Curriculum of Diploma Programme

in

Computer Science & 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
2420103	**BEC**	**Fundamentals of Electrical and Electronic Engg.** (CSE, AIML, ME, ME (Auto), MIE, AE, CRE, CHE, TE)	03	-	04	02	09	06
2418104	**BCC**	**Fundamental of IT System** (CSE, AIML)	03	-	04	02	09	06
2420105	**BEC**	**Electrical & Electronics Workshop** (EE, ELX, CSE, AIML)	-	-	04	02	06	03
2418107	**BCC**	**ICT Tools** (CE, ME, ME (Auto), FTS, CSE, AIML, MIE, CRE, CHE, FPP, TE, CACDDM, GT)	-	-	04	02	06	03
2400007	**NRC**	**Indian Constitution** (Common for All Programmes)	01	-	-	-	01	01
2400009	**NRC**	**Open Educational Resources** (FTS, CHE, CSE, EE, ME, ME (Auto), MIE, ELX, AIML, CRE, CACDDM, AE, CE, ELX (R), GT)	01	-	-	-	01	01
Total			**13**	**1**	**20**	**12**	**46**	**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
2400102B	**ASC**	**Applied Physics –B** (CSE, AIML, EE, ELX, ELX (R))	30	70	20	30	20	30	200
2420103	**BEC**	**Fundamentals of Electrical and Electronic Engg.** (CSE, AIML, ME, ME (Auto), MIE, AE, CRE, CHE, TE)	30	70	20	30	20	30	200
2418104	**BCC**	**Fundamental of IT System** (CSE, AIML)	30	70	20	30	20	30	200
2420105	**BEC**	**Electrical & Electronics Workshop** (EE, ELX, CSE, AIML)	-	-	20	30	20	30	100
2418107	**BCC**	**ICT Tools** (CE, ME, ME (Auto), FTS, CSE, AIML, MIE, CRE, CHE, FPP, TE, CACDDM, GT)	-	-	20	30	20	30	100
2400007	**NRC**	**Indian Constitution** (Common for All Programmes)	25	-	-	-	-	-	25
2400009	**NRC**	**Open Educational Resources** (FTS, CHE, CSE, EE, ME, ME (Auto), MIE, ELX, AIML, CRE, CACDDM, AE, CE, ELX (R), GT)	25	-	-	-	-	-	25
Total			**170**	**280**	**120**	**180**	**100**	**150**	**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.

A) Course Code : 2400101(T2400101/S2400101)

B) Course Title : Basic Engg. Mathematics
(CE, ME, ME (Auto), CSE, EE, ELX, ELX (R), AIML, MIE, CRE, CHE)

C) Pre-requisite Course(s) :

D) Rationale :

This course is an extension of the course based on Mathematics of the first semester namely Basic Engineering Mathematics. The course is designed to inculcate its application in relevant branches of engineering and technology. With calculus, we can find how the changing conditions of a system affect us, and we can control a system. Definite integral is a powerful tool that helps us realize and model the world around us. Differential equations are widely applied to modern natural phenomena, engineering systems, and many other situations. Numerical methods offer approximate but credible accurate solutions to problems that are not readily or possibly solved by closed-form solution methods. On the other hand, Numerical integration is a computational (approximate) approach to evaluating definite integrals. It has a lot of applications in engineering such as in the computation of areas, volumes, and surfaces. It also has the advantage of being easily programmable in computer software. Probability distributions are useful for modeling, simulation, analysis, and inference on varieties of natural processes and physical phenomena. A situation in which an experiment is repeated a fixed number of times can be modeled, engineers need to apply existing knowledge of success and failure to a specific analytical scenario.

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

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

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

F) Suggested Course Articulation Matrix (CAM):

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

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

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

G) Teaching & Learning Scheme:

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

Legend:

CI: Classroom Instruction (Includes different instructional/ implement at ion 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= (1xCIhours) + (0.5xLIhours) + (0.5xNotionalhours)

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

H) Assessment Scheme:

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

Legend:

PTA: Progressive Theory Assessment in the classroom (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 assignments, micro-projects, seminars, 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 for internal as well as external assessment may vary as per the requirement of the respective course. For valid and reliable assessment, the internal faculty should prepare a 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. *TSO 2i.* Find the derivative of Logarithmic, Implicit, and Parametric functions. *TSO 2j.* Familiar with the concept of calculus given in Indian Mathematics. (IKS)	**Unit-2.0 Differential Calculus** **Function and Limit** 2.1 Concept of function. 2.2 Different type of functions. 2.3 Domain and Range of Function. 2.4 Concept of Limits and its evaluation. **Continuity** 2.5 Concept of continuity with simple problems. **Differentiation** 2.6 Differentiation by First Principle. 2.7 Differentiation of Algebraic, trigonometric, Exponential, and Logarithmic functions. 2.8 Differentiation of sum, product, and quotient of two functions. 2.9 Differentiation of composite functions by Chain Rule. 2.10 Logarithmic differentiation. 2.11 Implicit differentiation. 2.12 Differentiation of Parametric Functions. 2.13 Calculus in Indian Knowledge System: The Discovery of Calculus by Indian Astronomers. (Indian Mathematics). (IKS)	**CO2**
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.	**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.	**CO3**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
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.	3.3 Rate of change of quantities. 3.4 Equation of Tangent and Normal. 3.5 Maxima and Minima. 3.6 Radius of curvature.	
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. *TSO 5d.* Calculate the Coefficient of variance of given data for engineering applications.	**Unit-5.0 Probability and Statistics** **Probability** 5.1 Concept of Probability. 5.2 Addition and multiplication theorems of Probability. **The measure of Central Tendency** 5.3 Mean, Median, Mode. **Measure of Dispersion** 5.4 Range, Variance, Standard Deviation. 5.5 Coefficient of Variation.	**CO5**

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

K) Suggested 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. 4.2 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.	4.	• Geometrical interpretation of Gradient. • Geometrical Interpretation of lines in various forms. • Geometrical interpretation of the perpendicular distance of a line. • Geometrical representation of conic-section.	CO4
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

A) Course Code : 2400102B (T2400102B/P2400102B/S2400102B)

B) Course Title : Applied Physics – B (CSE, AIML, EE, ELX, ELX (R))

C) Pre- requisite Course(s) :

D) Rationale :

Physics is the natural science that studies the fundamental principles governing matter, energy, space, and time. Engineering physics is a branch of applied physics that focuses on the application of physics principles to engineering problems. Graduates of diploma engineering programs are expected to have a solid foundation in physics that they can apply to real-world problems, including in industrial settings. This curriculum aims to prepare students to be successful in the workforce by providing them with a deep understanding of physics concepts and their practical applications, including in industrial settings. This curriculum also includes examples of industrial applications of physics principles in areas such as robotics, electrical power generation and transmission, digital electronics and communication, and semiconductor technology. This course will help the diploma engineers to apply the basic concepts and principles of physics for solving various broad-based engineering problems and comprehend different state of art technology-based applications.

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

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

CO-1 Estimate the errors in measurements of physical quantity with precision.

CO-2 Apply the concept of waves for various engineering applications involving wave dynamics.

CO-3 Apply the concepts of electromagnetics in engineering applications.

CO-4 Use semiconductor devices for various electronics related applications.

CO-5 Apply the basic concepts of modern physics for solving engineering problems.

F) Suggested Course Articulation Matrix (CAM):

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

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

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G) Teaching & Learning Scheme:

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		Classroom Instruction (CI)		Lab Instruction (LI)	Notional Hours (TW+ SL)	Total Hours (CI+LI+TW+SL)	Total Credits (C)
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2400102B	Applied Physics- B	03	-	04	02	09	06

Legend:

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Course Code	Course Title	Assessment Scheme (Marks)						Total Marks (TA+TWA+LA)
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		Progressive Theory Assessment (PTA)	End Theory Assessment (ETA)	Internal	External	Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)	
2400102B	Applied Physics- B	30	70	20	30	20	30	200

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:

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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. *TSO 1b.* Estimate the errors in the measurement of given physical quantity. *TSO 1c.* Derive dimensional formula of given physical quantity. *TSO 1d.* Apply dimensional analysis for inter conversion of units. *TSO 1e.* Establish relation among physical quantities using dimensional analysis. *TSO 1f.* Use dimensional analysis to check the correctness of a given equation.	**Unit-1.0 Unit and Measurements** 1.1 Physical quantities, fundamentals and derived units and system of units 1.2 Accuracy, precision and errors (systematic and random) in measurements, Method of estimation of errors (absolute and relative) in measurement, propagation of errors, significant figures 1.3 Dimensions and dimensional formulae of physical quantities, Principle of homogeneity of dimension in an equation 1.4 Applications of dimensions: conversion from one system of units to other, corrections of equations and derivation of simple equations. 1.5 Ancient astronomical instruments: Chakra, Dhanuryatra , Yasti and Phalaka yantra .	**CO1**
TSO 2a. Explain the various terms related to SHM. *TSO 2b.* Distinguish between mechanical and electromagnetic waves with examples. *TSO 2c.* Differentiate between longitudinal and transverse waves with examples. *TSO 2d.* Find the relation between the terms used to describe wave motion. *TSO 2e.* Explain the principle of Superposition of waves	**Unit-2.0 Simple Harmonic and Wave Motion** 2.1 Periodic and Oscillatory Motion 2.2 Simple Harmonic Motion (SHM): Displacement, velocity, acceleration, time period, frequency and their interrelation 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). *TSO 3b.* Differentiate between electric potential and potential difference. *TSO 3c.* Apply Gauss' law to find the electric field intensity due to charge bodies. *TSO 3d.* Describe factors affecting the capacitance of a given capacitor. *TSO 3e.* Find the expression for magnetic field caused by current carrying circular wire at the center. *TSO 3f.* Explain Faraday's law of electromagnetic induction and Lenz's with applications. *TSO 3g.* Explain the terms required to describe the AC current	**Unit-3.0 Electrostatics, Electromagnetism and Electric Current** 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 3.2 Gauss' law, electric field intensity due to straight charged conductor, charged plane sheet and charged sphere 3.3 Dielectric, Capacitance of capacitor (parallel plate), Factor affecting capacitance of capacitors 3.4 Magnetic field and its units, Biot Savart Law Magnetic field due to current caring wire: straight and circular wire, Lorentz force (force on moving charge in magnetic field) 3.5 Magnetic flux, Faraday's law of electromagnetic induction, Lenz's law, Self and Mutual induction, eddy current, motional emf 3.6 DC and AC currents, Average, rms and Peak value of AC current	**CO3**
TSO 4a. Distinguish material on the basis of band gap.	**Unit-4.0 Semiconductor Physics**	**CO4**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 4b. Explain the various terms related to movement of charge carrier inside the semiconductors. *TSO 4c.* Explain the formation of depletion layer in a given pin junction. *TSO 4d.* Use V-I characteristic of explain the working of given p-n junction device.	4.1 Energy band and band gap, insulator, semi-conductor, conductor 4.2 Intrinsic and Extrinsic semiconductors, Drift velocity, drift and diffusion current, Mobility, current density, law of mass action. 4.3 Depletion layer and barrier Potential, p-n junction and V-I characteristics, Half wave and full wave rectifier 4.4 Photocells, Solar cells; working principle and engineering applications.	
TSO 5a. Apply the concept of photoelectric effect to explain the of photonic devices. *TSO 5b.* Explain Laser, components of laser and its various engineering applications. *TSO 5c.* Explain propagation of light in optical fiber and applications of optical fiber. *TSO 5d.* Describe the properties of nanomaterials and its various applications.	**Unit-5.0 Modern Physics** 5.1 Photoelectric effect; threshold frequency, work function, Stopping Potential, Einstein's photoelectric equation. 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. 5.3 Optical fibers: Total internal reflection, acceptance angle and numerical aperture, Optical fiber types, applications in telecommunication, medical and sensors. 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. *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. *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. *LSO 3.2.* Estimate errors in the measurement.	3.	Spherometer	CO1
LSO 4.1. Measure the variation of Time period with Mass of a given spring Oscillator. *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

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
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 *LSO 13.2.* Determine the value of Plank's Constant (*h*) from the graph between KE v/s frequency of incident light. *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.
7. For a given V-I characteristic graph p-n junction diode, determine the dynamic and static resistance.
8. Apply the concept of work function in various device and instruments, such as photodiodes, solar cells and electron microscope.

b. Micro Projects:

1. Make prototype Vernier calipers and screw gauge of desired LC,
2. Fiber optics: Demonstrate the phenomenon of total internal reflection.
3. LASER: Prepare model to demonstrate the properties and applications of LASER.
4. Use physics lab mobile application for demonstration of various concepts of physics.
5. Use Arduino board and with embedded sensors to measure the physical quantities.
6. Make prototype parallel plate capacitor and measure capacitance.
7. Make working model to demonstrate Lenz Law.
8. Prepare model to demonstrate DC and AC current.
9. Demonstrate the conversion of light energy into electric energy by using LED(s).
10. Waves in string: standing waves in string using woofer loudspeaker.
11. Use smartphone to measure the different physical quantity with the sensor applications.
12. Use open source simulation software such as SCILAB and PheT to demonstrate SHM/wave, Phase difference between two waves and superposition of waves.

c. Other Activities:

1. Seminar Topics:
    - Needs of measurements in engineering and science.
    - Optical fibers: Construction and application in communication systems.
    - Synthesis and applications of nanomaterials
    - Applications of SHM/wave in daily life.
    - Ohm's Law and its applications in series and parallel circuits.
    - Kirchhoff's Laws and applications
    - Power and Energy in Electrical Circuits
    - Resistivity and Conductivity:
    - Electrical Safety and Hazard Prevention
    - Laser applications in Computer peripherals/ communications/ robotics
    - Holography.

2. Visits: Visit nearby industry with Instrumentation, production and Laser/optical fibers facilities. Prepare report of visit with special comments Instrumentation technique and material used.

3. Self-Learning Topics:
    - Vectors and its properties with applications
    - Diffraction of light
    - Newton's Laws of motion, momentum, inertia, impulse
    - Continuous and discrete charge distribution
    - Force, work, energy, power, work-energy theorem, law of **conservation of energy**
    - Frictions and its types
    - Relation between Electric field (E)and potential (V)
    - Work done in various Processes, Adiabatic constant (Cp/Cv = ϒ), Mayer's formula (Cp - Cv = R)
    - Ultrasonic
    - Microwave and electromagnetic wave.
    - Ruby Laser

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: T2420103

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO.1a Apply the concept of charge, voltage and current in the given electrical circuit TSO.1b Differentiate between AC and DC currents. TSO.1c Differentiate between practical and Ideal current/voltage source TSO.1d Calculate work, power, and energy in the given circuit TSO.1e Calculate the equivalent resistance/Capacitance/ inductance in the given series and parallel electric circuit. TSO.1f Explain the heating/magnetic/chemical effect of the electric current with a relevant application. TSO.1g Calculate the energy stored in a given resistor/capacitor/inductor. TSO.1h Explain the effect of various media on capacitance TSO.1i Explain behavior of current in a resistor/capacitor/inductor.	**Unit-1.0 Basic Electrical Parameters and Concepts** 1.1 Electric charge, flow of charges, Electric Current D.C and A.C, Concept of ideal and practical current sources 1.2 Analogy of charge, potential /Voltage difference D.C and A.C, Induced emf/voltage, Terminal voltage, Concept of Ideal & Practical voltage sources 1.3 Resistor - Properties, Classification, Practical application of resistors, Effect of temperature on resistance, Series and parallel combination of resistors, Phase difference 1.4 Heating, magnetic and chemical effect of current, Electrical work, Power and energy, Open and short circuit condition of electric circuit 1.5 Capacitors – Properties, Capacitance formation, Expression for capacitance, Capacitive reactance, Energy stored in capacitor, Series & parallel combination of capacitors, Types of capacitors including super capacitors and their applications 1.6 Inductors – Properties, Self and mutual inductance, inductive reactance, Voltage and current equations of inductor, Energy stored in inductor, Inductance in A.C. and D.C. circuits, Types of Inductors including MEMS inductor and their applications	**CO-1**
TSO.2a Differentiate between- ● AC and DC current in all aspects (Generation, Waveforms and applications) ● Active and passive elements ● Linear & Non-linear circuit ● Unilateral and Bilateral circuit ● Loop and mesh in a given circuit TSO.2b Apply Ohm's law and Kirchhoff's laws to determine current and voltage in a given circuit. TSO.2c Explain various AC fundamental parameters. TSO.2d Use operator 'j' to calculate various quantities in A.C circuit	**Unit-2.0 Fundamentals of D.C. and A.C. Circuits** **DC Circuits** 2.1 AC and DC current, voltage and Power 2.2 Ohm's law, Kirchhoff's Current Law, Kirchhoff's Voltage law 2.3 Active & Passive elements, Linear & Non-linear circuit, unilateral and Bilateral circuit element, 2.4 Node, Branch, Loop, Mesh **A.C Circuits** 2.5 Frequency, Time period, Amplitude, Angular Velocity, RMS Value, Average Value, Form factor, Peak factor, Power factor 2.6 Phasor representation and transformation from Polar to rectangular form and vice versa of alternating quantities	**CO1, CO2**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO.3a Explain various terms related to magnetic circuit. TSO.3b Calculate various parameters of a given magnetic circuit. TSO.3c Plot B-H curve and Hysteresis loop of a given magnetic materials TSO.3d Explain the phenomenon of induced e.m.f and current TSO.3e Apply principles of Faraday's law to calculate induced e.m.f in the given circuit TSO.3f Apply various Laws in a given magnetic circuits	**Unit-3.0Magnetic Circuits and Electromagnetic Induction** 3.1 Magnetic flux, Magnetomotive force, Magnetic field strength, Permeability, Reluctance. 3.2 Magnetic leakage, leakage coefficient 3.3 Magnetic Hysteresis, Hysteresis loop, 3.4 Magnetization (B-H) Curve 3.5 Analogy between electric and magnetic circuits 3.6 Electromagnetism 3.7 Induced e.m.f -Statically (self and mutual) and dynamically induced emf, 3.8 Faraday's Laws of electromagnetic Induction. 3.9 Lenz's Law, Fleming's R.H. rule; direction of induced E.M.F, Fleming's L.H. rule, Ampere's Law	**CO2, CO3**
TSO.4.a Describe the construction and working principle of the given type of semiconductor TSO.4.b Describe the principle of the given type of semiconductor. TSO.4.c Describe between the given type insulator, conductor and semiconductor based on energy band theory. TSO.4.d Describe working principle, characteristics and application of the given type of diode. TSO.4.e Describe working principle of the given type of Bipolar Junction Transistor. TSO.4.f Describe working principle of the given type of Field Effect Transistor.	**Unit-4.0Basic Electronic Components** 4.1 Semiconductors: Definition, types of semiconductors and their materials. Energy band theory and effect of temperature. 4.2 Diodes: Basic Concept of Diodes, N-type & p-type PN Junction Diode – Forward and Reverse Bias Characteristics i.e., PN junction Barrier voltage, depletion region, Junction Capacitance. Forward biased & reversed biased junction, Diode symbol 4.3 Bipolar Junction Transistor (BJT): NPN and PNP Transistor – Operation and characteristics. symbol 4.4 Field Effect Transistor (FET): FET – Operation and characteristics, Classification FET and advantages, FET symbol	**CO4**
TSO.5a Convert one number system to other number system. TSO.5b Use Boolean Algebra to solve expressions TSO.5c Implement Boolean expressions for given logic gates	**Unit-5.0Overview of Digital Electronics** 5.1 Introduction to different Number systems: Binary, Octal, Decimal & Hexadecimal & their Conversion from one another 5.2 Introduction to Boolean Algebra, rules and Laws of Boolean Algebra – DE Morgan's Law 5.3 Study of logic gates (NOT, OR, NOR, AND, NAND) Symbolic representation, Truth Table and Implementation of Boolean expressions	**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: P2420103

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
LSO 1.1 Classify given electrical components in to Resistor, Inductor and Capacitor.	1.	Classification of electrical components	CO1
LSO 1.2 Plot the terminal voltage of a source starting from no load to different load (Current) conditions	2.	Terminal voltage of a source for different load conditions	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 electric circuit	CO1
LSO 1.4 Verify the zero Phase difference between current and voltage waveform for a resistor connected to an AC source with respect to time (using CRO).	4.	Phase difference between voltage and current waveform in a given resistor using CRO	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 1.6 Measure resistance inan series and parallel combination of resistors using digital multimeter	6.	Measurement of resistances in series and combination in an electric circuit.	CO1
LSO 1.7 Calculate the value of equivalent capacitance in series and parallel combination and verify by measuring the value of capacitance using digital multimeter	7.	Measurement of capacitance in series and parallel combination of Capacitors.	CO1
LSO 2.1 Apply ohm's law to calculate voltage across each element in a given circuit	8.	Measurement of voltage across each element of the given linear circuit	CO1, CO2
LSO 2.2 Determine currents using KCL in a given electric circuit and verify it by conducting experiment	9.	Measurement of current in the given electric circuit.	CO1, CO2
LSO 2.3 Determine voltages using KVL in a given electric circuit and verify it by conducting experiment	10.	Measurement of voltage in a given electric circuit	CO1, CO2
LSO 2.4 Verify the Phase difference (Lag)between current and voltage waveform for an inductor connected to an AC source with respect to time using CRO.	11.	Phase difference(lag) between voltage and current waveform in a given inductor	CO1, CO2
LSO 2.5 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 using CRO	CO1, CO2
LSO 2.6 Perform experiment to plot BH curve in a magnetic material	13.	BH curve of a given magnetic material	CO1, CO2

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
LSO 3.1. Perform experiment to demonstrate statically and dynamically induced emf.	14.	Statically and Dynamically induced emf.	CO2, CO3
LSO 3.2. Perform experiment to demonstrate self and mutual inductance.	15.	Self and Mutual inductance.	CO2, CO3
LSO 3.3. Perform experiment to demonstrate Faraday's laws of electromagnetism	16.	Faraday's laws of electromagnetism.	CO2, CO3
LSO 3.4. Perform experiment to demonstrate Flemings right hand and left-hand rules	17.	Flemings right hand and left-hand rules.	CO2, CO3
LSO 3.5. Perform experiment to demonstrate Lenz's law	18.	Lenz's law.	CO2, CO3
LSO 4.1 Test the working of a given diode, and plot the labelled V-I characteristics	19.	VI characteristics of Diode.	CO4
LSO 4.2 Test the working of a given BJT and plot the labelled V-I characteristics.	20.	VI characteristics of BJT.	CO4
LSO 4.3 Test the working of a given FET and plot the labelled V-I characteristics	21.	VI characteristics of FET	CO4
LSO 5.1 Build and verify the truth tables for all logic gates – NOT, OR, NOR, AND, NAND	22.	Logic Gates – NOT, OR, NOR, AND, NAND	CO5

L) Suggested Term Work and Self-Learning: S2420103 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. Prepare a report on comparison of a physical system (containing two vertical water columns connected with a horizontal capillary tube and liquid flow due to gravity) to demonstrate the analogy of charge, potential difference and current flow in electrical system.
ii. Prepare a report on types of resistors, their power ratings and relevant applications.
iii. Calculate resistance value of a given resistor based on color codes and verify its value using multimeter.
iv. Prepare a chart showing range of resistances used for electrical insulating materials.
v. Sketch a plot of BH curve for soft and hard magnetic materials respectively.
vi. Collect the information regarding various types of inductors used in different domestic appliances.
vii. Prepare a chart of different types of capacitors used with their applications.
viii. Prepare a chart illustrating an example to differentiate between useful and leakage flux.

b. Micro Projects:

1. Demonstrate the working of resistor, Inductor and Capacitor through role play or using animation
2. Prepare detailed specifications of a typical capacitor bank used for power factor improvement in an industry.

J) Theory Session Outcomes (TSOs) and Units: T2418104

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 1a. Describe the anatomy of the Computer System. *TSO 1b.* List the different Input and Output devices. *TSO 1c.* Identify the different types of memory in computer systems. *TSO 1d.* Describe communication between different components of a computer. *TSO 1e.* Describe the functionalities of a computer system. *TSO 1f.* Use Internet digital Platforms	**Unit-1.0 Basics of Computer System** 1.1 Computer System and its Components. - Generation of Computer - Anatomy of Computer Systems - Input and output device - Motherboard - Peripherals - Backend and Front end of System Unit 1.2. Storage device in Computer System - Primary Storage - Secondary Storage 1.3. CPU Components - Register - Control Unit - ALU 1.4. Types of Bus - Address Bus - Data Bus - Control Bus 1.5 Search Engine - Introduction - Search Query - Applications of Internet Digital Platforms (BHIM, Digi-Locker, m-Parivahan, NPTEL etc.)	**CO1**
TSO 2a. Convert Binary numbers into different number systems *TSO 2b.* Classify Basic Logic gates and Universal Gates *TSO 2c.* Use basic universal logic gates to design simple digital logic circuit functions	**Unit 2.0 Digital Logic and Number System** 2.1 Introduction to digital computers and number system - Binary number system - Base conversions (Binary, Decimal, Hexadecimal, Octal) - Binary Coded Decimal 2.2 Basic Logic gates - AND, OR, INVERTER, XOR, XNOR - Working of Universal Gates - NAND Gate - NOR Gate	**CO2**
TSO 3a. Explain the functions and services of OS. *TSO 3b.* Explain different types of operating systems. *TSO 3c.* Write steps to Install Windows/Linux Operating System using a hypervisor. *TSO 3d.* Differentiate the licensed and freeware software.	**Unit 3.0 Computer Software and Operating System** 3.1 Different Types of Computer Software - Application Software - System Software - Utility Software 3.2 General features of OS - Introduction - Need, Functions, Services 3.2 Types of OS - Batch Operating System. - Multitasking/Time-Sharing OS. - Multiprocessing OS.	**CO3**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
	- Real-Time OS. - Distributed OS. - Network OS. - Mobile OS 3.3 Windows & Linux Operating Systems (Installation) - Microsoft Windows OS (History Basic Features, Current State of OS) - Linux Operating System (Architecture, Components of Linux System, Kernel Mode vs User Mode, Basic Features) 3.4 Proprietary & Open-source software	
TSO.4a Compare various computer network topologies and types of networks. *TSO.4b* Describe the functions of Networking Devices. *TSO.4c* Classify the concepts of Modulation & Multiplexing for Digital Communication. Describe various wired and wireless media for digital communications. *TSO.4d* Explain the use of IP addressing systems, DNS, and communication devices in the Internet and Intranet.	**Unit.4.0 Computer Network and Internet Tools** 4.1 Basic terminology of Computer Network - Network and its types (LAN, MAN, WAN) 4.2 Network Topology (Bus, Ring, Star, Mesh) 4.3 Networking Devices (Types and use) - Hub, Switch, Router, Bridge, Gateway, Modem, Repeater, Wireless Access Point, NIC 4.4 Transmission modes (Simplex, half-duplex, Full-duplex) 4.5 Modulation (Definition and Need) - Types of Analog Modulation - Types of Digital Modulation 4.6 Wired and Wireless media - Twisted -pair, - Coaxial, - Fiber Optics, - Radio - Infrared - Satellite 4.7 Internet & Intranet - URL - Internet - Intranet - Comparison between Intranet & Internet 4.8 Network Addressing (IPv4) - Internet Protocol (need, types) - Classful addressing scheme, Address space, notations, netid, hostid - Need of IPv6	**CO4 and CO5**
TSO 5a. Explain concepts of Information Security for Data Protection. *TSO 5b.* Classify various cyber-attacks. *TSO 5c.* Describe cyber laws for data protection and IPR	**Unit. 5.0 Information Security** 5.1 Need for Information Security - Definition of various terms of Information Security. - Cryptography - Vulnerability - Threat - Attack - Encryption - Decryption	**CO6**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
	5.2The Principles of Security & Confidentiality, Integrity, Availability (CIA triad) 5.3Security services, Use of Firewall 5.3.1 Cyberattacks - Introduction of common types of attacks (Malware, Man-in-the-middle attack, Denial-of-service attack, SQL injection, Phishing, Password cracking.) 5.3.2 Cyber Law IT Amendment Act 2008 (Section 66 & 67)	

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

K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical: P2418104

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
LSO 1.1. Install device driver. *LSO 1.2.* Install given software on your system. *LSO 1.3.* Perform Registration process on digital India platform.	1.	1.1 Identify specifications of various types of computer systems available in your institute. 1.2 Install Printer, scanner driver. 1.3 Install any two freeware or open-source software/tool by using web browser 1.4 Use Digital India Platforms: BHIM, Digi-Locker, m-parivahan, NPTEL.	CO-1
LSO 2.1. Verify truth table of basic logic gates *LSO 2.2.* Design basic logical gates with NAND and NOR gates	2.	2.1 Using Integrated circuit (IC), verify the truth table of basic logic gates. 2.2 Verify truth table and digital logic circuits of basic logic gates with the help of NAND gate using IC. 2.3 Design digital logic circuit functions of basic logic gates with the help of the universal gate-NOR Gate using IC.	CO-2
LSO 3.1 Identify different software in the PC LSO 3.2 Install different operating systems on PC. LSO 3.3 Use different Linux commands in real life.	3.	3.1 Install windows and Linux operating system 3.2 Practice of Basic UNIX Commands and various UNIX editors such as vi, ed, ex.	CO-3
LSO 4.1. Configure IPV4 addressing in the pc of a network *LSO 4.2.* Implement the cross-wired cable and straight-through cable using a clamping tool. *LSO 4.3.* Interpret Ping and Traceroute Output.	4	4.1 Identify the different networking devices. 4.2 Configure the IPv4 address in every computer in the computer network lab 4.3 Learn different LAN connections in the computer network lab. 4.4 Practically implement the cross-wired cable and straight-through cable using the clamping tool. 4.5 Interpreting Ping and Traceroute Output 4.6 Run Packet tracer tool	CO-4

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
LSO 4.6 Identify terminals of a given transistor using suitable measuring instrument. *LSO 4.7* Perform soldering operation in a given situation.		4.5 Measure voltage and current for single and three phase Supply using multimeter and clip on meter. 4.6 Perform continuity test of given component using Multimeter. 4.7 Identify three terminals of a transistor using digital Multimeter. 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. *LSO 5.2* Describe the procedure to use the given firefighting equipment. *LSO 5.3* List the materials used for first Aid. *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. 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.

J) Theory Session Outcomes (TSOs) and Units:

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
–	**Unit-1.0** **Word Processing** **1.0 Word Processing:** Overview of Word processor Basics of Font type, size, colour, Effects like Bold, italic, underline, Subscript and superscript, Case changing options, previewing a document, saving a document, closing a document and exiting application. **1.1 Editing a Document:** Navigate through a document, Scroll through text, Insert and delete text, Select text, Undo and redo commands, Use drag and drop to move text, Copy, cut and paste, Use the clipboard, Clear formatting, Format and align text, Formatting Paragraphs, Line and paragraph spacing, using FIND and REPLACE, Setting line spacing, add bullet and numbers in lists, add borders and shading, document views, Page settings and margins, Spelling and Grammatical checks **1.2 Changing the Layout of a Document:** Adjust page margins, change page orientation, Create headers and footers, Set and change indentations, Insert and clear tabs. **1.3 Inserting Elements to Word Documents**: Insert and delete a page break, Insert page numbers, Insert the date and time, Insert special characters (symbols), Insert a picture from a file, Resize and reposition a picture **1.4 Working with Tables:** Insert a table, Convert a table to text, Navigate and select text in a table, Resize table cells, Align text in a table, Format a table, Insert and delete columns and rows, Borders and shading, Repeat table headings on subsequent pages, Merge and split cells. **1.5 Working with Columned Layouts and Section Breaks:** a Columns, Section breaks, Creating columns, Newsletter style columns, Changing part of a document layout or formatting, Remove section break, Add columns to remainder of a document, Column widths, Adjust column spacing, Insert manual column breaks.	**CO-1**
–	**Unit-2.0 Spreadsheets** **2.1 Working with Spreadsheets:** Overview of workbook and worksheet, Create Worksheet Entering data, Save, Copy Worksheet, Delete Worksheet, Close and open Workbook. **2.2 Editing Worksheet:** Insert data, adjust row height and column width, delete, move data, insert new rows and columns, Copy and Paste content, Find and Replace, Spell Check, sheet view Zoom In-Out, insert Special Symbols, Insert Comments, Add Text Box, Undo-redo Changes, - Freeze Panes, hiding/unhiding rows and columns. **2.3 Formatting Cells and sheet:** Setting Cell Type, Setting Fonts, Text options, Rotate Cells, Setting Colors, Text Alignments, Merge and Wrap, apply Borders and Shades, Sheet Options, Adjust Margins, Page Orientation, insert Header and Footer, Insert Page Breaks, Set Background. **2.4 Working with Formula:** Creating Formula, absolute and relative cell references, Copying and pasting Formula, Common spreadsheet Functions such as sum, average, min, max, date, In, And, or, mathematical	**CO-2**

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

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

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

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

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant Cos Number(s)
LSO 13.1. Run slide presentation in different modes *LSO 13.2.* Print slide presentation	13.	i. Run slide presentation in customize form/modes ii. Print slide presentation as sheet, handouts using various print options	CO-3
LSO 14.1. Apply given animation effects to the text and slides.	14.	Apply different animation effects to the text and slides with given options.	CO-3
LSO 15.1. Add audio and video files in the presentation	15.	Add some sample audio and video files in the presentation and format the same with various options available.	CO-3
Internet Basics			
LSO 16.1. Configure internet and browser setting	16.	a) Configure Internet connection b) Configure browser settings and use browsers	CO-4
LSO 17.1. Use different internet services	17.	a) Use internet for different web services, such as, chat, email, video conferencing, etc.	CO-4
LSO 18.1. Work with Google Doc	18.	Work with Google Doc for creating collaborative documents on cloud	CO-4
LSO 19.1. Work with google sheet	19.	Work with google sheet for creating collaborative spreadsheets on cloud	CO-4
LSO 20.1. Work with google slides	20.	Work with google slides for creating collaborative slide presentation on cloud	CO-4
LSO 21.1. Create google form	21.	a) Create google form for a sample survey b) Through google forms collect user's response, download it in csv format, analyze it and represent data/trend through graphs and present it.	CO-4, CO3

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

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

b. Micro Projects:

I. **Word documents**: prepare documents such as Time Table, Application, Notes, Reports. (Subject teacher shall assign a document to be prepared by each student)

II. **Slide Presentations:** Prepare slides with all Presentation features such as: content presentation, presentation about department, presentation of reports. (Subject teacher shall assign a presentation to be prepared by each student).

III. **Spreadsheets:** Prepare statements such as Pay bills, tax statement, student's assessment record using spreadsheet- perform statistical analysis, sorting and filtering operations, represent data through various types of charts. (Teacher shall assign a spreadsheet to be prepared by each student).

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. *TSO 1b.* Describe the challenges and benefits of using OER in a class. *TSO 1c.* Apply various aspects of evaluating OER before use *TSO 1d.* Explain necessity to assess an OER's adaptability. *TSO 1e.* Use preliminary search for open educational resource. *TSO 1f.* Find OER using various resources.	**Unit-1.0 Open Educational Resources** 1.1 OER - definition 1.2 What is NOT OER. 1.3 Benefits of using OER – Benefits to Students - Access to Quality Education 1.4 OER - Benefits to Faculty - Use, Improve and Share, Network and collaborate with peers, Lower Cost, Improve access to information 1.5 Challenges of Using OER – Subject Availability, Format and Material type availability, Time and Support availability 1.6 Evaluating OER – a) Clarity, Comprehensibility, and Readability, b) Content and Technical Accuracy, c) Adaptability and Modularity, d) Appropriateness and Fit, e) Accessibility 1.7 Finding Open Content - OER Search Scenario Filter by Usage Rights in Google, Repositories and Search Tools, Subject-specific Repositories	**CO1**
TSO 2a. Explain benefits of copyright protection for creator *TSO 2b.* Explain exceptions and limitations to copyright law *TSO 2c.* List rights granted to copyright holders. *TSO 2d.* Explain Exceptions and limitations to copyright law *TSO 2e.* Explain Fair use/fair dealing apply to copyright *TSO 2f.* Elaborate Public domain and how does it relate to copyright *TSO 2g.* Elaborate penalties for copyright infringement. *TSO 2h.* Explain copyright for digital content and the internet. *TSO 2i.* Explain use of copyrighted works in education *TSO 2j.* Explain the use of free licenses	**Unit-2.0 Copyright and Open Licensing** 2.1 Copyright and what it does protect, benefits of copyright protection for creators, duration of copyright protection last, rights granted to copyright holders. 2.2 Exceptions and limitations to copyright law, fair use/fair dealing apply to copyright 2.3 Public domain and its relation to copyright. 2.4 Penalties for copyright infringement 2.5 Apply copyright to digital content and the internet 2.6 Use of copyrighted works in education. 2.7 Open Licenses – GNU – Free Documentation license, Free Art License 2.8 Why Free Licenses – Retain, Reuse, Revise, Remix, Redistribute	**CO2**
TSO 3a. Describe the four different Creative Commons License components. *TSO 3b.* Explain the reason some CC-licensed content might not be considered OER. *TSO 3c.* Explain the Strength and weakness of four Open CC Licenses *TSO 3d.* Choose the right Creative Commons license for work.	**Unit-3.0 Creative Common Licenses** 3.1 Alternatives to copyright as Creative Commons licenses. 3.2 Four components of creative common Licenses – Attribution, Share- Alike, Non – commercial, No Derivatives 3.3 Choosing a Creative common licenses – Wiley's 5 Rs and Creative Common Licenses	**CO3**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 3e. Apply a Creative Commons license to existing work. *TSO 3f.* Use of Creative Commons licenses for commercial purposes. *TSO 3g.* Modify a work licensed under Creative Commons. *TSO 3h.* Revoke a Creative Commons license, combine works with different Creative Commons licenses *TSO 3i.* Differentiate between Attribution and Citation	3.4 Four Open CC Licenses and Their Strengths and Weaknesses – (a) CC BY (b) CC BY SA (c) CC BY NC (d) CC BY NC SA 3.5 Attribution Vs Citation - Creative Commons licensed work without giving attribution 3.6 Apply a CC License - choose the right Creative Commons license for work, apply a Creative Commons license to existing work, Creative Commons licenses be used for commercial purposes, modify a work licensed under Creative Commons, revoke a Creative Commons license, combine works with different Creative Commons licenses	

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

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

a. Assignments:

Related to Open Educational Resources – CO1

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

Related to Copyright – CO2

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

Related to Creative Common Licenses – CO3

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