Curriculum of Diploma Programme

in

Textile Engineering

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

State Board of Technical Education (SBTE), Bihar

Semester – II
Teaching & Learning Scheme

Course Codes	Category of course	Course Titles	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				
2428201	**PCC**	**Yarn Manufacture -I**	03	-	04	02	09	06
2428202	**PCC**	**Fabric Manufacture -I**	03	-	04	02	09	06
2400102C	**ASC**	**Applied Physics -C** (FPP, GT, CACDDM, TE)	03	-	04	02	09	06
2420103	**BEC**	**Fundamentals of Electrical and Electronics Engg.** (CSE, AIML, ME, ME (Auto), MIE, AE, CRE, CHE, TE)	03	-	04	02	09	06
2400104	**HSC**	**Communication Skills (English)** (Common for all Programmes)	03	-	04	02	09	06
Total			**15**	**-**	**20**	**10**	**45**	**30**

Note: Prefix will be added to Course Code if applicable (T for Theory, 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 - II
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)	
2428201	**PCC**	**Yarn Manufacture -I**	30	70	20	30	20	30	200
2428202	**PCC**	**Fabric Manufacture -I**	30	70	20	30	20	30	200
2400102C	**ASC**	**Applied Physics -C** (FPP, GT, CACDDM, TE)	30	70	20	30	20	30	200
2420103	**BEC**	**Fundamentals of Electrical and Electronics Engg.** (CSE, AIML, ME, ME (Auto), MIE, AE, CRE, CHE, TE)	30	70	20	30	20	30	200
2400104	**HSC**	**Communication Skills (English)** (Common for all Programmes)	30	70	20	30	20	30	200
Total			**150**	**350**	**100**	**150**	**100**	**150**	**1000**

Note: Prefix will be added to Course Code if applicable (T for Theory, 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 : **2428201 (T2428201/P2428201/S2428201)**

B) Course Title : Yarn Manufacture-I

C) Pre- requisite Course(s) : Textile Fibres

D) Rationale :

Yarn Manufacturing process is commonly known as "Spinning" in Textile industry. The basic idea about spinning preparatory processes such as Ginning, Blow room, Carding, draw frame and Combing machineries and the working of these machines are essential for understanding of the preparation to spinning process. In ginning and blow room, cotton seeds and heavy impurities are removed. Carding process improves fibre individualization and removes residual impurities from the cotton fibre. Combing is done for straightening, parallelization, upgrading the quality of cotton fibres and removing short fibres. In drawing process, fibre parallelization and improvement in evenness is achieved. The knowledge and skills acquired through this course will enable the students to handle these machines, supervise the yarn manufacturing process and perform the necessary setting changes required for processing different counts.

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

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

CO-1 Select relevant ginning machine to remove seeds from cotton.

CO-2 Select relevant sequence of machineries in blow room for given fibre

CO-3 Use carding machine to individualize the fibres, remove impurities and neps in cotton material.

CO-4 Use draw frame to produce even sliver.

CO-5 Use comber to produce good quality sliver by removing short fibres and hooks.

F) Suggested Course Articulation Matrix (CAM):

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

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

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

G) Teaching & Learning Scheme:

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				
2428201	Yarn Manufacture-I	03	-	04	02	09	06

Legend:

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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)	
2428201	Yarn Manufacture-I	30	70	20	30	20	30	200

Legend:

PTA: Progressive Theory Assessment in 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:

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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: T2428201

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 1a. Explain the objectives of ginning process. *TSO 1b.* Select suitable ginning machine for a given type of cotton fibre. *TSO 1c.* Identify causes of fibre damage during ginning process. *TSO 1d.* Describe the bailing process. *TSO 1e.* Describe the characteristics of given type of fibre bale.	**Unit-1.0 Ginning and Bailing** 1.1 Ginning: objectives, Types of ginning machines, Working mechanism, Advantages and limitations of each type 1.2 Defects in ginning 1.3 Cotton pressing and bailing, Standard bale dimensions and its weight 1.4 Different impurities/trash present in the cotton bales, Grading of cotton	**CO1**
TSO 2a. Describe the basic operations in blow room. *TSO 2b.* Explain the importance of mixing and blending of fibres. *TSO 2c.* Describe the working of a given feeding device with sketche *TSO 2d.* Describe the working of a given opener. *TSO 2e.* Explain principle of opening and cleaning of fibres. *TSO 2f.* Explain working of given machine used for cleaning of fibres. *TSO 2g.* Explain the working of given machine used for mixing and blending of fibres with neat sketches. *TSO 2h.* Explain the working of dust removal machine with neat sketches. *TSO 2i.* Explain the process of material transport in blow room. *TSO 2j.* Describe the working of dust removal machine with neat sketches. *TSO 2k.* Explain scutcher machine with neat sketches. *TSO 2l.* Explain lap regulating mechanism to produce uniform laps. *TSO 2m.* Select machine sequence for given fibre mixing and blending. *TSO 2n.* Calculate cleaning efficiency, Speed, hank density and production of blow room. *TSO 2o.* Explain the modern developments in blow room.	**Unit-2.0 Blow room** 2.1 Outline of yarn manufacturing/Spinning process 2.2 Objectives of blow room process. 2.3 Mixing and blending: Objectives, Difference between mixing and blending 2.4 Types of mixing and blending operations: Stack mixing, Bin mixing, Bale mixing, Flock blending, Lap blending, Web blending, Sliver blending, fibre blending, Roving blending 2.5 Feeding apparatus: Clamped feeding, free flight feeding 2.6 Opening, Techniques of opening, 2.7 Opening devices: Spiked lattice, Gripping element, Porcupine openers, Vertical openers, Two and three bladed beater, Kirschner beater, Hopper bale opener, Hopper feeder, Automatic bale opener, Unifloc, Blendomat 2.8 Cleaning, Techniques of cleaning, The Grid, elements of grid, grid adjustment 2.9 Cleaning devices: Step cleaner, Axi-flo cleaner, Monocylinder cleaner, The RN cleaner, ERM cleaner, Cleanomat 2.10 Factors influencing opening and cleaning, major and minor cleaning/beating points 2.11 Mixing devices: Mixing battery, Multiple mixer, The Unimix 2.12 Dust removal: Dust extractor, DUSTEX dedusting machines 2.13 Metal detection: Magnetic metal extractors, Electronic metal extractors 2.14 Scutcher machine: Lap forming, Delivery cages, calendaring, filters and dust trunk, Lap linear density, Lap regularity and Lap rejection 2.15 Sequence of blow room machineries for different varieties of cotton	**CO2**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
	2.16 Cotton conveying: Lattices, conveyor belts, pneumatic conveying, Chute feed system 2.17 Cleaning efficiency, Calculations related to blow room production, Hank calculation 2.18 Spinning Norms: Evaluation of blow room performance, speeds and settings, Maintenance of blowroom machineries 2.19 Modern development in blow room line	
TSO 3a. Explain the functions of card. *TSO 3b.* Describe with sketches the construction and working of revolving flat carding machine. *TSO 3c.* Describe the types of card clothing with neat sketches. *TSO 3d.* Compare among flexible, semi-rigid and rigid card clothing. *TSO 3e.* Explain working principle of auto-leveling equipment. *TSO 3f.* Describe the maintenance procedure of card. *TSO 3g.* Explain the formation of fibre hooks during carding operation. *TSO 3h.* Calculate speed, draft, cleaning efficiency and production of carding machine.	**Unit-3.0 Carding** 3.1 Carding: Objects of carding, Operating principle, Construction and working of revolving flat carding machine 3.2 Operating zones of carding machine 3.3 Card clothing and its classification 3.4 Maintenance of card clothing, Methods of stripping and grinding 3.5 Auto-levelling at card: Objectives, classification and principle. 3.6 Card settings and their effect on sliver quality. 3.7 Formation of fibre hooks 3.8 Calculation related to carding machine: Speeds, draft, production and hank of sliver and cleaning efficiency 3.9 Evaluation of card performance, Features of high production card 3.10 Modern development in carding.	**CO3**
TSO 4a. State the objectives of Draw frame. TSO 4b. Explain construction and working principle of Draw frame with neat sketch. TSO 4c. Explain the importance of drafting and doubling on yarn quality. TSO 4d. Describe with sketches the given drafting arrangement. TSO 4e. Distinguish different types of drafting systems. TSO 4f. Describe different types of top roller weighting system. TSO 4g. Explain sliver blending in Draw frame. TSO 4h. Explain the process of hook removal in draw frame TSO 4i. Identify the defects observed in drawn sliver. TSO 4j. Classify short, medium and long term irregularity. TSO 4k. Calculate the speed, draft and production of a draw frame for the given situation.	**Unit-4.0 Draw Frame** 4.1 Draw frame: Objectives, Principles of drafting and doubling, Passage of material through draw frame 4.2 Construction and working of Draw-frame 4.3 Draft: Type of Draft, Draft Distribution, drafting zone, Drafting Systems, Roller weighting system 4.4 Removal of hooks, Fibre parallelization 4.5 Speed and Settings, auto-leveler, stop motion 4.6 Sliver blending in Draw frame 4.7 Factors influencing drafting force 4.8 Draw frame defects, causes and remedies. 4.9 Short, medium and long term irregularity. 4.10 Draft and production calculation in Draw frame. 4.11 Features of modern Draw frame. 4.12 Maintenance of Draw frame	**CO4**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 5a. Define objectives of combing process. *TSO 5b.* Justify the need of preparatory process for comber. *TSO 5c.* State the importance of even passage between Card and Comber. *TSO 5d.* Explain construction and working principle of Sliver lap, Ribbon lap and Super lap machine with sketches. *TSO 5e.* Differentiate between lap doubling and sliver doubling process. *TSO 5f.* Describe parameters influencing the combing operation. *TSO 5g.* Explain combing cycle. *TSO 5h.* Explain Noil extraction theory. *TSO 5i.* Explain defects in combed sliver with their causes and remedies. *TSO 5j.* Describe modern developments in combing process. *TSO 5k.* Calculate the production in Kg/shift of the given combing preparatory machine and combing machine.	**Unit-5.0 Combing** 5.1 Objectives of combing process. 5.2 Need of preparatory process for comber, Requirement of the even passage between Card and Comber. 5.3 Combing preparation process: Conventional Process (Lap doubling): Construction and working of Sliver lap machine, Ribbon lap machine. Modern process (Sliver doubling): Construction and working of Super lap machine. 5.4 Effect of hook formation during carding on comber lap performance at combing. 5.5 Combing cycle, Feeding, Nipping, Cylinder combing, Top comb combing, Detaching, Forward feed, Backward feed. 5.6 Noil extraction. 5.7 Construction and working of Nasmith Comber. 5.8 Speeds and Settings. 5.9 Faults in comber and their remedies. 5.10 Recent development in comber preparatory machines and comber. 5.11 Performance evaluation of combers. 5.12 Draft and production calculation pertaining to combing machineries.	**CO5**

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

K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical: P2428201

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
LSO 1.1. Identify the correct material flow sequence to produce the lap. *LSO 1.2.* Demonstrate the passage of material through each machine of blow room line.	1.	Passage of material in the blow room	CO2
LSO 2.1. Use appropriate opener machine for tuft opening from bale of cotton. *LSO 2.2.* Use suitable cleaner machine in the blowroom for given fibre type. *LSO 2.3.* Select mixing machines for blending and mixing of given textile fibre. *LSO 2.4.* Draw the sketch the blowroom machinery and gearing diagram neatly. *LSO 2.5.* Identify major and minor cleaning points in the blow room line.	2.	Mechanism of opening, cleaning and mixing	CO2
LSO 3.1. Use dust extractor machine to remove micro dust from textile fibre. *LSO 3.2.* Use trash analyzer machine to estimate the trash percentage in given cotton fibre.	3.	Dust removal	CO2

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
LSO 4.1. Determine the speed and production of different beaters/cleaners used in blowroom using gearing arrangement. *LSO 4.2.* Use weighing machine to determine hank of lap by weighing grains per yard for given lap. *LSO 4.3.* Determine cleaning efficiency of blow room.	4.	Calculation of speed, production and hank density	CO2
LSO 5.1. Determine the speed and production of scutcher machine using gearing arrangement.	5.	Scutcher machine	CO2
LSO 6.1. Draw the sketch of the passage of material through carding machine. *LSO 6.2.* Identify feed roller, licker-in, cylinder, doffer, flats and doffer comb on carding machine. *LSO 6.3.* Draw line and gearing diagrams of carding machine.	6.	Passage of material through carding machine	CO3
LSO 7.1. Set different card settings as per given fibre. *LSO 7.2.* Demonstrate functions of auto-levelers on Card. *LSO 7.3.* Determine speed, draft, draft constant, and production in Kg/shift of a card using gearing diagram of carding machine. *LSO 7.4.* Determine cleaning efficiency of carding machine.	7.	Working of carding machine	CO3
LSO 8.1. Draw the sketch of the passage of material through draw frame machine. *LSO 8.2.* Identify different components of roller drafting system used in draw frame.	8.	Passage of material through Draw frame	CO4
LSO 9.1. Sketch the line and gearing diagrams Determine draft, draft constant, speeds and production in Kg/shift of draw frame using gearing diagram of draw frame. *LSO 9.2.* Demonstrate the working of electrical stop motion on draw frame. *LSO 9.3.* Operate the draw frame efficiently.	9.	Working of draw frame	CO4
LSO 10.1. Set the speed of draw frame for different fibres.	10	Settings of draw frame	CO4
LSO 11.1. Draw the line and gearing diagrams of Sliver lap, Ribbon lap and Super lap. *LSO 11.2.* Calculate speed and production of the given machine.	11.	comber preparatory machine	CO5
LSO 12.1. Sketch the line and gearing diagrams of Comber. *LSO 12.2.* Demonstrate combing cycle and nipper motion on Comber.	12.	Working of comber	CO5

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
LSO 12.3. Calculate speed, draft, noil percentage and production of above machines.			

L) Suggested Term Work and Self Learning: S2428201

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 list of major ginning industries available in India along with their ginning capacity.
2. Prepare a report focused on speed and setting norms in Blow room for different count of yarn.
3. Collect the specifications of the latest carding machine manufactured by various manufacturers and prepare a report.
4. Derive the formula of drafting force experienced in drafting zone.
5. List down the latest development in comber

b. Micro Projects:

1. **Fibre sample collection:** Collect the sample of different types of cotton fibre, prepare property chart and compare their properties.
2. **Sliver analysis:** Calculate hank of card sliver and analyze weight per unit length.
3. **Sliver defects analysis:** Prepare report on various defects observed in card, Drawn or Combed slivers, provide reasons for those defects and suggest possible remedies to avoid it.
4. **Machine setting:** Prepare report on change in speed and setting parameters required in Blow room, Card, Draw frame and Comber while changing the raw material from natural fibre to man-made fibre.
5. **Market survey of wire points:** Collect different types of wire points available in market and make a sample book of wire points with their specifications and uses.
6. **Machine specifications:** Prepare a report on machine specifications of Blow room, Card, Draw frame and Comber of different manufacturers.
7. **Fibre waste:** Prepare a report on fibre wastes and suggest strategies for its re-use.

c. Other Activities:

1. Seminar Topics:
   - Recent technological advancement of blow room.
   - Recent technological advancement of card.
   - Recent technological advancement of draw frame.
   - Recent technological advancement of comber.
2. Visits:
   - Visit nearby spinning industry and prepare machinery layout.
   - Prepare report on different manufacturers' Blow room, Carding, Draw frame and Comber based on your industrial visit.
   - Collection of various machine specifications and process parameters for Blow room, Carding, Draw frame and Comber.

3. Self-Learning Topics:

- High volume Instrument for determination of cotton fibre parameters
- Changes required in Blowroom for processing synthetic fibres
- Calculation of CV% during Draw frame operation

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%	20%		-	-
CO-2	35%	35%	30%	20%	60%	35%	35%
CO-3	20%	20%	20%	20%		20%	20%
CO-4	15%	15%	`15%	20%	40%	25%	25%
CO-5	20%	20%	25%	20%		20%	20%
Total Marks	**30**	**70**	**20**	**20**	**10**	**20**	**30**
			50				

Legend:

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

**: Mentioned under point- (N)

#: Mentioned under point-(O)

Note:

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

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

Unit Title and Number	Total Classroom Instruction (Cl) Hours	Relevant COs Number(s)	Total Marks	ETA (Marks)		
				Remember (R)	Understanding (U)	Application & above (A)
Unit-1.0 Ginning and Bailing	05	CO1	8	2	2	4
Unit-2.0 Blow room	17	CO2	25	8	7	10
Unit-3.0 Carding	10	CO3	15	4	5	6
Unit-4.0 Draw frame	07	CO4	10	3	3	4
Unit-5.0 Combing	9	CO5	12	3	3	6
Total	**48**	**-**	**70**	**20**	**20**	**30**

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

O) Suggested Assessment Table for Laboratory (Practical):

S. No.	Laboratory Practical Titles	Relevant COs Number(s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
1.	Passage of material in the blow room	CO2	50	40	10
2.	Mechanism of opening, cleaning and mixing	CO2	50	40	10
3.	Dust removal	CO2	50	40	10
4.	Calculation of speed, production and hank density	CO2	50	40	10
5.	Scutcher machine	CO2	50	40	10
6.	Passage of material through carding machine	CO3	50	40	10
7.	Working of carding machine	CO3	50	40	10
8.	Passage of material through Draw frame	CO4	50	40	10
9.	Working of draw frame	CO4	50	40	10
10.	Settings of draw frame	CO4	50	40	10
11.	comber preparatory machine	CO5	50	40	10
12.	Working of comber	CO5	50	40	10

Legend:
PRA*: Process Assessment
PDA**: Product Assessment

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

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

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

S. No.	Name of Equipment, Tools and Software	Broad Specifications	Relevant Experiment/Practical Number
1.	Automatic bale opener	Material: Cotton, man-made fibres up to 65 mm staple length, Production output: Cotton (1000 - 2000 kg/h)	1,2
2.	Cleaning machine	Material: Cotton, cotton waste, linen, Production volume: 1000-1400 kg/h, working width:1600 mm, Clearer roller diameter:750 mm, Speed:480-960 rpm, Length: 2000 mm, Width:1000 mm, Height:2000 mm	1,2,3,4,5

S. No.	Name of Equipment, Tools and Software	Broad Specifications	Relevant Experiment/Practical Number
3.	Mixing machine	Material: fibres up to 65 mm staple length, Production: 800-1000 kg/h, No. of chambers:8, Opening roller speed: 500-600 rpm, Take-off roller speed:660 rpm, Width:1500 mm, Length:8795 mm	1,2,5
4.	Carding machine	Working width:1500 mm, Licker-in diameter:180 mm, Licker-in speed:1000-2000 rpm, Main cylinder diameter:814 mm, Main cylinder speed:600-900 rpm, Doffer diameter:680 mm, Delivery:300-400 m/min., Flat bars:80, In working position:27, Flat direction: backward, Pressure:6 bar	6,7
5.	Miniature Draw frame	Delivery: Single, Delivery speed: 100-150 m/min, No. of sliver fed:6-8, Drafting system with pressure bar, Draft range: 8-12	8,9,10
6.	Super lap former	Delivery speed: 70-150 m/min, Drafting system: 3 over 3, Draft range: 1.3 – 2.2	11
7.	Comber	No. of combing head: 8, No. of delivery:1, material: suitable for cotton fibre (Rectilinear comber), nips/min: 250-400	12

R) Suggested Learning Resources:

(a) Books:

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Manual of Cotton Spinning, Volume I-IV	W. A. Hunter and C. Shrigley	The Textile Institute, ISBN 978-0900739095
2.	Technology of short- staple spinning – Vol I to IV	W Klein	Textile institute pub, Manchester
3.	Spun Yarn Technology	Oxtoby Eric	Butterworth's (Publishers) Limited, UK,1983, ISBN: 0-408-01464--4
4.	Handbook of Yarn production	P. R. Lord Peter	Woodhead publishing limited in association with The Textile institute, North America,2003, ISBN 1 85573 696 9
5.	Handbook on Cotton Spinning Industry	B. Purushothama	Woodhead Publishing India Pvt. Ltd., New Delhi, 2016, ISBN 13: 978-93-85059-55-1
6.	Fundamentals of Spun Yarn Technology	Carl A. Lawrence	CRC Press publication, Florida. ISBN 0-203—00958-4 Master E-book ISBN 1-56676-821-7 (Print Edition)
7.	NCUTE Extension Program- Drawing, Combing and Roving	Dr. R. Chattopadhyay Dr. R. S. Rengasamy	NCUTE PilotProgram, Indian Institute of Technology, New Delhi, 2003
8.	Technology of short- staple spinning – Vol I to IV	W Klein	Textile institute pub, Manchester
9.	Hand Book of Cotton spinning	William Taggart	Universal Pub. Corp.
10.	Essential facts of practical cotton spinning	T.K. Pattabhiram,	Soumya pub. Bombay
11.	Cotton spinning calculations	T.K. Pattabhiram	Soumya pub. Bombay
12.	Manual of cotton spinning – vol I to IV	Ed AFW coulson	Textile Institute, Manchester

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
13.	The Institute of Textile Technology USA series on textile processing	S. ZALOSKI	

(b) Online Educational Resources:

1. https://archive.nptel.ac.in/courses/116/102/116102048/
2. http://www.itamma.org/
3. http://www.textileassociationindia.org/
4. http://www.sitra.org/
5. http://www.cottonjouney.com/Storyofcotton/page5.asp
6. http://textiletechinfo.com/spinning/BLOWROOM.htm
7. http://textilelearner.blogspot.in
8. http://www.nitma.org/

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

(c) Others:

i. The Rieter Manual of Spinning by Klein Werner Rieter Machine Works Ltd., Winterthur, Switzerland, 2014, ISBN 10 3-9523173-2-2/ ISBN 13 978-3-9523173-2-7

*****

A) Course Code : 2428202 (T2428202/P2428202/S2428202)

B) Course Title : Fabric Manufacture -I

C) Pre- requisite Course(s) : Textile Fibre

D) Rationale :

Weaving is the most widely used method of Fabric Manufacturing in which the fabric is produced by interlacement of two distinct sets of yarn or threads. Diploma graduates in Textile Engineering should have understanding of basic principle and process of weaving along with different mechanism involved in weaving machinery. This course on Fabric manufacturing tries to develop skills and concepts required for fabric formation and various mechanism involved in it. After studying this course students will be able to identify cause and remedy of loom stoppage during weaving process. The knowledge gained through this course will help students to acquire skill sets required for producing a fabric using plain power loom which will enable them to take up the courses based on advanced Fabric manufacturing process in coming semester.

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** Identify the causes and remedy of loom stoppage during production.
- **CO-2** Modify the setting of primary motions of loom as per requirement of a particular fabric.
- **CO-3** Set the secondary motions of loom to get required picks per minute.
- **CO-4** Maintain auxiliary motions of loom to produce fabric with minimum defect effectively.
- **CO-5** Use loom for production of fabric efficiently with minimum down time.

F) Suggested Course Articulation Matrix (CAM):

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

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

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

G) Teaching & Learning Scheme:

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				
2428202	Fabric Manufacture-I	03	-	04	02	09	06

Legend:

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

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

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

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

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

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

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

H) Assessment Scheme:

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)	
2428202	Fabric Manufacture-I	30	70	20	30	20	30	200

Legend:

PTA: Progressive Theory Assessment in 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 assignment, micro project, seminar and self-learning is to be done by internal faculty (Internal Assessment) whereas assessment of output/product/ presentation related to these activities will be carried out by external faculty/expert (External Assessment). However, criteria of internal as well as external assessment may vary as per the requirement of respective course. For valid and reliable assessment, the internal faculty should prepare checklist & rubrics for these activities.

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

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

J) Theory Session Outcomes (TSOs) and Units: T2428202

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 1a. Identify fabric manufactured from different fabric formation method. *TSO 1b.* Differentiate among different type of loom. *TSO 1c.* Identify different parts of loom. *TSO 1d.* Describe the function of various parts of loom. *TSO 1e.* Explain the Principle of weaving *TSO 1f.* Distinguish between functions of different motions of weaving.	**Unit-1.0 Introduction to Weaving** 1.1 Conventional Textile Manufacturing Process, Different methods of fabric formation: Weaving, Knitting, Nonwoven, Felting, Braiding, Netting. 1.2 Weaving Technology, Type of looms, Brief ideas of Handlooms & Power loom. 1.3 Plain Power loom: Passage of warp material through Loom, Various parts of looms and its function, Principle of Weaving 1.4 Motions in weaving: Primary Motions, Secondary Motions and Auxiliary Motions	**CO1, CO5**
TSO 2a. Identify the different types of shed used in fabric manufacturing. *TSO 2b.* Select the suitable shedding type required for the given fabric. *TSO 2c.* Differentiate between cam and tappet shedding *TSO 2d.* Explain the working of tappet shedding mechanism. *TSO 2e.* Select a suitable shedding type based on their merit and, imitations for a particular scenario. *TSO 2f.* Determine timing and settings of the tappet shedding mechanism for the given situation.	**Unit-2.0 Shedding Mechanism** 2.1 Shedding, Types of shed 2.2 Shedding mechanisms: function, need and its kinds 2.3 The scope of tappet, dobby and jacquard shedding 2.4 Cam Shedding, Tappet Shedding, merits and limitations 2.5 Negative and positive tappet shedding 2.6 Tappet shedding: Types, Inside-Outside tappet shedding. Condition of good shedding, Shedding Time Cycle, Early shedding and late shedding.	**CO1, CO2, CO5**
TSO 3a. Explain the objective of picking mechanism. *TSO 3b.* Explain the working of given type of picking mechanism. *TSO 3c.* Select the type of picking mechanism required for the given application. *TSO 3d.* Determine timing and settings of the picking mechanism for the given situation. *TSO 3e.* Identify the defects produced due to defective picking mechanism. *TSO 3f.* Explain the working of Crank beat-up mechanism. *TSO 3g.* Adjust the setting of sley, crank and crank arm on a loom.	**Unit-3.0 Picking and Beat-Up Mechanism** 3.1 Picking mechanism: Objective, types, cone – over pick mechanism, cone – under pick mechanism and other conventional picking mechanism, Comparison between under pick and over pick. Picking Time Cycle 3.2 Essential feature to a good pick 3.3 Defects in negative picking, Early and late picking 3.4 Shuttle and its types, defects in shuttle and shuttle cop 3.5 Function of picker, picking band, buffer, check strap, swell spring, shuttle guard, shuttle flying, shuttle trapping 3.6 Beat-up and its objective, Construction and Mechanism of Crank beat-up	**CO1, CO2, CO5**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
	3.7 Function of sley, crank and crank arm, Eccentricity of sley motion and its effect on loom working, Factors affecting the sley-motion	
TSO 4a. Describe with sketches the functions of secondary motions. *TSO 4b.* Describe the working of given take-up mechanism with sketch. *TSO 4c.* Calculate the dividend of loom to decide required pick-wheel for a given fabric production. *TSO 4d.* Describe with sketches the working mechanism of given type of let-off motion. *TSO 4e.* Select the appropriate type of let-off motion for a given condition	**Unit-4.0 Automatic Looms** 4.1 Take-Up Motion: Objectives, Classification, Negative and positive take up motion, five wheel and seven-wheel take - up motion, Dividend of loom, calculated dividend and practical dividend, Changing the number of picks per inch 4.2 Let- Off Motion: Objectives, Types, Negative and positive let- off motion, Types of negatives let – off motion: Frictional let-off motion, Chain, lever and weight let-off motion, Advantages and Limitations of chain, lever and weight let-off motion, Conditions to good let – off motion	**CO3, CO5**
TSO 5a. Describe the functioning of given warp stop motion *TSO 5b.* Identify the reason for loom stoppage due to warp stop motion. *TSO 5c.* Describe the functioning of given weft fork motion. *TSO 5d.* Select between side and center weft fork motion for a loom for particular application. *TSO 5e.* Identify the reason for loom stoppage due to warp protecting motion. *TSO 5f.* Compare the features of the given types of warp protecting motions. *TSO 5g.* Identify the defects of fabric produced due to knocking off action of loom. *TSO 5h.* Explain relative merits and demerits of the given type of temple motion with reference to other types.	**Unit-5.0 Shuttle less Looms:** 5.1 Warp Stop Motion: Objectives and types, Mechanical, Electrical and Electromagnetic warp stop motion 5.2 Weft Fork Motion: Objectives, Principles and types, Side Weft fork motion and center weft fork motion, advantages and limitations 5.3 Warp Protecting Motion: Objectives and Needs, Types: Loose Reed, Fast reed and Electromagnetic Warp Protecting motion, Loom knocking off or banging off; Defects of Knocking off 5.4 Temple Motion: Two roller, three roller full width, Temple bracket mounting, types of temple rollers	**CO1, 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: P2428202

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
LSO 1.1. Identify various parts on power-loom. *LSO 1.2.* Draw the sketch of the passage of warp on loom.	1.	Passage of warp on loom.	CO1
LSO 2.1. Identify various parts of tappet shedding mechanism. *LSO 2.2.* Calculate the shed height for the given tappet shedding.	2.	Working of tappet shedding mechanism	CO1
LSO 3.1. Adjust the setting of Dobby shedding mechanism on a loom as per requirement.	3.	Dismantle, refit and set timings of tappet shedding mechanisms	CO1, CO2

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
LSO 3.2. Apply safety precautions required for dismantling and refitting.			
LSO 4.1. Identify various parts of over-pick mechanism on a plain power loom. *LSO 4.2.* Adjust the setting of over-pick mechanism on a plain power loom as per requirement.	4.	Dismantle, refit and set timings of over-pick mechanism	CO1, CO2
LSO 5.1. Identify various parts of cone under-pick mechanisms on a plain power loom. *LSO 5.2.* Adjust the setting of cone under-pick mechanisms on a plain power loom as per requirement.	5.	Dismantle, refit and set timings of cone under-pick mechanisms	CO1, CO2
LSO 6.1. Identify various parts of beat-up mechanism on a plain power loom. *LSO 6.2.* Adjust the setting of beat-up mechanism on a plain power loom as per requirement.	6.	Dismantle, refit and set timings of beat-up mechanism	CO1, CO2, CO5
LSO 7.1. Identify various parts of Five wheel take up mechanism on a plain power loom. *LSO 7.2.* Modify the of Five wheel take up mechanisms on a plain power loom to produce required picks/inch. *LSO 7.3.* Calculate the production speed of plain power loom.	7.	Dismantle, refit and set timings of Five wheel take up mechanisms	CO1, CO3, CO5
LSO 8.1. Identify various parts of Seven wheel take up mechanism on a plain power loom. *LSO 8.2.* Modify the of Seven wheel take up mechanisms on a plain power loom to produce required picks/inch. *LSO 8.3.* Calculate the production speed of plain power loom.	8.	Dismantle, refit and set timings of Seven wheel take up mechanisms	CO1, CO3, CO5
LSO 9.1. Identify various parts of let off mechanism on a plain power loom. *LSO 9.2.* Modify the speed setting of let off mechanism in a plain power loom. *LSO 9.3.* Calculate the speed of let off mechanism in a plain power loom.	9.	Working of let off mechanism	CO1, CO4, CO5
LSO 10.1. Identify various parts of loose reed mechanism on a plain power loom. *LSO 10.2.* Maintain the setting of loose reed mechanism for smooth running of plain power loom.	10.	Dismantle, refit and set timings of Loose reed mechanism	CO4, CO5
LSO 11.1. Identify various parts of fast reed mechanism on a plain power loom. *LSO 11.2.* Maintain the setting of fast reed mechanism for smooth running of plain power loom.	11.	Dismantle, refit and set timings of Fast reed mechanism	CO4, CO5

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
LSO 12.1. Produce a fabric sample using an available plain power loom. *LSO 12.2.* Identify cause and remedy of loom stoppage due to various reason during production of a fabric.	12.	Weaving of fabric on Power loom	CO5

L) Suggested Term Work and Self Learning: S2428202

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. Make a list of causes of loom stoppage during production along with their remedy.
2. Prepare the time cycle for different type of shed.
3. List down the different type of secondary motion and also mention their speeds.
4. Draw diagram of various auxiliary mechanisms on a card board. Draw diagrams of various parts, write function of each part.
5. Draw diagram of beat-up mechanism of power loom on a card board and label the part.

b. Micro Projects:

1. Collect the plain, twill or matt weave fabric available in the local market and sketch the design tappet profile along with timing and setting required for producing this fabric on plain power loom.
2. Prepare a report by downloading the product catalog of looms manufactured by 5 different machine manufacturers on different types of primary motions used in these looms.
3. Prepare a report by downloading the product catalog of looms manufactured by 5 different machine manufacturers on different types of secondary and auxiliary motions used in these looms.
4. Prepare a video by clubbing videos available online on different auxiliary motions used in the looms.
5. Collect total 5 samples of plain, twill or matt weave fabric available in the local market and calculate the speed their picks per inch (PPI) and determine the speed of take up and let-off roller required to produce these fabrics.

c. Other Activities:

1. Seminar Topics:
   - Importance of Loom timing.
   - Commercially available power looms and their primary motions.
   - Advancement in Auxiliary motions.
   - Causes and remedy of loom stoppage during production of woven fabric.
   - Weaving of manmade fibres

2. Visits: Visit nearby industry with woven fabric manufacturing facilities. Prepare report of visit with special comments on Primary, secondary and auxiliary motions used, material used, fabric materials produced in production and cost of the produced fabric.

3. Self-Learning Topics:
   - Fabric manufacturing using Handlooms
   - New developments in plain power looms.
   - Weaving of Viscose Rayon fabrics.
   - Production and setting calculations for plain power loom.

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	25%	25%	30%	20%	25%	35%	20%
CO-2	20%	20%	20%	20%	-	20%	20%
CO-3	10%	10%	10%	20%	25%	10%	20%
CO-4	10%	10%	20%	20%	25%	10%	20%
CO-5	35%	35%	20%	20%	25%	25%	20%
Total Marks	**30**	**70**	**20**	**20**	**10**	**20**	**30**
			50				

Legend:

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

**: Mentioned under point- (N)

#: Mentioned under point-(O)

Note:

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

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

Unit Title and Number	Total Classroom Instruction (CI) Hours	Relevant COs Number(s)	Total Marks	ETA (Marks)		
				Remember (R)	Understanding (U)	Application & above (A)
Unit-1.0 Introduction to Weaving	8	CO1, CO5	12	4	4	4
Unit-2.0 Shedding Mechanism	13	CO1, CO2, CO5	18	4	6	8
Unit-3.0 Picking & Beat-Up Mechanism	15	CO1, CO2, CO5	20	5	5	10
Unit-4.0 Secondary Motions	6	CO3, CO5	10	3	3	4
Unit-5.0 Auxiliary Motions	6	CO1, CO4, CO5	10	4	2	4
Total	**48**	**-**	**70**	**20**	**20**	**30**

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

O) Suggested Assessment Table for Laboratory (Practical):

S. No.	Laboratory Practical Titles	Relevant COs Number(s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
1.	Working of tappet shedding mechanism.	CO1	60	30	10
2.	Working of tappet shedding mechanism	CO1	50	40	10
3.	Dismantle, refit and set timings of tappet shedding mechanisms	CO1, CO2	60	30	10
4.	Dismantle, refit and set timings of over-pick mechanism	CO1, CO2	60	30	10
5.	Dismantle, refit and set timings of cone under-pick mechanisms	CO1, CO2	60	30	10
6.	Dismantle, refit and set timings of beat-up mechanism	CO1, CO2, CO5	60	30	10
7.	Dismantle, refit and set timings of Five wheel take up mechanisms	CO1, CO3, CO5	60	30	10
8.	Dismantle, refit and set timings of Seven wheel take up mechanisms	CO1, CO3,CO5	50	40	10
9.	Working of let off mechanism	CO1, CO4,CO5	50	40	10
10.	Dismantle, refit and set timings of Loose reed mechanism	CO4, CO5	60	30	10
11.	Dismantle, refit and set timings of Fast reed mechanism	CO4, CO5	60	30	10
12.	Weaving of fabric on Power loom	CO5	50	40	10

Legend:
PRA*: Process Assessment
PDA**: Product Assessment

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

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

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

S. No.	Name of Equipment, Tools and Software	Broad Specifications	Relevant Experiment/Practical Number
1.	Plain Power Loom	With tappet shedding mechanism Fabric Width : 54-60 inch Machine speed : 200 rpm Automatic loom	All
2.	Plain Power Loom	With over pick mechanism Fabric Width : 54-60 inch Machine speed : 200 rpm Automatic loom	4,8,9,12
3.	Plain Power Loom	With cone under pick mechanism Fabric Width : 54-60 inch Machine speed : 200 rpm Automatic loom	5, 8, 9, 12

R) Suggested Learning Resources:

(a) Books:

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Principle Of Weaving	R. Marks & A.T.S. Robbinson	The Textile Institute, Manchester, 1976 ISBN:0-900739258
2.	Weaving, Machines, Mechanisms, Management	M.K. Talukdar	Mahajan Publishers Ahmedabad,1998 ISBN: 8185401160
3.	Weaving: Conversion of Yarn to Fabric	P.R. Lord & M.H. Mahamed,	Woodhead Publication, USA, 1982 ISBN:9781855734838
4.	Principles of fabric formation	Prabir Kumar Banerjee	CRC Press, Taylor & Francis Ltd, 2014 ISBN: 9780429097331
5.	Principles of Woven Fabric Manufacturing	Abhijit Majumdar	CRC Press ISBN-13 : 978-1498759113

(b) Online Educational Resources:

1. https://nptel.ac.in/courses/116102005
2. https://www.lindauerdornier.com/en/weaving-machines/
3. https://www.youtube.com/watch?v=puMQqDI_UG8
4. https://www.youtube.com/watch?v=c4ErybycOjM
5. https://www.youtube.com/watch?v=worKmsWZqYE
6. https://web.itu.edu.tr/~berkalpo/Weaving_Lecture/WeaveTech_Chapter2_history.pdf
7. https://www.youtube.com/watch?v=kXZE8B-IiVc
8. http://nopr.niscpr.res.in/bitstream/123456789/19309/1/IJFTR%2019%283%29%20172-176.pdf

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

(c) Others:

1. Indian Textile Journal
2. The Mechanism of Weaving; Thomas William Fox; Franklin Classics Trade Press (18 October 2018); ISBN-13: 978-0343769680
3. Power Loom Users' Guide
4. Power Loom product brochures
5. Lab Manuals

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A) Course Code : **2400102C (T2400102C/P2400102C/S2400102C)**

B) Course Title : Applied Physics – C (FPP, GT, CACDDM, TE)

C) Pre- requisite Course(s) :

D) Rationale :

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

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

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

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

CO-2 Apply the concept of force, work and energy in different engineering situations

CO-3 Apply the concepts and principles of rotational and wave motion in various textile and allied engineering problems.

CO-4 Select relevant materials for industrial applications based on its physical properties.

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

F) Suggested Course Articulation Matrix (CAM):

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

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

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

G) Teaching & Learning Scheme:

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				
2400102C	Applied Physics - C	03	-	04	02	09	06

Legend:

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

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

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

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

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

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

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

H) Assessment Scheme:

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)	
2400102C	Applied Physics - C	30	70	20	30	20	30	200

Legend:

PTA: Progressive Theory Assessment in 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 assignment, micro project, seminar and self-learning is to be done by internal faculty (Internal Assessment) whereas assessment of output/product/ presentation related to these activities will be carried out by external faculty/expert (External Assessment). However, criteria of internal as well as external assessment may vary as per the requirement of respective course. For valid and reliable assessment, the internal faculty should prepare checklist & rubrics for these activities.

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

J) Theory Session Outcomes (TSOs) and Units: T2400102C

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 a given physical quantity. *TSO 1d.* Apply dimensional analysis for inter conversion of units.	**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. (IKS)	**CO1**
TSO 2a. Explain the terms force, impulse and momentum. *TSO 2b.* Apply the concept of conservation of linear momentum in various situations. *TSO 2c.* Apply the concept of friction in various engineering situations. *TSO 2d.* Calculate the net work done conservative and non-conservatives forces *TSO 2e.* Apply the concept of conservation of energy in various situations. *TSO 2f.* Derive the expression for power in terms of force and velocity.	**Unit-2.0 Force, Work, Power & Energy** 2.1 Force, momentum, impulse, conservation of linear momentum, recoil of gun & rocket propulsion 2.2 Friction: coefficient of friction, static, kinetic and limiting friction, law of friction, Advantages and limitations due to friction. methods to remove friction 2.3 Work: Types (zero work, positive & negative work), work done by conservative and non-conservatives force 2.4 Energy: Kinetic energy, work energy theorem, potential energy, conservation of energy and its applications.	**CO2**
TSO 3a. Explain circular motion and various terms related to circular motion. *TSO 3b.* Distinguish between translational and rotational motion. *TSO 3c.* Explain the terms torque and angular momentum. *TSO 3d.* Apply the principle of conservation of angular momentum in given situation. *TSO 3e.* Differentiate between periodic motion and oscillatory motion. *TSO 3f.* Explain the various terms related to SHM. *TSO 3g.* Derive an expression for total energy of particle executing SHM.	**Unit-3.0 Circular, Rotational and SHM** 3.1 Circular motion, angular displacement, angular velocity, frequency, time period, angular acceleration, relation between angular & linear velocity and linear acceleration & angular acceleration 3.2 Translational and rotational motion, torque and angular momentum, conservation of angular momentum 3.3 Periodic and Oscillatory Motion 3.4 Simple Harmonic Motion (SHM): Displacement, velocity, acceleration, time period, frequency and their interrelation,	**CO3**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
	Kinetic and potential energy of particle executing SHM	
TSO 4a. Explain the stress-strain curve of a given elastic or plastic body. *TSO 4b.* Apply the concepts of surface tension and viscosity to solve a given engineering problems. *TSO 4c.* Explain the behavior of given fluids on the basis of their viscosity. *TSO 4d.* Determine the various modes heat transfer in a given engineering problem. *TSO 4e.* Apply the principle of calorimetry in various engineering situations.	**Unit-4.0 Physical Properties of Matter and Calorimetry** 4.1 Elasticity: Hooke's law, Coefficient of elasticity, Young's modulus, Bulk Modulus and modulus of rigidity, stress-strain curve, 4.2 Surface tension: cohesive and adhesive forces, Surface Tension, angle of contact, applications of surface tension, capillary action, effect of temperature and impurity on surface tension 4.3 Viscosity: Viscosity and coefficient of viscosity, Critical Velocity, Reynold's number, streamline and turbulent flow, Terminal velocity, Stokes law and effect of temperature on viscosity. 4.4 Calorimetry: concept of heat and its unit, principal of calorimetry, specific heat capacity, latent heat (fusion and vaporization), mechanical equivalence of heat.	**CO4**
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 related to textile industries.	**Unit-5.0 Modern Physics** 5.1 Photoelectric effect; threshold frequency, work function, Stopping Potential, Einstein's photoelectric equation. 5.2 Lasers: Properties of Laser, Energy levels, ionization and excitation potentials; spontaneous and stimulated emission; population inversion, pumping methods, types of lasers: Ruby 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 field 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: P2400102C

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 Determine the spring constant of a given spring.	4.	Spring Oscillator	CO2
LSO 5.1. Use mixture method to determine the specific heat capacity of given solid	5.	Specific heat of Solid	CO2
LSO 6.1. Use Searle's apparatus to determine the Young's modulus of a given wire	6.	Searle's apparatus	CO4
LSO 7.1. Apply Stokes law to determine the coefficient of viscosity of a given viscous liquid.	7.	Stokes law	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 experiment	CO3
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. Plot the graph between KE of Photo electron v/s frequency of incident light *LSO 11.2.* Determine the value of Plank's Constant (*h*) from the Graph between KE v/s frequency of incident light. *LSO 11.3.* Determine the variation of stopping potential w.r.t frequency of incident photon	11	Photo electric effect (virtual lab experiment)	CO5
LSO 12.1. Determine the wave length of different spectral lines of Hydrogen spectra	12	Emission Spectra of Hydrogen (virtual lab experiment)	CO5

L) Suggested Term Work and Self Learning: S2400102C

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. Use dimensional analysis to check the validity of equations or derive relationships between physical quantities.
2. Explain the importance of using consistent units in calculations and the consequences of unit errors.
3. Find the value of heat produced in a body due to loss of mechanical energy in different situation.

4. Explain the conservation of PE to KE and vice versa in a given physical situation.
5. Find the temperature of the mixture of two different liquids in thermal equilibrium for a given conditions.
6. Prepare a chart on lasers mentioning different characteristics along with applications(online)

b. Micro Projects:

1. Make prototype Vernier calipers and screw gauge of desired LC.
2. Collect wires/ fibers different materials and find the fracture point for required applications
3. Fiber optics: Demonstrate the phenomenon of total internal reflection.
4. LASER: Prepare model to demonstrate the properties and applications of LASER.
5. Viscosity: Collect 3 to 5 liquids and prepare a working model to differentiate liquids based on viscosity and demonstrate their applications.
6. Motion: Prepare model of ball rolling down on inclined plane to demonstrate the conservation of energy and motion of an object in inclined plane.
7. Prepare prototype Atwood machine
8. Use smartphone to measure the different physical quantity with the sensor applications.
9. Prepare list of photonic materials used for engineering applications.

c. Other Activities:

i. Seminar Topics:
- Needs of measurements in engineering and science.
- Applications of circular motions in daily life and engineering.
- LASER: Production & applications in science, industry, medical and defense, holography.
- Optical fibers: Construction and application in communication systems.
- Synthesis and applications of nanomaterials in textile industry.
- Applications of lasers in textile

ii. Visits:
- Visit nearby industry with Instrumentation, production and Laser/optical fibers facilities. Prepare report of visit with special comments Instrumentation technique and material used.
- Visit planetarium, Science city and research institutions for exploring the experimental and research facilities available.

iii. Self-Learning Topics:
- Vectors and its properties with applications.
- types of fundamental units, system of units
- Newton's Laws of motion, momentum, inertia, impulse.
- derivation of formula for moment of inertia
- Force, work, energy, power, work-energy theorem, law of conservation of energy
- Frictions and its types
- Electromagnetic waves
- Pressure, density, Pascal's law, atmospheric and gauge pressure
- Work done in various Processes, Adiabatic constant ($C_p/C_v = \Upsilon$), Mayer's formula ($C_p - C_v = R$)
- CO_2 Laser, Semiconductor LASER, He Ne laser.
- CNT, Graphene, C_{60}

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

COs	Course Evaluation Matrix						
	Theory Assessment (TA)**		Term Work Assessment (TWA)			Lab Assessment (LA)#	
	Progressive Theory Assessment (PTA) Class/Mid Sem Test	End Theory Assessment (ETA)	Term Work & Self Learning Assessment			Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)
			Assignments	Micro Projects	Other Activities*		
CO-1	12%	12%	20%	20%	10%	30%	20%
CO-2	22%	22%	20%	20%	10%	15%	20%
CO-3	24%	24%	30%	20%	30%	25%	20%
CO-4	22%	22%	15%	20%	20%	10%	20%
CO-5	20%	20%	15%	20%	30%	20%	20%
Total Marks	**30**	**70**	**20**	**20**	**10**	**20**	**30**
			50				

Legend:

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

**: Mentioned under point- (N)

#: Mentioned under point-(O)

Note:

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

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

Unit Title and Number	Total Classroom Instruction (CI) Hours	Relevant COs Number(s)	Total Marks	ETA (Marks)		
				Remember (R)	Understanding (U)	Application & above (A)
Unit-1.0 Unit and Measurements	8	CO1	10	4	4	2
Unit-2.0 Force, Work, Power & Energy	10	CO2	14	4	4	6
Unit-3.0 Circular, Rotational and SHM	8	CO3	16	4	6	6
Unit-4.0 Physical Properties of Matter and calorimetry	12	CO4	16	4	6	6
Unit-5.0 Modern Physics	10	CO5	14	4	4	6
Total	**48**	**-**	**70**	**20**	**24**	**26**

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

O) Suggested Assessment Table for Laboratory (Practical):

S. No.	Laboratory Practical Titles	Relevant COs Number(s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
1.	Vernier caliper	CO1	60	30	10
2.	Screw gauge:	CO1	60	30	10
3.	Spherometer.	CO1	60	30	10
4.	Spring Oscillator	CO3	50	40	10
5.	Specific heat of Solid	CO2	50	40	10
6.	Searle's apparatus	CO3	60	30	10
7.	Stokes law	CO3	50	40	10
8.	Photo-electric cell experiment	CO3	60	30	10
9.	Numerical Aperture of an optical fiber	CO5	40	50	10
10.	He-Ne/diode laser	CO5	50	40	10
11.	Photo electric effect (virtual lab experiment)	CO5	70	20	10
12.	Emission Spectra of Hydrogen (virtual lab experiment)	CO4	70	20	10

Legend:
PRA*: Process Assessment
PDA**: Product Assessment

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

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

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

S. No.	Name of Equipment, Tools and Software	Broad Specifications	Relevant Experiment/Practical Number
1.	Vernier-Caliper	Range: 0-15 cm, Resolution 0.01 cm.	1,8
2.	Micrometer screw gauge	Range 0-25 mm, Resolution 0.01 mm	2,7,8

S. No.	Name of Equipment, Tools and Software	Broad Specifications	Relevant Experiment/Practical Number
3.	Spherometer	Vertical scale range -10mm to 10 mm, Graduation resolution 0.01 mm	3
4.	Spring oscillator	A spring, a measuring ruler, mass hanger and variable masses (50 gram, 100 gram) .	4
5.	Specific heat of solid	Calorimeter with stirrer, balance, thermometer and mass box	5
6.	Searle's apparatus	Two long steel wires of the same length and diameter, Brass rods, stopwatch, meter scale,0.5 kg slotted masses, hanger	6
7.	Stokes law	A long cylindrical glass jar, Transparent viscous fluid, stop watch, bob, glycerin, tube clamp stand, Meter scale, Spherical ball, Thread	7
8.	Photo-electric cell experiment	Photo cell mounted in the metal box, Lamp holder with 60W bulb, analog meters (500µA & 1000mV), wooden bench fitted with scale and connecting wires	8
9.	Numerical Aperture of an optical fiber	Laser Diode (2- 3 mW,632mm) Objective(10X), Optical fiber (1-meter-long), detector with BNC connector Auto arranging Multimeter, Screen with circular graduations, one circular base with linear and circular motion and optical bench	9
10.	He-Ne/diode laser	He-Ne Laser (output 0.5 –5.0mW, wavelength 632.8 nm power supply 240V, 50Hz) Or diode laser (2- 3 mW,632mm), Transmission grating 15000 lines/inch, photo detector with BNC connector and holder, screen with clamp type holder, knife edge with micrometer movement, digital multimeter, scale with mount	10
11.	Photo electric effect (virtual lab experiment)	https://vlab.amrita.edu/?sub=1&brch=195&sim=840&cnt=1	11
12.	Emission Spectra of Hydrogen (virtual lab experiment)	https://vlab.amrita.edu/?sub=1&brch=195&sim=359&cnt=1	12

R) Suggested Learning Resources:

(a) Books:

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Concept of physics-1	H.C. Verma	Bharti Bhawan Publications, 2021 ISBN: 8177091875, 978-8177091878
2.	Concept of physics-2	H.C. Verma	Bharti Bhawan Publications, 2021 ISBN: 8177092324, 978-8177092325
3.	Text Book of Physics for Class XI (Part-I, Part-II)	N.C.E.R.T., Delhi	N.C.E.R.T., Delhi, 2019 ISBN: 81-7450-508-3(Part-I) & ISBN: 81-7450-566-0 (Part-II)
4.	Text Book of Physics for Class XII (Part-I, Part-II)	N.C.E.R.T., Delhi	N.C.E.R.T., Delhi, 2019 ISBN: 81-7450-631-4 (Part-I) & ISBN: 81-7450-671-3 (Part II)
5.	Engineering Physics	P. V. Naik	Pearson Education Ltd., 1993 ISBN: 817758362X,978-8177583625
6.	Applied Physics-I	Dr. Mina Talati & Vinod Kumar Yadav	Khanna Book Publishing (2021) ISBN : 978-93-91505-43-1
7.	Applied Physics-II	Dr. Hussain Jeevakhan	Khanna Book Publishing (2021) ISBN: 978-93-91505-57-8
8.	Engineering Physics	D. K. Bhattacharya & Poonam Tandon	Oxford University Press, ISBN: 0199452814, 978-0199452811

(b) Online Educational Resources:

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

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

(c) Others:

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

*****

A) Course Code : **2420103 (T2420103/P2420103/S2420103)**

B) Course Title : Fundamentals of Electrical and Electronics Engg.
(CSE, AIML, ME, ME (Auto), MIE, AE, CRE, CHE, TE)

C) Pre- requisite Course(s) : Engineering Physics, Basic Algebra and Calculus

D) Rationale :

This course is a fundamental course included in the curriculum mainly to introduce the students of Computer Science and Engineering, Artificial Intelligence and Machine Learning diploma courses to the basic concepts and basic laws of electricity, principle of magnetism and electromagnetic induction, basic electrical and electronics components and also to the basics of digital electronics so that students will be able to apply the same for solving the day to day basic electrical engineering problems in their own discipline. Diploma holders are expected to apply the fundamentals of this course while working with equipment being operated with electrical sources and while using various types of electrical equipment and instruments in their field.

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. Apply basic concepts of electricity to determine various electric parameters in a given electrical system.

CO-2. Apply the fundamental laws and concepts of DC and AC circuits to a given electrical system.

CO-3. Apply the principles of magnetism and electromagnetism to a given equipment. Test the functionality of a given basic electronic component.

CO-4. Use Boolean expressions and number systems to realize the basic logic circuits.

F) Suggested Course Articulation Matrix (CAM):

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

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

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

G) Teaching & Learning Scheme:

Course Code	Course Title	Scheme of Studies (Hours/Week)					
		Classroom Instruction (CI)		Lab Instruction (LI)	Notional Hours (SW+ SL)	Total Hours (CI+LI+SW+SL)	Total Credits(C)
		L	T				
2420103	Fundamentals of Electrical and Electronics Engineering	03	-	04	02	09	06

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 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, open educational resources (OERs)

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

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

H) Assessment Scheme:

Course Code	Course Title	Assessment Scheme (Marks)						Total Marks (TA+TWA+LA)
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2420103	Fundamentals of Electrical and Electronics Engg.	30	70	20	30	20	30	200

Legend:

PTA: Progressive Theory Assessment in 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).

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Note:

- ETA & ELA are to be carried out at the end of the term/ semester.
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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**
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-3.0 Magnetic 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	**CO2, CO3**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
	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	
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-4.0 Basic 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-5.0 Overview 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

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number (s)
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 in an 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
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.
3. Prepare a chart for commonly used capacitors used in different domestic appliances (name of appliances with type and ratings)
4. Build and test the capacitor and choke in a fluorescent lamp for its proper working.
5. Connect three chokes in series and 40 Watts lamp in series with a switch across a single-phase AC supply. Analyze the effect of switching action and comment on variation of voltage and current with respect to time.
6. Search animations demonstrating Faraday's laws of electromagnetic induction and Lenz's law to understand the concepts of electromagnetic induction and develop a presentation
7. Prepare a report on the comparison of technical parameters of NPN and PNP transistor.
8. Build and test the transistor switch circuit.
9. Build the logic gates and verify the truth table

c. Other Activities:

1. Seminar Topics;
   - Types of resistors, Inductors and capacitors and their application
   - Basic laws governing DC and AC circuits
   - Applications based on principle of electromagnetic induction.

2. Surveys;
   - Carry out a market survey for availability of different types of resistors used for small projects.
   - Survey a market for availability of different types of semiconductor diodes used for small projects.

3. Visit;
   - Visit institute laboratory/workshop and prepare report about the various electrical sources available along with their specifications.
   - Visit to a nearby electrical substation and observe the capacitors installed

d. Self-Learning Topics:

- Industrial/commercial applications of AC and DC supply
- Differentiate between AC and DC in terms of generation, waveforms, and power

- Conduct a literature survey and prepare list of materials (conducting, insulating, magnetic) and their corresponding applications commonly used in electrical system.
- Applications of statically and dynamically induced emf
- Different types of CROs available in the market
- Different types of Multimeter available in the market

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 (SWA)			Lab Assessment (LA)#	
	Progressive Theory Assessment (PTA) Class/Mid Sem Test	End Theory Assessment (ETA)	Term Work & Self Learning Assessment			Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)
			Assignments	Micro Projects	Other Activities*		
CO-1	15%	15%	20%	20%	33%	20%	20%
CO-2	20%	25%	20%	20%	33%	25%	20%
CO-3	25%	25%	20%	20%	34%	20%	20%
CO-4	25%	20%	20%	20%	--	20%	20%
CO-5	15%	15%	20%	20%	--	15%	20%
Total Marks	**30**	**70**	**20**	**20**	**10**	**20**	**30**
			50				

Legend:

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

******: Mentioned under point- (N)

#: Mentioned under point-(O)

Note:

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

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

Unit Title and Number	Total Classroom Instruction (CI) Hours	Relevant COs Number(s)	Total Marks	ETA (Marks)		
				Remember (R)	Understanding (U)	Application & above (A)
Unit-.1.0 Basic Electrical parameters and concepts	8	CO1	11	4	4	3
Unit-.2.0 Fundamentals of DC and AC circuits	12	CO2	17	4	6	7
Unit-.3.0 Magnetic circuits and electromagnetic induction	10	CO3	17	4	6	7
Unit-.4.0 Basic electronic components	10	CO4	14	4	6	4
Unit-.5.0 Overview of Digital electronics	8	CO5	11	4	3	4
Total Marks	**48**	**-**	**70**	**20**	**25**	**25**

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

O) Suggested Assessment Table for Laboratory (Practical):

S. No.	Laboratory Practical Titles	Relevant COs Number(s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA (%)	PDA (%)	
1.	Classification of electrical components	CO1	50	40	10
2.	Terminal voltage of a source for different load conditions	CO1	50	40	10
3.	Measurement of current and voltage in a branch of the electric circuit	CO1	50	40	10
4.	Phase difference between voltage and current waveform in a given resistor using CRO	CO1	45	45	10
5.	Value of color-coded resistor	CO1	50	40	10
6.	Measurement of resistances in series and combination in an electric circuit.	CO1	50	40	10
7.	Measurement of capacitance in series and parallel combination of Capacitors.	CO1	50	40	10
8.	Measurement of voltage across each element of the given linear circuit	CO1, CO2	50	40	10
9.	Measurement of current in the given electric circuit.	CO1, CO2	50	40	10
10.	Measurement of voltage in a given electric circuit.	CO1, CO2	50	40	10
11.	Phase difference(lag) between voltage and current waveform in a given inductor.	CO1, CO2	50	40	10
12.	Phase difference(lead) between voltage and current waveform in a given capacitor using CRO.	CO1, CO2	50	40	10
13.	BH curve of a given magnetic material.	CO1, CO2	50	40	10
14.	Statically and Dynamically induced emf.	CO2, CO3	50	40	10
15.	Self and Mutual inductance.	CO2, CO3	50	40	10
16.	Faraday's laws of electromagnetism.	CO2, CO3	50	40	10
17.	Flemings right hand and left-hand rules.	CO2, CO3	50	40	10
18.	Lenz's law.	CO2, CO3	60	30	10
19.	VI characteristics of Diode.	CO4	60	30	10
20.	VI characteristics of BJT.	CO4	60	30	10
21.	VI characteristics of FET.	CO4	60	30	10
22.	Logic Gates – NOT, OR, NOR, AND, NAND	CO4	50	40	10

Legend:

PRA*: Process Assessment

PDA**: Product Assessment

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

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

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

S. No.	Name of Equipment, Tools and Software	Broad Specifications	Relevant Experiment/Practical Number
1.	DC Source (Variable)	0-20/50 Volts	1-18
2.	AC Source (Variable)	0-300 Volts	1-18
3.	Voltmeter	0-300 V, 0-75 V (MI & MC)	1-18
4.	Ammeter	0-5/10/20 A (MI), 0-2 A (MC)	1-18
5.	Rheostats	0-50 Ohms, 5 Amp; 0-300 Ohms, 2 amp	1-18
6.	Resistors, Capacitors, and Inductors	Appropriate ratings and different types	1, 6
7.	Demonstration kit for demonstrating statically and dynamically induced emf	Lab experiment purpose	14
8.	Demonstration kit to demonstrate self and mutual inductance.	Lab experiment purpose	15
9.	Demonstration kit for Faraday's laws of electromagnetic induction.	Lab experiment purpose	16
10.	Demonstration kit for Flemings right hand and left hand rules.	Lab experiment purpose	17
11.	Demonstration kit for Lenz's law.	Lab experiment purpose	18
12.	Multimeter	Digital Multimeter: 3 1/2-digit display, 9999 counts digital multimeter measures: V_{ac}, V_{dc} (1000V max), A_{dc}, A_{ac} (10 amp max), Resistance: (0 - 100 M$\wedge$), Capacitance and Temperature measurement	5,7,19,20,21,22
13.	Electronic Work Bench	Bread Board 840 -1000 contact points: Positive and Negative power rails on opposite side of the board, 0-30 V, 2 Amp Variable DC power supply, Function Generator 0-2MHz, CRO: 0-30 MHz, Digital Multimeter	19,20,21,22
14.	CRO dual trace	25 MHz,230 V AC, 50 Hz	4,12,19,20,21,22

S. No.	Name of Equipment, Tools and Software	Broad Specifications	Relevant Experiment/Practical Number
1.	DC Source (Variable)	0-20/50 Volts	1-18
2.	AC Source (Variable)	0-300 Volts	1-18
3.	Voltmeter	0-300 V, 0-75 V (MI & MC)	1-18
4.	Ammeter	0-5/10/20 A (MI), 0-2 A (MC)	1-18
5.	Rheostats	0-50 Ohms, 5 Amp; 0-300 Ohms, 2 amp	1-18
15.	Electronic components Connecting probes	PN diode -NPN and PNP, BJT, FET, Logic gates OR, AND, NOT, NOR, NAND Connecting probes -1 set	19,20,21,22

R) Suggested Learning Resources:

(a) Books:

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Basic Electrical Engineering	Mittle and Mittal	McGraw Education, New Delhi, 2015, ISBN: 978-0-07-0088572-5
2.	Fundamentals of Electrical Engineering	Saxena, S. B. Lai	Cambridge University Press, ISBN: 9781107464353
3.	Electrical Technology Vol- I	Theraja, B. L.	S. Chand Publications, New Delhi. 2015, ISBN: 9788121924405
4.	Basic Electrical and Electronics Engineering	Jegathesan, V.	Wiley India, New Delhi, 2015, ISBN: 97881236529513
5.	Principles of Electronics	Mehta, V.K.; Mehta, Rohit	S. Chand and Company, Ram Nagar, New Delhi-110 055, 504, 2014, ISBN: 9788121924
6.	Basic Electronic Engineering	Baru V.; Kaduskar R.; Gaikwad S.T.	Dream tech Press, New Delhi, 2015, ISBN: 9789350040126

(b) Open Educational Resources (OER):

1. https://onlinecourses.nptel.ac.in/noc20_ee64/preview
2. https://archive.nptel.ac.in/courses/108/108/108108076/
3. https://nptel.ac.in/courses/122106025
4. https://www.youtube.com/watch?v=Zr2SxTiKUCM&list=PLJvKqQx2Atc61XCOHXm_ACNkOkAm3yO4 &index=4
5. https://www.youtube.com/watch?v=9LNRAwf3uqs
6. https://de-iitr.vlabs.ac.in/List%20of%20experiments.html

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

(c) Others:

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

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A) Course Code : 2400104 (T2400104/P2400104/S2400104)

B) Course Title : Communication Skills (English) (Common for all Programmes)

C) Pre-requisite Course(s) :

D) Rationale

Communication forms a crucial element in the success of any organization or industry in the globalized economy. The global village gives due weightage to the English language and it enjoys a privileged status. Engineering students with English as a communicative language are open to many opportunities across the globe. This course will develop Listening, Speaking, Reading, and Writing Skills (LSRW) in the students for effective dissemination of their ideas, projects, patents, and research in the form of presentations, reports, research papers, memos, circulars, etc. Additionally, it will help students of diploma in engineering to present concepts and designs effectively along with writing CVs, Group Discussions, and Mock Interview sessions in placements and job recruitments. Though communication skills in SBTE, Bihar largely emphasizes to communicate effectively in English communication in Hindi is also focused to some extent at the diploma level. Effective Communication can be easily learned through Indian mythological scriptures like Bhagwat Geeta, Ramayana, Mahabharata, and others. (IKS)

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

F) Suggested Course Articulation Matrix (CAM):

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

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

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

G) Teaching & Learning Scheme:

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

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 the teacher to ensure the 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)	
2400104	Communication Skills (English)	30	70	20	30	20	30	200

Legend:

PTA: Progressive Theory Assessment in 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 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: T2400104

The details of TSOs and units for communication in English is mentioned in Part – A while communication in Hindi is mentioned in Part – B in the following table.

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
Part -A (English) TSO1.a Define communication and its different forms. TSO1.b Explain the elements of communication with Case Studies from Bhagwat Geeta's conversation between Krishna and Arjun before the war. (IKS) TSO1.c Explain the linkages between different stages of communication with the help of a diagram. TSO1.d Apply the principles of effective communication and state two examples of communication from Ramayana (IKS) TSO1.e State eight for explaining different types of barriers to communication Case Studies from Mahabharata - the conversation between Kauravas and Pandavas in the war field (IKS) TSO1.f Identify the barriers to communication. TSO1.g Suggest the ways to overcome/minimize communication barriers.	**Unit-1.0 Communication** 1.1 Communication: Role, Relevance, Elements (Context-Sender-Message-Channel-Receiver-Feedback) 1.2 Process / Stages: Ideation- Encoding, Selecting Proper Channel, Transmission, Receiving, Decoding, Giving Feedback 1.3 7 Cs / Principles of Effective Communication: Considerate, Correct, Concrete, Concise, Clear, Complete. Courteous 1.4 Barriers to Communication: Physiological, Physical, Psychological, Mechanical, Semantic/Language, Cultural. Overcome/ minimize Barriers. 1.5 Case Studies from: • Bhagwat Geeta's conversation between Krishna and Arjun before the war (IKS) • Mahabharata the conversation between Kauravas and Pandavas in the war field (IKS)	**CO1** **CO2**
TSO 2a. Distinguish between formal and informal communication Case Studies from Bhagwat Geeta and the different conversations of Krishna and Arjun during the war (IKS). *TSO 2b.* Illustrate the types of Formal Communication with examples. *TSO 2c.* Define verbal & non-verbal communication. *TSO 2d.* TSO 2d. Explain the advantages of oral and written Communication. *TSO 2e.* Interpret non-verbal codes from Mahabharata (IKS) *TSO 2f.* Explain the role of tables, charts & graphs in communication. *TSO 2g.* Differentiate Intrapersonal and Interpersonal Communication with Case Studies	**Unit- 2.0 Types of Communication** 2.1 Based on organizational structure: Formal (Vertical, Horizontal, Diagonal), Informal (Grapevine) 2.2 Based on the method of expression: Verbal-Oral & Written communication. Non-verbal communication and its Codes- Kinesics, Chronemics, Proxemics, Haptics, Vocalics/Paralanguage, Artifacts, Graphic and Visual Communication 2.3 Based on the number of people involved: Interpersonal, and Group Communication. 2.4 Case Studies from Bhagwat Geeta's different conversations with Krishna and Arjun during the war (IKS).	**CO3**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 2h. List the advantages and disadvantages of Group Communication.		
TSO 3a. Prepare a glossary of new words from the given texts. TSO 3b. Summarize the given texts in your own words. TSO 3c. Recognize the types of sentences in the given texts. TSO 3d. Find out idioms and phrases used in the given texts. TSO 3e. Write a short biography of the given writers. TSO 3f. Identify the figures of speech used in the given texts. TSO 3g. Classify the forms of poetry. TSO 3h. Elaborate the central idea / theme of the given poems in your own words.	**Unit-3.0 Reading Comprehension** Comprehension, vocabulary enhancement and grammar exercises based on the reading of the following texts: **Section-1 (Prose)** 3.1 An Astrologer's Day by R K Narayan 3.2 Indian Civilization and Culture by M K Gandhi 3.3 The Secret of Work by Swami Vivekanand 3.4 My Struggle for an Education by Brooker T Washington **Section-2 (Poetry)** 3.5 Where the Mind is without Fear by R N Tagore 3.6 Ode on Solitude by Alexander Pope 3.7 Stopping by Woods on a Snowy Evening by Robert Frost 3.8 A Psalm of Life by H W Longfellow	**CO4** **CO5**
TSO 4a. Form new words adding prefix and suffix to the given root words. *TSO 4b.* Write synonyms and antonyms of the given words. *TSO 4c.* Use the given idioms and phrases in your own sentences. *TSO 4d.* Distinguish between acronym and abbreviation. *TSO 4e.* Prepare a list of technical jargons of your respective branch. *TSO 4f.* Identify the parts of speech of the specific words in the given sentences. *TSO 4g.* Fill in the blanks with suitable verb forms in the given sentences. *TSO 4h.* Transform the given sentences as directed. *TSO 4i.* Punctuate the given paragraphs.	**Unit-4.0 Vocabulary and Grammar** 4.1 Word Formation: Prefix, Suffix, Acronym 4.2 Synonyms, Antonyms, Homonyms, One Word Substitution, Idioms and Phrases 4.3 Technical Jargons -Related to the respective program 4.4 Parts of speech 4.5 Time and Tense 4.6 Transformation: Voice, Narration, Removal of 'Too', Question Tag 4.7 Punctuation	**CO4, CO5**
TSO 5a. Write the precis of the given passage with suitable title. TSO 5b. Draft letters and applications for the given purpose. TSO 5c. Compose E-mails, Notices, Memos, and Circulars. TSO 5d. Prepare reports of the projects of your respective branch. TSO 5e. Write a report on the events organized in your institute.	**Unit-5.0 Professional Writing** 5.1 Precis Writing 5.2 Business Letters / Applications 5.3 Drafting E-mails, Notices, Memos, Circulars 5.4 Report Writing: Project and Event/ Incident Report Writing	**CO5**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
Part -B (हिंदी) *TSO 1a* सम्प्रेषण कौशल का अर्थ स्पष्ट कर सकेंगे. *TSO 1b* भाव एवं सम्प्रेषण में अंतर बता पाएँगे. *TSO 1c* सम्प्रेषण की प्रक्रिया का उल्लेख कर सकेंगे. *TSO 1d* श्रवण अविव्यक्ति, वाचन और लेखन की अवधारणा को स्पष्ट कर सकेंगे. *TSO 1e* सम्प्रेषण कौशल के निर्धारक तत्वों का विवेचन कर सकेंगे. *TSO 1f* प्रभावशाली सम्प्रेषण के सिद्धांतों का समावेश अपने वार्तालाप में कर सकेंगे.	**Units-1.0: सम्प्रेषण सिद्धान्त एवं व्यवहार** 1.1 सम्प्रेषण : परिचय , अर्थ एवं परिभाषा 1.2 सम्प्रेषण की प्रक्रिया एवं तत्त्व 1.3 सम्प्रेषण के प्रकार : औपचारिक एवं अनौपचारिक, शाब्दिक एवं अशब्दिक 1.4 प्रभावशाली सम्प्रेषण के सिद्धांत एवं सम्प्रेषण व्यवधान कुरुक्षेत्र में श्रीकृष्ण- अर्जुन संवाद महाभारत युद्ध प्रारम्भ होने से पहले कुरुक्षेत्र में श्री कृष्ण ने अर्जुन के प्रश्नों के उत्तर देते हुए जीवन के सूत्र समझाए थे।ये उपदेश श्रीमद्भागव गीता में मिलते	**CO1, CO2, CO3**
TSO 2a तकनीकी कौशल एवं व्यव्हार कौशल में अन्तर बता पाएँगे . TSO 2b व्यव्हार कौशल का म महत्व स्पष्ट कर पाएँगे . TSO 2c आत्मा जागरूकता एवं आत्मा विश्लेषण का विवेचन सोदाहरण कर पाएँगे . TSO 2d भावनात्मक बुद्धिमत्ता एवं करुणा, अनुकूलनशीलता एवं लचीलापन का विकास कर पाएँगे. TSO 2e दैनिक जीवन में अनुकूलनशीलता एवं लचीलापन को आत्मसात कर पाएँगे .	**Unit-2.0: व्यावसायिकउत्कृष्टता हेतु व्यव्हार कौशल** 2.1 परिचय : तकनीकी कौशल एवं व्यवहार कौशल 2.2 व्यवहार कौशल का महत्त्व 2.3 जीवन कौशल : आत्म जागरूकता एवं आत्म विश्लेषण 2.4 वनात्मक बुद्धिमत्ता एवं करुणा, अनुकूलनशीलता एवं लचीलापन, व्यवहार कौशल का उपयोग श्रीराम केवट संवाद श्रीराम जब लक्ष्मण और सीता के साथ वन गमन के लिए प्रस्थान करते हैं तब सरयू नदी के पार उतारने लिए केवट से अनुरोध करते हैं।	**CO1**
TSO 3a पठित गद्यांश एवं पद्यांश से प्राप्त नयी शब्दावली विकसित कर पाएँगे TSO 3b दिए गये कहानियों, कविताओं एवं निबंधों का सारांश अपने शब्दों में लिख पाएँगे. TSO 3c दिए गये कहानियों, कविताओं एवं निबंधों में प्रयुक्त मुहावरों एवं अलंकारों को बता पाएँगे . TSO 3d कविताओं का भावार्थ स्पष्ट कर पाएँगे .	**Unit-3.0: पाठ-बोध : शब्दावली परिवर्धन एवं व्याकरण अभ्यास** 3.1 नमक का दरोगा, ईदगाह – मुंशी प्रेमचंद 3.2 बात (निबंध)- प्रताप नारायण मिश्र 3.3 वह प्रदीप जो दिख रहा है झिलमिल दूर नहीं है – रामधारी सिंह दिनकर 3.4 नर हो न निराश करो मन को – मैथिलीशरण गुप्त 3.5 कबीर के दोहे -काल्ह करे सो आज कर , जाति न पूछो साधू की , ऐसी वाणी बोलिए	**CO4**
TSO 4a अपनी शाखा से सम्बन्धित तकनीकी शब्दावली का चयन कर पाएँगे . TSO 4b पर्यायवाची एवं विलोम शब्दों से सम्बंधित शब्दावली तैयार कर सकेंगे . TSO 4c दिये गये गद्यांशों में विराम चिह्नों का सही प्रयोग कर पाएँगे .	**Unit-4.0: शब्दावली एवं व्याकरण** 2 Hrs 4.1 सामान्य शब्दावली 4.2 प्रशासनिक शब्दावली 4.3 शब्द भेद, अनेक शब्दों के लिए एक शब्द 4.4 विराम चिन्ह 4.5 मुहावरें एवं कहावतें	**CO4 CO5**
TSO 5a दिए गये दिए गये गद्यांशों का संक्षेपण कर पाएँगे . TSO 5b विभिन्न प्रकार के पत्रों, आवेदनों ,सूचनाओं, विज्ञप्तियों को लिख पाएँगे . TSO 5c अपनी शाखा से सम्बंधित प्रतिवेदन लेखन कर	**Unit-5.0: लेखन कौशल** 5.1 सार- लेखन 5.2 औपचारिक एवं व्यवसायिक पत्र लेखन	**CO5**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
पाएँगे . TSO 5d अपने संस्थान में हुए आयोजनों का प्रतिवेदन लिख पाएँगे.	5.3 प्रारूप लेखन – सूचना, निविदा लेखन, प्रतिवेदन लेखन, बायोडाटा	

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

K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical: P2400104

These practical's are common for both Part – A and Part -B.

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

Practical/Lab Session Outcomes (LSOs)		S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
LSO19.a	Prepare a list of technical jargon and register specific to their program /industry.	19	Technical Jargons	CO5
LSO20.a	Write the specifications of the machines/ equipment available in the workshops/labs.	20	Specifications of the machines/ equipment	CO5
LSO21.a	Write a report on the projects of their respective branches.	21	Report on the Projects	CO5

L) Suggested Term Work and Self-Learning: S2400104

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.

a. Visit your institute's library/ web search and enlist the books, journals, and magazines related to your respective branches to prepare a bibliography consisting of names of the authors, titles of the books, publication, and place of publication.
b. SWOT Analysis: Analyze yourself concerning your strengths and weaknesses, opportunities, and threats for your communication.
c. Interview an eminent personality and write a report on it.
d. Deliver a seminar for 10-12 minutes using PPT on the topic given.
e. Prepare your timetable for a week and prioritize your activities.
f. Visit any historical places/offices/farms/industries/development sites etc. near your city and prepare a report on it.
g. Prepare a video of effective professional communication after listening to Bhagwat Geeta's conversation between Arjun and Krishna in the war field (IKS).

b. Micro Projects:

i. Book review – students should read a book and then write their reviews about the book and present it in the class.
ii. Interview any successful person in your locality in context with his life journey, inspiration social contribution, role model, and keys to success.
iii. Prepare a register of technical jargon of the industry related to their specific branch.
iv. Prepare a presentation on environmental issues of their locality with their solution.
v. Listen to the dialogues of the conversation between Krishna and Arjun before the war for specific and effective Communication (IKS)

c. Other Activities:

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

d. Self- learning topics:

- Listen to different Conversations of Ramayana,(the Rama -Bharat conversation before going to Vanvaas) Mahabharata (Bheem and Arjun Conversation during War), and Bhagwat Geeta (discussions of Strategies before War) to develop effective communication Skills (IKS)
- Collect new words from daily newspapers.
- Observe negotiation skills in the nearby shops.
- Watch educational channels for improving English communication.

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

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

Legend:

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

**: Mentioned under point- (N)

#: Mentioned under point-(O)

Note:

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

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

Unit Title and Number	Total Classroom Instruction (CI) Hours	Relevant COs Number (s)	Total Marks	ETA (Marks)		
				Remember (R)	Understanding (U)	Application & above (A)
(Part - A) **Unit-1.0** Communication Theory and Practice	5	CO1, CO2	10	3	3	4
Unit- 2.0 Types of Communication	5	CO3	8	2	2	4
Unit-3.0 Reading Comprehension	8	CO4, CO5	12	3	3	6

Unit Title and Number	Total Classroom Instruction (Cl) Hours	Relevant COs Number (s)	Total Marks	ETA (Marks)		
				Remember (R)	Understanding (U)	Application & above (A)
Unit-4.0 Vocabulary and Grammar	7	CO4, CO5	10	3	3	4
Unit-5.0 Professional Writing	7	CO5	10	3	4	3
(Part-B) **Units-1.0:** सम्प्रेषण सिद्धान्त एवं व्यवहार	2	CO1, CO2	3	1	1	1
Unit-2.0: व्यावसायिक उत्कृष्टता हेतु व्यव्हार कौशल	2	CO3	3	1	1	1
Unit-3.0: पाठ-बोध :शब्दावली परिवर्धन, एवं व्याकरण अभ्यास	5	CO4, CO5	5	1	1	3
Unit-4.0: शब्दावली एवं □□□□□□□	4	CO5	5	1	1	3
Unit-5.0: लेखन कौशल	3	CO5	4	2	1	1
Total	**48**	-	**70**	**20**	**20**	**30**

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

O) Suggested Assessment Table for Laboratory (Practical):

S. No.	Laboratory Practical Titles	Relevant COs Number (s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
1	Emotions of the Speakers.	CO1	30	60	10
2	Instructions of Audio Transcripts.	CO1	30	60	10
3	Language Puzzles.	CO1	30	60	10
4	Repetition of Words.	CO1	30	60	10
5	Summarize the Excerpts.	CO1	30	60	10
6	Listening Excerpts.	CO2	30	60	10
7	Sounds of minimal Pairs, Syllables and Words etc.	CO2	30	60	10
8	Phonetic Transcription.	CO2	30	60	10
9	Stress and Intonation.	CO2	30	60	10
10	Paralanguage Codes	CO2	30	60	10

S. No.	Laboratory Practical Titles	Relevant COs Number (s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
11	Non-Verbal Codes	CO2	30	60	10
12	Verbal and Non-Verbal Presentations	CO2	30	60	10
13	Sounds of minimal pairs, syllables and words	CO2	30	60	10
14	Locate the Dictated Words	CO3	30	60	10
15	Jumbled Sentences.	CO3	30	60	10
16	Pronunciation.	CO3	30	60	10
17	Compare the Point of view with their Peers.	CO4	30	60	10
18	Main Ideas of the Excerpt	CO4	30	60	10
19	Technical Jargons	CO5	30	60	10
20	Specifications of the machines/ equipment	CO5	30	60	10
21	Report on the Projects	CO5	30	60	10

Legend:

PRA*: Process Assessment

PDA**: Product Assessment

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

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

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

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

S. No.	Name of Equipment, Tools and Software	Broad Specifications	Relevant Experiment/Practical Number
4.	Head Phones with microphones	Logitech H111 wired on headphones	1 to 21
5.	Computer Furniture	Computer Desk, chair	1 to 21
6.	Smart Projector	Standard Specification	1 to 21

R) Suggested Learning Resources:

(a) Books:

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Communication Skills in English (AICTE Prescribed Text Book)	Dr. Anjana Tiwari	Khanna and Khanna, New Delhi
2.	Business Communication	Dr. Nishith Rajaram Dubey, Anupam Singh	Publisher: Indra Publishing House, 2023 ISBN- 978-93-93577-69-6
3.	Communication Skills	Sanjay Kumar & Pushap Lata	Oxford University Press, India
4.	Employability Skills	Dr. Nishith Rajaram Dubey, Anupam Singh	Indra Publishing House, 2023 ISBN - 978-93-93577-68-9
5	Technical Communication for Engineers	Shalini Verma	S. Chand
6.	English Grammar	Raymond Murphy	S. Chand
7.	British English Grammar and Composition	Dr. Ashok Kumar Singh	Student's Friends
8.	A Textbook of English Phonetics	T. Balasubramanian	Macmillan Publishers
9.	Thesaurus of English Words and Phrases	Roget	Simon and Schuster
10	Better English Pronunciation	J. D. O'Connor	Cambridge: Cambridge University Press, 1980
11	An English Grammar: Comprehending Principles and Rules	Lindley Murray.	London: Wilson and Sons, 1908.
12	Effective Communication Skills	Kulbhushan Kumar	Khanna Publishing House, New Delhi (Revised Edition 2018)
13	Examine your English	Margaret M. Maison	Orient Longman: New Delhi, 1964
14	Collin's English Dictionary	Harper Collins	Harper Collins, Glasgow
15	संप्रेषण कौशल	डॉ प्रवीण कुमार अग्रवाल , डॉ अवनीश कुमार मिश्रा	साहित्य भवन पब्लिकेशन : आगरा
16	आधुनिक हिंदी व्याकरण और रचना	डॉ वासुदेवनंदन प्रसाद	भारती भवन पब्लिकेशन

(b) Online Educational Resources:

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

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

(c) Others:

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

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