wellness<br>3.4 Role of Physical Activities and Recreational Games in maintaining physiological and psychological wellbeing.<br>3.5 Different Methods to Maintain Health, Wellness and to enhance mood<br>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<br>3.7 Anxiety, Stress and Aging-Meaning of Anxiety, Stress and Aging, Types and Causes of Stress, | **CO3, CO4** |

| Major Theory Session Outcomes (TSOs) | Units | Relevant COs Number(s) |
|---|---|---|
| | 3.8 Stress, anxiety and depression reduction with exercise, yoga and meditation<br>3.9 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) |
|---|---|---|---|
| *LSO 1.1.* Perform various sports activities for overall growth and development<br>*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 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. | |
| *LSOs 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,Gomukh asana, Padmasana, Siddhasana, Bhadrasana, Swastikkasana, Vajrasana, Supta-Vajrasana, Yoga-Mudra | |
| | 12. | MUDRAS & SURIYANAMASKAR<br>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 | |
| *LSO 3.1.* Prepare diet chart for optimal health and wellbeing | 17. | Prepare a diet chart for the given sport. | CO3 |

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

**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.

**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: T2400009

| Major Theory Session Outcomes (TSOs) | Units | Relevant COs Number(s) |
|---|---|---|
| *TSO 1a.* Explain the difference between OER and other free educational materials.<br>*TSO 1b.* Describe the challenges and benefits of using OER in a class.<br>*TSO 1c.* Apply various aspects of evaluating OER before use<br>*TSO 1d.* Explain necessity to assess an OER's adaptability.<br>*TSO 1e.* Use preliminary search for open educational resource.<br>*TSO 1f.* Find OER using various resources. | **Unit-1.0 Open Educational Resources**<br>1.1 OER - definition<br>1.2 What is NOT OER.<br>1.3 Benefits of using OER – Benefits to Students - Access to Quality Education<br>1.4 OER - Benefits to Faculty - Use, Improve and Share, Network and collaborate with peers, Lower Cost, Improve access to information<br>1.5 Challenges of Using OER – Subject Availability, Format and Material type availability, Time and Support availability<br>1.6 Evaluating OER – a) Clarity, Comprehensibility, and Readability, b) Content and Technical Accuracy, c) Adaptability and Modularity, d) Appropriateness and Fit, e) Accessibility<br>1.7 Finding Open Content - OER Search Scenario Filter by Usage Rights in Google, Repositories and Search Tools, Subject-specific Repositories | **CO1** |
| *TSO 2a.* Explain benefits of copyright protection for creator<br>*TSO 2b.* Explain exceptions and limitations to copyright law<br>*TSO 2c.* List rights granted to copyright holders.<br>*TSO 2d.* Explain Exceptions and limitations to copyright law<br>*TSO 2e.* Explain Fair use/fair dealing apply to copyright<br>*TSO 2f.* Elaborate Public domain and how does it relate to copyright<br>*TSO 2g.* Elaborate penalties for copyright infringement.<br>*TSO 2h.* Explain copyright for digital content and the internet.<br>*TSO 2i.* Explain use of copyrighted works in education | **Unit-2.0 Copyright and Open Licensing**<br>2.1 Copyright and what it does protect, benefits of copyright protection for creators, duration of copyright protection last, rights granted to copyright holders.<br>2.2 Exceptions and limitations to copyright law, fair use/fair dealing apply to copyright<br>2.3 Public domain and its relation to copyright.<br>2.4 Penalties for copyright infringement<br>2.5 Apply copyright to digital content and the internet<br>2.6 Use of copyrighted works in education.<br>2.7 Open Licenses – GNU – Free Documentation license, Free Art License<br>2.8 Why Free Licenses – Retain, Reuse, Revise, Remix, Redistribute | **CO2** |

| Major Theory Session Outcomes (TSOs) | Units | Relevant COs Number(s) |
|---|---|---|
| *TSO 2j.* Explain the use of free licenses | | |
| *TSO 3a.* Describe the four different Creative Commons License components.<br>*TSO 3b.* Explain the reason some CC-licensed content might not be considered OER.<br>*TSO 3c.* Explain the Strength and weakness of four Open CC Licenses<br>*TSO 3d.* Choose the right Creative Commons license for work.<br>*TSO 3e.* Apply a Creative Commons license to existing work.<br>*TSO 3f.* Use of Creative Commons licenses for commercial purposes.<br>*TSO 3g.* Modify a work licensed under Creative Commons.<br>*TSO 3h.* Revoke a Creative Commons license, combine works with different Creative Commons licenses<br>*TSO 3i.* Differentiate between Attribution and Citation | **Unit-3.0 Creative Common Licenses**<br>3.1 Alternatives to copyright as Creative Commons licenses.<br>3.2 Four components of creative common Licenses – Attribution, Share- Alike, Non – commercial, No Derivatives<br>3.3 Choosing a Creative common licenses – Wiley's 5 Rs and Creative Common Licenses<br>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<br>3.5 Attribution Vs Citation - Creative Commons licensed work without giving attribution<br>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?