FIBRETECHNOLOGY-I			
Course Code	**1BTX301**	Scheme	2025
Type of Course	**PCC**	Semester	III
Teaching Hours/Week (L:T:P)	3:2:0	CIE Marks	50
Total Hours of Pedagogy per semester L /T/P/SL&TW:	42: 28 : 00 :50	SEE Marks	50
Credits	**4**	Total Marks	100
Examination type (SEE)	Theory	Exam Hours	3 h

Course outcome (Course Skill Set)

At the end of the course, the student will be able to:

1. Classify polymers, explain methods of polymerization, copolymerization and interpret concepts of functionality, kinetic chain length and extent of reaction with respect to polymerization.
2. Classify and compare natural and manufactured fibres, explain the concepts involved in production of sustainable fibres viz., cotton, wool, silk, bast, banana and coir fibres
3. Explain / interpret the concepts involved in production of regenerated fibres and methods of production of manufactured fibres and effect of synthetic fibres on environment.
4. Justify the physical and chemical parameters involved in the production of regenerated fibres and determine parameters related to manufactured fibre production

Module-1

Introduction to polymers, requirements of fibre forming polymers, classification of polymers, Techniques & methods of production of polymers. Copolymerization, kinetic chain length, functionality, extent of reaction.

Number of Hours: 8h

Module-2

Introduction to textile fibres and essential requirements of textile fibres. Classification of textile fibres.

Cotton fibres – Origin, History, Cultivation and Grading, Brief outline on BT and organic cotton fibres.

Bast fibres - Introduction, Types of bast fibres, method of extraction of bast fibres, Introduction to Banana and coir fibres.

Protein fibres: - Introduction to natural protein fibres. **Wool**–origin,differenttypesofwool,gradingofwool. BriefintroductiontoDuckdowns,GoosedownandAngorahairfiber.

Number of Hours:8h

Module-3

Silk fibre- Study of life cycle of Silk worm. Extraction of silk fibre, Different verities of silk yarns and brief introduction to wild silk, and spun silk.Brief outline on spider silk fibres.

Introduction to manufactured fibres- Types of manufactured fibres, comparison of manufacturedfibreswith naturalfibres. Conceptsofmanufacturedfibresspinning, Spinnabilityconcept ofpolymeric fluids. Briefout line on melt, dry and wet spinning. Comparison of these spinning methods. Dry jet-wet spinning.

Number of Hours: 8h

Module-4

Process variables in melt spinning. Instabilitiesinmeltspinning,Highspeedmeltspinning.Calculationsrelatedtomelt,dryandwetspinning.Roleof criticalparametersandtheir variationalong spinline. Briefoutlineonspecialshapedfibres,microdenier,ultrafineandNanofibres.**Spinfinishapplications**-objectives, requirements,formulationsandmethodsofapplication. Number of Hours:9h

Module-5

Regeneratedfibres-typesofregeneratedfibres,Chemistryandproductionofregular Viscoserayon,Di-acetate, Tri acetate, Cuprammonium and Eco-friendlyrayon fibres. Studieson regenerated Bamboo fibres. Effect of synthetic fibres on environment. Methods of disposal of synthetic fibre waste. 3R Concept in synthetic fibre industry. Number of Hours:9h

Suggested Learning Resources: (Text Book/ Reference Book/ Manuals):

Text books:

1. Manufactured fibre technology, V.B Gupta, V.K Kothari, Chapman and Hall, London, 1997.
2. Handbook of Textile Fibres Volume I Natural Fibres, J Gordon Cook, Woodhead Publishing Series in Textiles, 1984.
3. Handbook of Textile Fibres Volume 2 Man-Made Fibres, J. Gordon Cook, Woodhead Publishing Series in Textiles, 1984.
4. Manmade fibre science and Technology, Mark Atlas, Vol. I& II, Wiley, NT 1967.
5. A Textbook of Fibre Science and Technology, S.P Mishra, New Age International (P) Limited, 2000
6. Textile fibres, Shenai V.A., Sevak Publications Bombay, 1980.
7. Production of Synthetic Fibres, A. Vaidya, Prentice Hall of India Pvt. Ltd., New Delhi, 1988.

Reference books / Manuals:

1. Handbook of Textile Fibre Structure, Volume-I, S. Eichhorn, J.W.S Hearle, M. Jaffe, T. Kikutani,
2. Woodhead Publishing in Textiles,2009.
3. Fundamentals and Manufactured Polymer Fibres, CRC Press, Woodhead Publishing in Textiles,2009
4. Formation of synthetic fibres, Walczalk.K. Gordon & Sci. London 1977.
5. High speed fibre spinning, Ziabicki A. Wiley NY., 1985.
6. Man-made Fibres, R W Moncrieff, Heywood Books, Open Library, 1966.
7. High Performance fibres, J.W.S.Hearle, Wood Head,UK-2005.
8. Textile Science, Gohl E P G and Vilensky LD, CBS Publishers, Delhi, 1983.
9. Introduction to Textile Fibres, Murthy, H. V Sreenivasa, Woodhead Publishing in Textiles, 1984.
10. Regenerated Cellulose Fibres, Woodhead Publishing Ltd, 2000.

Web links and Video Lectures (e-Resources):

Web Links:

1. **The Fiber Society – Textile Fibre Research Resources**
2. **Textile Exchange – Sustainable Fibres Information**
3. **Fibre2Fashion – Textile Fibre Technology Articles**
4. **NPTEL – Textile Engineering Courses**
5. **ScienceDirect – Textile Fibre Research Articles**

Video Lectures:

1. **NPTEL lectures on *Textile Fibres and Fibre Science***
2. **YouTube lectures on *Natural Fibres – Cotton, Wool, Silk and Bast Fibres***
3. **Video demonstrations on *Melt Spinning, Wet Spinning and Dry Spinning Processes***
4. **Industrial videos on *Synthetic Fibre Manufacturing – Polyester and Nylon Production***
5. **Lectures on *High Performance Fibres and their Applications***

Teaching-Learning Process (Innovative Delivery Methods):

The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes.

1. **ICT Enabled Teaching:** Use of PPTs, animations, fibre structure images, videos and virtual demonstrations to explain fibre production processes.
2. **Case-Based Learning:** Students analyse real-time applications of natural, synthetic and high-performance fibres in textile industries.
3. **Industrial Exposure & Active Learning:** Industrial visits, expert interactions, fibre identification activities and mini-projects to relate theory with practical applications.

Assessment Structure:

The assessment in each course is divided equally between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage.

- To qualify and become eligible to appear for SEE, in the **CIE**, a student must score at least **40% of 50 marks**, i.e., **20 marks**.
- To pass the **SEE**, a student must score at least **35% of 50 marks**, i.e., **18 marks**.
- Notwithstanding the above, a student is considered to have **passed the course,** provided the combined total of **CIE and SEE** is at least **40 out of 100 marks**.

Continuous Comprehensive Assessments (CCA)+ Internal Assessment Test (IA) = Continuous Internal EvaluationCIE [25+25=50 marks]

A minimum of **two Internal Assessment Tests (IA)** shall be conducted, carrying a total of **25 marks**.

In addition, **Continuous Comprehensive Assessment (CCA)** shall be conducted for a total of **25 marks**.

It is recommended to include **a maximum of two learning activities** as part of the CCA to foster the **holistic development of students**. These activities shall be:

Rubrics for Learning Activity (Based on the nature of learning activity, design the rubrics for each activity):

	Superior	**Good**	**Fair**	**Needs Improvement**	**Unacceptable**
Performance Indicator	**Superior**	**Good**	**Fair**	**Needs Improvement**	**Unacceptable**
Fibre identification & classification (CO1)	Accurate identification and detailed classification	Correct identification with minor errors	Basic identification	Limited knowledge	Unable to identify
Technical understanding (CO2/CO3)	Clear concepts with detailed explanation	Good understanding	Average understanding	Partial knowledge	Poor understanding
Report & Presentation (CO4)	Excellent report and presentation skills	Good report preparation	Satisfactory	Incomplete report	Not submitted

Suggested Learning Activities may include (but are not limited to):

- Course Project
- Case Study Presentation
- Programming Assignment
- Tool/Software Exploration
- Literature Review
- Open Book Test (preferably at RBL4 and RBL5 levels)
- GATE-based Aptitude Test
- Assignment (at RBL3, RBL4, or RBL5 levels)
- Any other relevant and innovative academic activity
- Use of MOOCs and Online Platforms

Suggested Innovative Delivery Methods may include (but are not limited to):

- Flipped Classroom
- Problem-Based Learning (PBL)
- Case-Based Teaching
- Simulation and Virtual Labs
- Partial Delivery of course by Industry expert/ industrial visits
- ICT-Enabled Teaching
- Role Play

Term Work (TW) and Self Learning (SL) components in Number of Hours per semester		
Term work (includes assignments, seminars, micro projects, industrial visits, any other student activities etc.)		
Sl. No.	**Term Work (TW) Activity**	**Number of Hours / Semester**
1.	Collect different types of polymer products (preferably waste and classify them as thermoplastic / thermoset biodegradable/non-biodegradable products and listing of their harmful effects on environment.	12HRS
2.	Collect various fabrics & classify them based on fibres used & list the benefits of each.	14hrs
SL: Self Learning, MOOCs, spoken tutorials, online educational resources etc.		
Sl. No.	**Self-Learning (SL) Activity**	**Number of Hours / Semester**
1.	Visit nearby Textile industry & prepare & present a report on the visit.	12hrs
2.	In a group of 4 solve all the questions related to the syllabus from GATE question paper & discuss the same over the classmates.	12hrs

Continuous Internal Evaluation (CIE)

1. The CIE marks shall be decided based on internal tests and other outcome-based activities. The continuous internal evaluation shall be carried out by the teacher handling the course.
2. Out of 50 marks earmarked for CIE, 25 marks shall be assigned for internal tests. The first test shall be conducted after completing two modules of the syllabus and the second one after completing the remaining three modules.
3. The remaining 25 marks shall be assigned for Continuous Course Assessment (CCA), conducted as per the rubrics listed in the assessment section of the respective syllabus.
4. A student shall obtain a minimum of 40% marks or 20 out of 50 marks allotted to CIE to become eligible to appear for the SEE.

Passing requirement in SEE

1. For a pass in the Semester End Examination (SEE), a student shall secure a minimum of 35 marks out of 100.
2. For the declaration of a pass grade, the sum of the Continuous Internal Evaluation (CIE) marks (out of 50) marks and the SEE marks scaled down to 50 shall be greater than or equal to 40 marks.
3. If the total (CIE + SEE) is less than 40 marks, the student shall be awarded the grade 'F' (Fail).

WEAVING TECHNOLOGY -1			
Course Code	1BTX302	Scheme	2025
Type of course	**IPCC**	Semester	III
Teaching Hours/Week (L:T:P)	3:00:2	CIE Marks	50
Total Hours of Pedagogy L:T:P:SL:TW	42:00: 28 : 50	SEE Marks	50

Credits	**4**	Total Marks	100
Type of Examination (IPCC):	Theory- CIE +SEE, and Lab- CIE only.	Exam Hours	3h

Course outcome (Course Skill Set)

At the end of the course, the student will be able to:

1. Identify the need for weaving preparatory processes, classify fabrics, the preparatory process and explain the principles and concepts involved in fabric formation, weaving preparatory processes such as winding, warping, pirn winding, and sizing.
2. Illustrate the principal and operations involved in weaving and explain the primary motion in looms
3. Determine efficiency and quality parameters in weaving preparatory and power loom operations
4. Compare machines used for preparatory processes, analyse the effect of setting timings and parameters influencing primary motion in shuttle loom and explain the application of AI in yarn preparatory process
5. Determine the speed and production of preparatory machines and dismantle and assemble primary motions in a loom and produces fabrics (50cms to 100cms)
   Note: Only for practical, Not to be included for SEE paper setting

Module-1

Fabric production –Classification of fabrics, properties, comparison of fabrics based on their properties, production, materials and end uses.

Weaving preparatory process - necessity of yarn preparatory processes for weaving. Objectives of winding. Classification of winding machines, passage of material through winding machine and function of parts.Terms and definitions, calculations related to production and efficiency. Use of electronic devices on windingmachines, Usterclassimat systems and its application.Classification of automatic winding machines. Salient features of different automatic winding machine.

Number of Hours:9

Module-2

Warping: Objectives, Types of warping and warping machines. Passage of material through beam warping machine, and Sectional warping machine and their working. Differenttypes of warping creels. Salient features of modern beam and sectional warping machines. Special requirements of yarn preparatory for shuttle less weavingmachines.

Weftpreparation -weftwinding and salient features of differenttypesofweftwindingmachines.
Number of Hours:8

Module-3

Sizing: Objectives, Sizing process, different types and techniques of sizing machines. Passage of material through multi cylinder sizing machine, working. Sizing ingredients and their importance, size paste preparation - pressure cookers, injection cookers and storage becks. Size recipe for different yarns. Calculations regarding Size concentration, Size add - on and Size pick up.
Number of Hours:9

Module-4

Controls in size box and sizing variables: Salient features of modern sizing machines. Stretch and its control, sizing machine creels, types of size boxes. Controls in size box and sizing variables. Methods of drying, working, comparison. Moisture measurement and drying temperature control. Sizing machine head stock and its function. Lappers and migrating behavior of ends. Conceptsofsingle-end sizing. Recenttrends in sizing i.e., foam sizing, solvent sizing, hot melt sizing. high pressure squeezing.

Post sizing operations - Drawing-in, leasing, knotting.

AI tools: Application of AI tools in weaving preparatory processes.
Number of Hours:8

Module-5

Weaving: Weaving process and looms, basic motions of weaving. **Shedding** – objective, different types of sheds.Positive and negative tappet shedding. Shedding: timings and settings. Early shedding andlate shedding. **Picking** -objectives, types of picking: cone over picking and cone under picking mechanisms. Picking timings & settings, methods to alter the timing & strength of picking mechanism. Shuttle checking devices. **Beat-Up** -

Objective, crank Beat up, Cambeat-up mechanism. Eccentricity of slay and factors affecting theslayeccentricity.Differenttypes ofreeds. Calculations regarding reedcount and loom production.
Number of Hours:8

PRACTICAL COMPONENTS OF IPCC

FIXED SET OF EXPERIMENTS

Experiments for Conduction

1. Passage of material through non-automatic and automatic cone/cheese winding machines. setting of tensioners, yarn clearers. Study of the salient features of winding machines.
2. Speed, production and efficiency calculations of cone/cheese winding machines.
3. Working on double flanged bobbin winder. Speed, production and efficiency calculations of double flanged winding machine
4. Passage of material through non-auto pirn winding machine. Speed, production and efficiency calculations
5. Passage of material through automatic pirn winding machine. Speed, production and efficiency calculations
6. Passage of material through sectional warping & beam warping machine. Speed calculations and calculations related to warp pattern, reed width, total no. of ends, no. Sections.
7. Passage of material through sizing machine. Calculations related to speed, production and efficiency
8. Dismantling, assembling, setting and timing of tappet shedding mechanism.
9. Dismantling, assembling, setting and timing of cone over pick.
10. Dismantling, assembling, setting and timing of Beat-up mechanism

Experiments for Demonstration

1. Plan of warp patterns for stripes and check fabrics
2. Study of different types of sizing ingredients, cooking and mixing beck
3. Knotting, drawing - in and denting of warp.

Suggested Learning Resources: (Text Book/ Reference Book/ Manuals):

Text books:

1. An Introduction to Winding and Warping, Talukdar M.K, Mahajan Pub. Ahmedabad.
2. Yarn preparation, Sengupta R. –Vol I & II Mahajan Pub. Ahmedabad
3. Modern Preparation and weaving, Ormerod A. Butterworth publication Co.
4. Textile Sizing by B. C. Goswamy, Rajesh D. Anandjiwala, David Hall
5. Principles of weaving by Robinson & Marks, published by Textile Institute, Manchester
6. Knitting technology- David Spencer.
7. Knitting Technology – Prof D B Ajagoankar. Publisher Universal publishing corporation. Mumbai.
8. Non-woven-Process, structure, properties and Applications. T.Karthik.prabhakaran C, R.Rathanmurthy. Wood head publishing in Textiles.

PublicationReference books / Manuals:

1. Weaving Tablets, published by Textiles Association of India, Bombay,
2. Warp Sizing mechanisms, Ramsbottom, published by Columbia press, Manchester,
3. Hand book of non-wovens. Edited by S.J.Russel. . Wood head publishing in Textiles.
4. Weaving machines, mechanisms and Management. M. K. Talukdar. Published by Mahajan Pub.Ahmedabad
5. Textile MathsVol.lll J.E. Booth, published by Textile Institute,
6. NPTEL Course: Fabric Manufacture - I, Dr. Abhijit Majumdar, IIT Delhi.
7. NPTEL Course: Manufactured Fibre Technology, Prof. Ashwini Kumar Agrawal, IIT Delhi.

Web links and Video Lectures (e-Resources):

Web Links:

1. Textile School – Weaving Technology Resources
2. Textile Learner – Textile Engineering Notes
3. NPTEL – Fabric Manufacturing Courses
4. International Textile Manufacturers Federation (ITMF)

Video Lectures:

1. NPTEL lectures on Fabric Manufacturing and Weaving Technology
2. Videos on winding, warping and sizing processes
3. Demonstration videos on loom motions (shedding, picking and beating)
4. Videos on knitting and nonwoven fabric manufacturing

Teaching-Learning Process (Innovative Delivery Methods):
The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes.

- **ICT Enabled Learning:** Use of PPTs, animations, videos and virtual demonstrations to explain weaving processes and machine mechanisms.
- **Experiential Learning:** Laboratory experiments, machine demonstrations, fabric analysis and production calculations for practical understanding.
- **Problem Based Learning:** Students solve numerical problems related to production, efficiency and machine parameters through assignments and discussions.

Assessment Structure:
The assessment for each course is equally divided between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each component carrying **50% weightage** (i.e., 50 marks each).
The CIE Theory component will be **25 marks** and CIE Practical component will be **25 marks**.

The CIE Theory component consists of IA tests for 25 marks. The CIE Practical component for continuous assessments will be for 15 marks through rubrics and for lab tests will be for 10 marks.

- To qualify and become eligible to appear for SEE, in the **CIE theory component**, a student must score at least **40% of 25 marks**, i.e., **10 marks**.
- To qualify and become eligible to appear for SEE, in the **CIE Practical component**, a student must secure **a minimum of 40% of 25 marks**, i.e., **10 marks**.
- To pass the **SEE**, a student must secure **a minimum of 35% of 50 marks**, i.e., **18 marks**.
- A student is deemed to have **successfully completed the course** if the **combined total of CIE and SEE is at least 40 out of 100 marks**.

CIE Practical component:
The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report using a defined set of rubrics. Each experiment report can be evaluated for 30 marks. The summation of all the experiments marks to be scaled down to 15 marks.
The laboratory test (duration 03 hours) at the end of the last week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and scaled down to 10 marks. For laboratory test, the student is required to conduct one experiment.

Rubrics for Learning Activity (Based on the nature of learning activity, design the rubrics for each activity):

Performance Indicator	Superior	Good	Fair	Needs Improvement	Unacceptable
Understanding of Weaving Processes (CO1)	Demonstrates excellent understanding of fabric classification, weaving preparatory processes and principles	Good understanding with minor errors of weaving concepts.	Basic understanding of weaving concepts	Limited knowledge and requires guidance	Unable to explain weaving processes
Machine Knowledge & Operation (CO2/CO5)	Clearly explains preparatory machine and passage of material and working mechanisms	Good knowledge of machinefunctions of preparatory machiness with minor errors	Basic knowledge of machine operation	Requires assistance to identify parts and functions of preparatory machines	Unable to identify machine components and functions of preparatory machines
Process Parameter Analysis (CO3/CO4)	Accurately determines speed, production, efficiency and analyses machine parameters	Performs calculations with minor errors	Basic calculations with limited analysis	Requires support for calculations	Unable to calculate process parameters
Practical Skills & Fabric Production (CO5)	Independently performs experiments, machine settings and produces fabric with accuracy	Performs experiments with minor assistance	Performs experiments with guidance	Incomplete practical work	Unable to perform practical work

Rubrics for CIE – Continuous assessment:

Performance Indicator	Superior	Good	Fair	Needs Improvement	Unacceptable
Concept Understanding (CO1)	Excellent understanding of weaving principles, preparatory processes and fabric formation	Good understanding with minor errors	Basic understanding of concepts	Partial knowledge	No clarity of concepts
Machine Operation & Experimental Skills (CO2/CO5)	Performs experiments independently with correct procedure and machine handling	Performs experiments with minor assistance	Performs experiments with guidance	Incomplete procedure	Unable to perform experiment
Calculation & Analysis (CO3)	Accurate calculation of production, efficiency, speed and weaving parameters with interpretation	Correct calculation with minor errors	Basic calculation ability	Requires guidance for calculations	Unable to calculate parameters
Laboratory Record & Documentation	Complete record with accurate results, diagrams and neat presentation	Proper record with minor mistakes	Average record maintenance	Incomplete record	Record not maintained

Rubrics for SEE / CIE Test:

Suggested rubrics for Practical continuous assessment:

Performance Indicator	Superior	Good	Fair	Needs Improvement	Unacceptable
Understanding of Experiment / Theory (CO1)	Complete understanding of principles, processes and applications	Good understanding with minor errors	Basic understanding	Limited understanding	No clarity
Execution of Experiment (CO2/CO5)	Performs experiment accurately with proper settings and observations	Performs with minor assistance	Requires guidance during experiment	Incomplete execution	Unable to perform
Calculation & Result Analysis (CO3)	Correct calculations with logical interpretation of results	Minor errors in calculations	Basic analysis of results	Incomplete analysis	Incorrect results
Viva & Technical Knowledge (CO1/CO4)	Answers confidently with detailed technical explanation	Answers most questions correctly	Answers basic questions	Limited response	Unable to answer

Performance Indicators	Excellent	Very Good	Good	Satisfactory

Machine Knowledge & Identification (CO1) (PO1)	Student identifies all parts of winding, pirn winding, warping, sizing and loom machines and explains their functions clearly. **(4)**	Student identifies most machine parts and explains functions with minor errors. **(3)**	Student identifies basic machine parts but lacks detailed knowledge. **(2)**	Student requires guidance to identify machine parts and functions. **(1)**
Experimental Procedure & Machine Setting (CO1/CO2) (PO2 & PO3)	Student independently performs experiments, sets machine parameters, timings and follows correct procedure. **(5)**	Student performs experiments with minor guidance and understands machine settings. **(4)**	Student follows procedure with assistance and has basic understanding of settings. **(3)**	Student requires continuous guidance to perform experiments. **(1-2)**
Operation & Handling of Machines (CO2/CO5) (PO3 & PO8)	Student efficiently operates winding, warping, sizing and loom mechanisms safely and explains working principles. **(7-8)**	Student operates machines properly with minor assistance and explains operations. **(5-6)**	Student operates machines with guidance and limited understanding. **(3-4)**	Student is unable to operate machines independently. **(1-2)**
Calculations & Result Analysis (CO3) (PO4)	Student accurately calculates speed, production, efficiency, warp pattern, reed width and analyses results. **(5)**	Student performs calculations with minor errors and interprets results. **(4)**	Student performs basic calculations with limited analysis. **(3)**	Student requires support for calculations and result interpretation. **(1-2)**
Laboratory Record & Demonstration (CO5) (PO9)	Lab record is complete with observations, calculations, diagrams and effective demonstration of experiment. **(7-8)**	Record is properly maintained with good presentation and demonstration. **(5-6)**	Record contains basic information with incomplete observations. **(3-4)**	Record is incomplete/not maintained and unable to demonstrate experiment. **(1-2)**

Note: Can add Engineering & IT tool usage based on the nature of the course

Suggested Learning Activities may include (but are not limited to):

- Course Project
- Case Study Presentation
- Programming Assignment
- Tool/Software Exploration
- Literature Review
- Open Book Test (preferably at RBL4 and RBL5 levels)
- GATE-based Aptitude Test
- Assignment (at RBL3, RBL4, or RBL5 levels)
- Any other relevant and innovative academic activity
- Use of MOOCs and Online Platforms

Suggested Innovative Delivery Methods may include (but are not limited to):

- Flipped Classroom
- Problem-Based Learning (PBL)
- Case-Based Teaching
- Simulation and Virtual Labs
- Partial Delivery of course by Industry expert/ industrial visits
- ICT-Enabled Teaching
- Role Play

Term Work (TW) and Self Learning (SL) components in Number of hours per semester

Term work (includes assignments, seminars, micro projects, industrial visits, any other student activities etc.)		
Sl. No.	**Term Work (TW) Activity**	**Number of Hours / Semester**
1.	Study of different yarn preparatory processes and prepare report	6hrs
2.	Collection and identification of different woven fabrics with applications	6hrs
3.	Study of loom motions and prepare working principle report	7hrs
4.	Fabric analysis and calculation of production & efficiency parameters	5hrs
SL: Self Learning, MOOCs, spoken tutorials, online educational resources etc.		
Sl. No.	**Self-Learning (SL) Activity**	**Number of Hours / Semester**
1.	Visit nearby weaving industry and prepare industrial visit report	8hrs
2.	Solve GATE questions related to weaving technology and discuss in groups	10hrs
3.	Online learning through NPTEL/MOOCs on fabric manufacturing	8hrs

Continuous Internal Evaluation (CIE)

(i)Theory component

The CIE marks of 25 shall be earmarked for two tests.

The first test shall be conducted after completing two modules of the syllabus and the second one after completing the rest three modules.

Each test shall be conducted for 25 marks. The average of the two tests scaled down to 25 marks shall constitute the test marks for a maximum of 25 marks.

(ii) Laboratory component

Out of 25 marks, 15 marks shall be assigned for assessment as per the rubrics listed in the course syllabus.

The remaining 10 marks shall be based on the practical test conducted by two Internal examiners appointed by the HoD.

The allotment of marks shall be as per the rubrics defined for regular class work and practical test as indicated in the Table – ICs/IPCCs 1.

(i) To qualify and become eligible to appear for the SEE of the IC/IPCC, a student shall secure at least 40 % of 25 marks, i.e., 10 marks, in the CIE theory component, and at least 40 % of 25 marks, i.e., 10 marks in the CIE Practical component.

Passing requirement in SEE

Table – ICs/IPCCs 1 Distribution of marks		
Component	**Description**	**Marks**
Allotment of marks for regular class work		
Ability in Conducting Experiments	Initiative, skill, safety practices, teamwork, and independent handling of equipment during regular lab sessions.	5 marks
Laboratory Record / Journal	Regular and neat maintenance of lab record, accuracy of results, and timely submission.	10 marks
Subtotal		**15**
Allotment of marks for CIE practical test		
Laboratory Test / Experiment Performance	Ability to set up apparatus, follow procedure, take observations, and obtain correct results in the test experiment.	5 marks
Viva-Voce	Understanding of theory, concepts, and experimental procedure; ability to explain results and answer related questions.	5 marks
Subtotal		**10**
Total		**25**

For a pass in the Semester End Examination (SEE), a student shall secure a minimum of 35 marks out of 100.

For the declaration of a pass grade, the sum of the Continuous Internal Evaluation (CIE) marks (out of 50) marks and the SEE marks scaled down to 50 shall be greater than or equal to 40 marks.

If the total (CIE + SEE) is less than 40 marks, the student shall be awarded the grade 'F' (Fail).

SPINNING TECHNOLOGY-I			
Course Code	**1BTX303**	Scheme	2025
Type of Course	**PCC**	Semester	III
Teaching Hours/Week (L:T:P)	3:2:0	CIE Marks	50
Total Hours of Pedagogy per semester L /T/P/SL&TW:	42: 28 : 0 : 50	SEE Marks	50
Credits	**4**	Total Marks	100
Examination type (SEE)	Theory	Exam Hours	3h

Course outcome (Course Skill Set)

At the end of the course, the student will be able to:

1. Recognize the need for spinning preparatory process and interpret operations involved in Ginning, Blowroom, Carding, Drawframe.
2. Estimate production, efficiency, draft and mechanism related parameters in Blowroom, Carding, Drawframe.
3. Analyse theoretical aspects of opening, cleaning, carding and drawing operations and distinguish between principles, mechanism and methods involved. and explain the concepts involved in application of AI in ginning and fibre preparatory process (opening, cleaning, carding and drawframe

Module-1

Importance and need of Ginning. Explanation of working of different types of gins. Defects, causes and remedies of ginning. Baling process and bale weights Impurities in the cotton and remedies to minimize impurities in cotton. Important cotton types and trash in those cottons. Grading of cottons Definition and objects of mixing and blending. Types of blending and common blends. Influence of fibre parameters namely length, fineness, strength, elongation, chemical deposits and neps on spinning performance

Introduction to Artificial Intelligence (AI) in Textile Industry: Basics of AI, Applications of AI in Ginning & Fibre Selection.

Number of Hours: 9h

Module-2

Objectives of Blow room. Types of opening action in blow room. Brief study of bale pluckers and bale grabbers. Study of design features and different types of openers and beaters on the Present-day Blow room. Modern developments in Blow room. Evaluation of Blow room performance - Hank calculation, production and efficiency calculation. Process Modification required in blow room to process blends of Polyester/cotton and polyester/viscose. Study of blow room line required for processing different types of blends.

AI Applications in Blow Room: Smart Blow Room Concepts, Machine Learning for Waste Optimization.

Number of Hours: 8h

Module-3

Definition and objects of revolving flat card. Study of design features and different types of clothing on licker in, cylinder and doffer and their specifications. Passage of material through revolving flat card. Auto leveller on card and its importance. Types of auto leveller, setting of different parts of card and gauges used for setting. Definition of draft in card and study of different types of draft and its calculation. Objects of stripping and grinding and their importance.

AI in Carding: Auto Leveller with AI Integration, Computer Vision in Carding.
Number of Hours: 8h

Module-4

Modern developments and salient features of modern cards. Specification of the present-day cards. Calculation of hank of sliver, production and efficiency in carding. Objects and principle of draw frame. Study of different drafting systems through sketches and types of draft in the drafting zone. Types of loading systems. Roller setting and procedure of roller setting.

AI in Carding: Quality Prediction Using Machine Learning.

Number of Hours: 9h

Module-5

Auto levellers on draw frame. Study of long and short creel draw-frames and their advantages and limitations. Brief study on bercolisation, scouring, buffing, roller eccentricity, shore hardness, calculations of draw frame such as production. Modern developments in draw frame and specifications of the present-day draw frame

AI in Draw Frame: Smart Auto Leveller, Predictive Maintenance.
Number of Hours: 8h

Suggested Learning Resources: (Text Book/ Reference Book/ Manuals):

Text books:

1. Technology of short-staple spinning, vol-I, vol-II Klein, W Textile Institute Pub., Manchester
2. Cotton Opening & Carding Merril G.R G.R. Merill, Lowell Mass
3. 'Opening and Cleaning' Shirley. The Textile Institute Publication, Manual of Cotton Spinning Vol. II, Part-II.
4. Spinning of man-made and blends on cotton system, K R Solhotra, The Textile Association of India

Reference books / Manuals:

1. Series on Textile processing Zaloski. S, Institute of Textiles Technology USA
2. Contemporary Textile Engineering Happey. F, Academic Press Inc
3. 'Cotton Ginning' Textile Progress, The Textile Institute Publication
4. Essential calculations of practical cotton spinning T.K. Pattabhiraman.
5. 'Cotton Production and Blow Room' Dr. R. N. Narkhedkar, Research IndiaPublication, Delhi.
6. NPTEL Course: Principle of Carding and Drawing, Prof. Ravi Chattopadhyay, IIT Delhi.

Web links and Video Lectures (e-Resources):

Web Links:

1. **NPTEL – Textile Engineering Courses**
2. **Textile Learner – Spinning Technology Resources**
3. **Textile School – Spinning Process and Technology**
4. **Fibre2Fashion – Textile Industry Resources**

Video Lectures:

1. **NPTEL lectures on Principles of Spinning and Yarn Manufacturing**
2. **Videos on Cotton Ginning, Blowroom and Carding Processes**

3. **Demonstration videos on Carding and Draw Frame Machines**

4. **Industrial videos on Modern Spinning Preparatory Processes**

Teaching-Learning Process (Innovative Delivery Methods):

The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes.

1.**ICT Enabled Teaching:** Use of PPTs, animations, machine videos and virtual demonstrations to explain spinning preparatory processes and mechanisms.

2. **Experiential Learning:** Laboratory demonstrations, machine studies, fibre testing, calculations of production and efficiency parameters.

3. **Problem Based Learning:** Case studies, assignments and group discussions on modern developments in blowroom, carding and drawframe processes.

Assessment Structure:

The assessment in each course is divided equally between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage.

- To qualify and become eligible to appear for SEE, in the **CIE**, a student must score at least **40% of 50 marks**, i.e., **20 marks**.
- To pass the **SEE**, a student must score at least **35% of 50 marks**, i.e., **18 marks**.
- Notwithstanding the above, a student is considered to have **passed the course,** provided the combined total of **CIE and SEE** is at least **40 out of 100 marks**.

Continuous Comprehensive Assessments (CCA)+ Internal Assessment Test (IA) = Continuous Internal EvaluationCIE [25+25=50 marks]

A minimum of **two Internal Assessment Tests(IA)** shall be conducted, carrying a total of **25 marks**.

In addition, **Continuous Comprehensive Assessment (CCA)** shall be conducted for a total of **25 marks**.

It is recommended to include **a maximum of two learning activities** as part of the CCA to foster the **holistic development of students**. These activities shall be:

Sl. No.	Name of the Learning activity	Maximum Marks
1.	Study and preparation of report on Blowroom, Carding and Drawframe machines	12
2.	Case study presentation on modern developments in spinning preparatory processes	13

Rubrics for Learning Activity (Based on the nature of learning activity, design the rubrics for each activity):

Performance Indicator	Superior	Good	Fair	Needs Improvement	Unacceptable
Understanding of Spinning Preparatory Processes (CO1)	Demonstrates excellent understanding of ginning, blowroom, carding and drawframe processes with detailed technical explanation	Good understanding of processes with minor errors	Basic understanding of preparatory processes	Limited understanding and requires guidance	Unable to explain the processes
Machine Knowledge & Working Principle (CO1/CO3)	Clearly explains machine parts, material passage, working principles and mechanisms of blowroom, carding and drawframe	Explains machine operations with minor errors	Basic knowledge of machine functions	Limited knowledge about machine mechanisms	Unable to identify machine parts and functions
Process Parameter Analysis (CO2)	Accurately explains and analyses draft, speed, production and efficiency parameters	Good analysis with minor calculation errors	Basic knowledge of process parameters	Requires support for analysis and calculations	Unable to explain process parameters
Modern Developments & AI Applications (CO3/CO4)	Effectively explains modern machines, automation and AI applications with suitable examples	Good awareness of latest developments and applications	Basic awareness of advancements	Limited information about modern developments	No knowledge of recent developments

Suggested Learning Activities may include (but are not limited to):

- Course Project
- Case Study Presentation
- Programming Assignment
- Tool/Software Exploration
- Literature Review
- Open Book Test (preferably at RBL4 and RBL5 levels)
- GATE-based Aptitude Test
- Assignment (at RBL3, RBL4, or RBL5 levels)
- Any other relevant and innovative academic activity
- Use of MOOCs and Online Platforms

Suggested Innovative Delivery Methods may include (but are not limited to):

- Flipped Classroom
- Problem-Based Learning (PBL)
- Case-Based Teaching
- Simulation and Virtual Labs
- Partial Delivery of course by Industry expert/ industrial visits
- ICT-Enabled Teaching
- Role Play

Term Work (TW) and Self Learning (SL) components in Number of Hours per semester

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

Sl. No.	Term Work (TW) Activity	Number of Hours / Semester
1.	Study of cotton grading, ginning process and preparation of report	5hrs
2.	Study of blowroom and carding machine working with process flow diagram	10hrs
3.	Calculation of production, efficiency and draft in blowroom, carding and drawframe	5hrs
4.	Collection and analysis of different fibre blends used in spinning industries	5hrs

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

Sl. No.	Self-Learning (SL) Activity	Number of Hours / Semester
1.	Industrial visit to spinning mill and preparation of report	7hrs
2.	Solve GATE questions related to spinning technology and group discussion	10hrs
3.	Online learning through MOOCs/NPTEL on spinning processes	8hrs

Continuous Internal Evaluation (CIE)

5. The CIE marks shall be decided based on internal tests and other outcome-based activities. The continuous internal evaluation shall be carried out by the teacher handling the course.
6. Out of 50 marks earmarked for CIE, 25 marks shall be assigned for internal tests. The first test shall be conducted after completing two modules of the syllabus and the second one after completing the remaining three modules.

7. The remaining 25 marks shall be assigned for Continuous Course Assessment (CCA), conducted as per the rubrics listed in the assessment section of the respective syllabus.
8. A student shall obtain a minimum of 40% marks or 20 out of 50 marks allotted to CIE to become eligible to appear for the SEE.

Passing requirement in SEE

4. For a pass in the Semester End Examination (SEE), a student shall secure a minimum of 35 marks out of 100.
5. For the declaration of a pass grade, the sum of the Continuous Internal Evaluation (CIE) marks (out of 50) marks and the SEE marks scaled down to 50 shall be greater than or equal to 40 marks.
6. If the total (CIE + SEE) is less than 40 marks, the student shall be awarded the grade 'F' (Fail).

CHEMICAL PROCESSING OF TEXTILES-I			
Course Code	**1BTX304**	Scheme	2025
Type of Course	**PCC**	Semester	III
Teaching Hours/Week (L:T:P)	3:0:0	CIE Marks	50

Total Hours of Pedagogy per semester L /T/P/SL&TW:	42: 0 : 0 : 48	SEE Marks	50
Credits	**3**	Total Marks	100
Examination type (SEE)	Theory	Exam Hours	3h

Course outcome (Course Skill Set)

At the end of the course, the student will be able to:

1. Explain the principles, concepts and theory involved in Chemical preparatory process of natural and manmade fibres. illustrate the effect of preparatory and dyeing process on environment and summarise water and energy conservation in preparatory and dying process
2. Interpret the principles, concepts and theory involved in dyeing of textiles using Direct, Reactive, Vat dyes, Acid dyes, Metal complex and Sulphur dyes,
3. Determine the parameters related to preparatory process of wet processing and dyeing of Textiles using Direct, Reactive, Vat dyes, Acid dyes, Metal complex, and Sulphur dyes.
4. Justify the various parameters and conditions used for preparatory wet processing and dyeing of Textiles using, Direct, Reactive, Vat dyes, Acid dyes, Metal complex and Sulphur dyes

Module-1

Introduction to Chemical processing of textiles. Preparatory processes and sequences, Chemicalsand auxiliaries used and their functions. **Singeing**–objectives, methods and working of various singeingmachines**,Desizing**–objects,mechanism,andvariousmethodsofDesizing.**Scouring**-objects, mechanism,methodofscouringofnaturalandsynthetictextiles.ModerndevelopmentsinDesizing andscouring.Water qualityrequirements forchemical processingofTextiles.

Number of Hours: 9h

Module-2

Bleaching; Mechanism and methods of bleaching of textiles. Various bleaching agents used and methods application. Quality control methods used and determination of degradation of cotton during scouring and bleaching. Batch processes, Semi-continuous and continuous processes. Modern developments in Bleaching. Machineries used for Preparatory Process. Brief study on eco-friendly processes. Optical whitening and method of application of OBA on cotton and other cellulosic materials.

Mercerization-Objects,physicalandchemicalchangesincottonduetomercerization,factors affectingmercerization,degree ofefficiencyofmercerizationprocess. Methods and Machines used for yarn and fabric mercerization, Modern developments in mercerization hot and liquid ammonia mercerisation. **Introduction to Textile Chemical Processing & AI** - Role of AI in Industry 4.0, Data Acquisition & Pre-processing in Textile Processing,

Number of Hours: 9h

Module-3

ColorationofTextiles;Classificationofdyesandprinciples of dyeing. Chemicals and auxiliaries used for textile dyeing and their functions. Chemical constitution ofdyes.Effectoffibrestructureondyeingbehaviour. Theories of dyeing. Action of electrolytes, effect of dye bath temperature, material to liquor ratio, dye bath pH. Modern concepts of dyeing and selection of dyes for specific end uses.

Number of Hours: 8h

Module-4

Direct dyes – Classification, properties, application, and after treatments**. Reactive dyes** – Classification, properties, dyeingconditions,andapplications.**Vatdyes**-Classification,properties,dyeingconditions, application. **Sulphur dyes** - Classification, properties, dyeing conditions, application. Process variables (pH, Temperature, MLR, Time, Concentration), **Sensors & IoT** in dyeing machines.

Number of Hours: 8h

Module-5

Azoic dyes - Classification, properties, dyeing conditions, application. **Acid dyes** - Classification, properties, dyeing conditions, application. **Mordant dyes and Metal Complex Dyes**: Classification, properties, dyeing conditions and application.**Basic dyes** - Classification, properties, dyeing conditions and application. Effects of wet processing on environment. Water and energy managementin chemical processes. Color Prediction & Recipe Optimization, **AI-based** shade matching,

Number of Hours: 8h

Suggested Learning Resources: (Text Book/ Reference Book/ Manuals):

Text books:

1. Chemical Technology in the pre-treatment process of textiles, S R Karmakar, Elsevier Science.
2. Technology of Bleaching and Dyeing of textile fibres-Chakraborthy, -Cox town Publications.
3. Textile Preparation and Dyeing, A K R Choudhury, Oxford and IBH Publishing Co. New Delhi.
4. Fundamentals and Practices in Colouration of Textiles J.N. Chakraborty-Wood head Publishing.

Reference books / Manuals:

1. Technology of Textile Processing-Vol. III-A Shenai-Sevak Publications
2. Textile Scouring & Bleaching. E.R.Trotman, B.I. Publications, New Delhi
3. Dyeing Of Textile Substrates, I – COTTON; Woodhead Publishing.
4. NPTEL Courses: Textile chemical Processing: Theory and practice of Preparatory Processes, Dr. B S Butola, IIT Delhi.
5. NPTEL Courses: Textile Effluent and its Management, Dr. Padma S Vankar, IIT Kanpur.

Web links and Video Lectures (e-Resources):

Web Links:

1. **NPTEL – Textile Chemical Processing Courses**
2. **Textile Learner – Textile Chemical Processing Resources**
3. **Textile School – Textile Processing Technology**
4. **Fibre2Fashion – Textile Processing Information**

Video Lectures:

1. **NPTEL lectures on Textile Chemical Processing and Dyeing Technology**
2. **Videos on desizing, scouring, bleaching and mercerization processes**
3. **Demonstration videos on textile dyeing methods and dye application**
4. **Industrial videos on modern wet processing machinery and effluent treatment**

Teaching-Learning Process (Innovative Delivery Methods):

The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes.

1. **ICT Enabled Teaching:** Use of PPTs, animations, process flow diagrams and videos to explain textile preparatory and dyeing processes.
2. **Experiential Learning:** Demonstration of chemical processing methods, study of textile chemicals, dyes, auxiliaries and industrial practices.
3. **Problem Based Learning:** Case studies, assignments and discussions on sustainable wet processing, water conservation and pollution control.

Assessment Structure:

The assessment in each course is divided equally between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage.

- To qualify and become eligible to appear for SEE, in the **CIE**, a student must score at least **40% of 50 marks**, i.e., **20 marks**.
- To pass the **SEE**, a student must score at least **35% of 50 marks**, i.e., **18 marks**.
- Notwithstanding the above, a student is considered to have **passed the course,** provided the combined total of **CIE and SEE** is at least **40 out of 100 marks**.

Continuous Comprehensive Assessments (CCA)+ Internal Assessment Test (IA) = Continuous Internal EvaluationCIE [25+25=50 marks]

A minimum of **two Internal Assessment Tests(IA)** shall be conducted, carrying a total of **25 marks**.

In addition, **Continuous Comprehensive Assessment (CCA)** shall be conducted for a total of **25 marks**.

It is recommended to include **a maximum of two learning activities** as part of the CCA to foster the **holistic development of students**. These activities shall be:

Sl. No.	Name of the Learning activity	Maximum Marks
1.	Preparation of report on textile preparatory processes (Desizing, Scouring, Bleaching and Mercerization)	12
2.	Case study presentation on modern dyeing techniques and eco-friendly processing	13

Rubrics for Learning Activity (Based on the nature of learning activity, design the rubrics for each activity):

Performance Indicator (CO/PO Mapping)	Superior	Good	Fair	Needs Improvement
Understanding of Preparatory Processes (CO1/PO1)	Demonstrates excellent understanding of singeing, desizing, scouring, bleaching, mercerization and explains principles with industrial applications	Good understanding of preparatory processes with minor errors	Basic understanding of processes and applications	Limited understanding and requires guidance
Knowledge of Dyeing Principles & Dyes (CO2/PO1)	Clearly explains classification, properties, mechanism and application of different dyes with suitable examples	Explains major dye classes with minor errors	Basic knowledge about dyes and dyeing methods	Partial understanding of dye selection and application
Process Parameter Analysis (CO3/PO2)	Correctly analyses and justifies parameters like pH, temperature, MLR, time and concentration	Identifies important parameters with minor mistakes	Understands some process parameters	Requires assistance to relate parameters with processes
Environmental & Sustainable Processing (CO1/CO4/PO7)	Provides excellent explanation of water conservation, energy management and eco-friendly processing methods	Good awareness of sustainable practices	Basic knowledge about environmental issues	Limited awareness of pollution control methods
Report Preparation & Presentation (CO4/PO9)	Report is well structured with detailed content, diagrams, references and effective presentation	Properly prepared report with good presentation	Average report with limited explanation	Incomplete report with poor presentation

Suggested Learning Activities may include (but are not limited to):

- Course Project
- Case Study Presentation
- Programming Assignment
- Tool/Software Exploration
- Literature Review
- Open Book Test (preferably at RBL4 and RBL5 levels)
- GATE-based Aptitude Test
- Assignment (at RBL3, RBL4, or RBL5 levels)
- Any other relevant and innovative academic activity
- Use of MOOCs and Online Platforms

Suggested Innovative Delivery Methods may include (but are not limited to):

- Flipped Classroom
- Problem-Based Learning (PBL)
- Case-Based Teaching
- Simulation and Virtual Labs
- Partial Delivery of course by Industry expert/ industrial visits
- ICT-Enabled Teaching
- Role Play

Term Work (TW) and Self Learning (SL) components in Number of Hours per semester

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

Sl. No.	Term Work (TW) Activity	Number of Hours / Semester
1.	Study of textile preparatory processes and preparation of process flow chart	5hrs
2.	Collection of different dyes and auxiliaries with their applications	5hrs
3.	Study report on modern textile processing machines	7hrs
4.	Analysis of water quality parameters used in textile processing	5hrs

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

Sl. No.	Self-Learning (SL) Activity	Number of Hours / Semester
1.	Visit to textile processing industry and preparation of industrial visit report	8hrs
2.	Solve GATE questions related to chemical processing of textiles	6hrs
3.	Online learning through MOOCs/NPTEL on textile dyeing and finishing	8hrs
4.	Study recent developments in sustainable and eco-friendly textile processing	4hrs

Continuous Internal Evaluation (CIE)

9. The CIE marks shall be decided based on internal tests and other outcome-based activities. The continuous internal evaluation shall be carried out by the teacher handling the course.

10. Out of 50 marks earmarked for CIE, 25 marks shall be assigned for internal tests. The first test shall be conducted after completing two modules of the syllabus and the second one after completing the remaining three modules.
11. The remaining 25 marks shall be assigned for Continuous Course Assessment (CCA), conducted as per the rubrics listed in the assessment section of the respective syllabus.
12. A student shall obtain a minimum of 40% marks or 20 out of 50 marks allotted to CIE to become eligible to appear for the SEE.

Passing requirement in SEE

7. For a pass in the Semester End Examination (SEE), a student shall secure a minimum of 35 marks out of 100.
8. For the declaration of a pass grade, the sum of the Continuous Internal Evaluation (CIE) marks (out of 50) marks and the SEE marks scaled down to 50 shall be greater than or equal to 40 marks.
9. If the total (CIE + SEE) is less than 40 marks, the student shall be awarded the grade 'F' (Fail).

SERICULTURE AND SILK TECHNOLOGY			
Course Code	**1BTX305**	Scheme	2025
Type of Course	**PCC**	Semester	III
Teaching Hours/Week (L:T:P)	3:0:0	CIE Marks	50
Total Hours of Pedagogy per semester	42: 0 : 0 : 48 :	SEE Marks	50

L /T/P/SL&TW:			
Credits	**3**	Total Marks	100
Examination type (SEE)	Theory	Exam Hours	3h

Course outcome (Course Skill Set)

At the end of the course, the student will be able to:

1. Outline the practices involved in mulberry production and pre cocoon technology and summarise the status of sericulture and silk industries in India.
2. Explain the concepts involved in post cocoon technology, silk by-products and spun silk Production and testing & grading of silk
3. Illustrate the physical and chemical concepts and theory involved in wet processing of silk.
4. Determine the parameters related to cocoon quality, reeling and post reeling operations.

Module-1

Introduction to sericulture and silk industry. Status of sericulture and silk industry in India and abroad. Mulberry cultivation practices, environmental conditions, types of mulberry plants. Silkworm rearing; Environmental conditions for silkworm rearing, various methods. Chawki rearing, Late age silkworm rearing,recentdevelopmentsinrearing.Seedproduction &grainageactivities. Silkwormdiseases,pests&theircontrol.

Number of Hours: 8h

Module-2

Introduction to Mulberry and Non-mulberry (wild) silks and their applications. Different types of cocoons,Physicaland commercialcharacteristics,sortingandtestingofcocoons.Stiflingofcocoons & Cocoon storage: objectives. Cocoon cooking: process and various methods: open pan, three pan, Conveyor cooking systems. Silk reeling. Systems of reeling, charka, cottage basin, multi-end filature, automaticreelingmachine,re-reelingprocess,recentdevelopmentsinsilkreeling.

Number of Hours: 9h

Module-3

Silkthrowing:Objectives. Winding,Doubling,Rewindingand Twisting,Manufactureofsilkyarns for ordinary, Soft, Chiffon, Crape, Georgette and Voile silk fabrics. Recent developments in silk throwing machines. Silk weaving preparation for warp & weft yarns.Silk handloom & power looms specialfeatures,modificationsrequiredtoweavesilkfabrics.

Number of Hours: 9h

Module-4

Spunsilkindustry.Introductiontospunsilkindustry,Differentsourceofsilkwaste,Sequenceof operationsinspunsilkproduction.Italian&Japanesesilkspinningsystems.Endusesofspunsilk yarns.Noilyarns.Seriplanetestingofsilkyarns.Testing&Gradingofsilkyarns.Flowchart, samplepreparation,visual test, windingtest recordingof results.ComparativestudyofIndianandChina silk.

Number of Hours: 8h

Module-5

Wetprocessingofsilk;Dyeingofsilkyarns&fabrics.Recentdevelopmentsinwetprocessingofsilk fabrics. Printing &finishingofsilk fabrics.Advantages and disadvantages ofloom finished silk fabrics Silkby-products:properties andapplication.SilkSericin:extraction,characterizationand applications.

Number of Hours: 8h

Suggested Learning Resources: (Text Book/ Reference Book/ Manuals):

Text books:

1. Silk Processing, Properties and Applications, K Murugesh Babu Elsevier publication
2. Hand Book of Practical Sericulture, S R Ullal and M N Narasimhanna, Central Silk Board, India.
3. Manuals on Sericulture, Vol – I, &II, Various Authors, FAO Publication.
4. Handbook of Sericulture Technologies, S.B. Dandin, Central Silk Board.
5. Mulberry Silk Reeling Technology, D. Mahadevappa, V G Halliyal, D G, Shankar, Ravindra, Bhandiwad, Oxford and IBH Publishing Company.
6. Handbook of Silk Technology, T N Sonwalkar, Taylor and Francis.

Reference books / Manuals:

1. Silk Wet Processing, Dr. M. L.Gulrajani, TAI Publication
2. Silk Weaving Compiled by Zhejiang Silk Engineering Institute, Science Pub Inc.

Web links and Video Lectures (e-Resources):

Web Links:

1. **Central Silk Board – Sericulture Resources**
2. **NPTEL – Textile Engineering Courses**
3. **Textile Learner – Silk Technology Resources**
4. **Fibre2Fashion – Silk Industry Information**

Video Lectures:

1. **Video lectures on mulberry cultivation and silkworm rearing practices.**
2. **Demonstration videos on cocoon cooking, silk reeling and throwing processes.**
3. **Videos on silk weaving, dyeing and finishing processes.**
4. **Industrial videos on modern silk production technologies.**

Teaching-Learning Process (Innovative Delivery Methods):

The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes.

- **ICT Enabled Teaching:** Use of PPTs, animations, videos and flow charts to explain sericulture practices, silk processing and testing methods.
- **Experiential Learning:** Industrial visits, cocoon/silk sample studies, demonstrations and case studies related to silk production.
- **Collaborative Learning:** Group discussions, assignments and presentations on recent developments in sericulture and silk technology.

Assessment Structure:

The assessment in each course is divided equally between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage.

- To qualify and become eligible to appear for SEE, in the **CIE**, a student must score at least **40% of 50 marks**, i.e., **20 marks**.
- To pass the **SEE**, a student must score at least **35% of 50 marks**, i.e., **18 marks**.
- Notwithstanding the above, a student is considered to have **passed the course,** provided the combined total of **CIE and SEE** is at least **40 out of 100 marks**.

Continuous Comprehensive Assessments (CCA)+ Internal Assessment Test (IA) = Continuous Internal EvaluationCIE [25+25=50 marks]

A minimum of **two Internal Assessment Tests(IA)** shall be conducted, carrying a total of **25 marks**.

In addition, **Continuous Comprehensive Assessment (CCA)** shall be conducted for a total of **25 marks**.

It is recommended to include **a maximum of two learning activities** as part of the CCA to foster the **holistic development of students**. These activities shall be:

Sl. No.	Name of the Learning activity	Maximum Marks
1.	Preparation of report on sericulture practices, cocoon production and silk reeling process	12
2.	Case study presentation on recent developments in silk technology and silk by-products	13

Rubrics for Learning Activity (Based on the nature of learning activity, design the rubrics for each activity):

Performance Indicator	Superior	Good	Fair	Needs Improvement	Unacceptable
Knowledge of Sericulture & Silk Technology (CO1/CO2)	Excellent understanding of sericulture practices, cocoon production and silk technology with detailed explanation	Good understanding of concepts with minor errors	Basic understanding of concepts	Limited understanding and incomplete knowledge	Unable to explain basic concepts
Analysis of Processes & Parameters (CO3/CO4)	Accurate analysis of cocoon quality, reeling and silk processing parameters with proper justification	Good analysis with suitable explanation	Basic analysis with limited explanation	Requires guidance for analysis	Unable to analyse processes
Report Preparation & Presentation (CO5)	Well-organized report with accurate information, diagrams and effective presentation	Proper report preparation with good presentation	Average report with satisfactory presentation	Incomplete report and weak presentation	Report not submitted / unable to present
Application of Knowledge (CO4/CO5)	Excellent correlation of concepts with silk industry practices and recent developments	Good correlation with industrial applications	Limited application of knowledge	Minimal industrial relevance	Unable to relate concepts

Suggested Learning Activities may include (but are not limited to):

- Course Project
- Case Study Presentation
- Programming Assignment
- Tool/Software Exploration
- Literature Review
- Open Book Test (preferably at RBL4 and RBL5 levels)
- GATE-based Aptitude Test
- Assignment (at RBL3, RBL4, or RBL5 levels)
- Any other relevant and innovative academic activity
- Use of MOOCs and Online Platforms

Suggested Innovative Delivery Methods may include (but are not limited to):

- Flipped Classroom
- Problem-Based Learning (PBL)
- Case-Based Teaching
- Simulation and Virtual Labs
- Partial Delivery of course by Industry expert/ industrial visits
- ICT-Enabled Teaching
- Role Play

Term Work (TW) and Self Learning (SL) components in Number of Hours per semester

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

Sl. No.	Term Work (TW) Activity	Number of Hours / Semester
1.	Study of mulberry cultivation and silkworm rearing practices and preparation of report	5hrs
2.	Identification and testing of different types of silk fibres and fabrics	5hrs
3.	Study of silk reeling, throwing and weaving processes	7hrs
4.	Preparation of report on silk by-products and their applications	5hrs

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

Sl. No.	Self-Learning (SL) Activity	Number of Hours / Semester
1.	Visit to silk industry/sericulture farm and preparation of report	8hrs
2.	Solve GATE questions related to silk technology and sericulture	6 hrs
3.	Online learning through MOOCs/NPTEL on silk processing and technology	8 hrs
4.	Study of recent developments in silk, spider silk and sustainable silk production	4 hrs

Continuous Internal Evaluation (CIE)

13. The CIE marks shall be decided based on internal tests and other outcome-based activities. The continuous internal evaluation shall be carried out by the teacher handling the course.

14. Out of 50 marks earmarked for CIE, 25 marks shall be assigned for internal tests. The first test shall be conducted after completing two modules of the syllabus and the second one after completing the remaining three modules.
15. The remaining 25 marks shall be assigned for Continuous Course Assessment (CCA), conducted as per the rubrics listed in the assessment section of the respective syllabus.
16. A student shall obtain a minimum of 40% marks or 20 out of 50 marks allotted to CIE to become eligible to appear for the SEE.

Passing requirement in SEE

10. For a pass in the Semester End Examination (SEE), a student shall secure a minimum of 35 marks out of 100.
11. For the declaration of a pass grade, the sum of the Continuous Internal Evaluation (CIE) marks (out of 50) marks and the SEE marks scaled down to 50 shall be greater than or equal to 40 marks.
12. If the total (CIE + SEE) is less than 40 marks, the student shall be awarded the grade 'F' (Fail).

SPINNING TECHNOLOGY LAB-I		Scheme	2025
Course Code	**1BTXL306**	Semester	III
Teaching Hours/Week (L:T:P)	0:0:2	CIE Marks	50
Total Hours of Pedagogy L:T:P:SLTW	0:0:28:2	SEE Marks	50
Credits	1	Total Marks	100
Examination type (SEE)	**Practical**	Exam Hours	2

Course outcome (Course Skill Set)

At the end of the course, the student will be able to:

1. Demonstrate the working of Blowroom, Carding, Drawframe and draw the passage of material and gearing diagram of these machines.
2. Calculate the speeds of Blowroom, Carding, Drawframe and determine Draft, Draft constant.
3. Estimate production, cleaning efficiency of Blowroom, Carding, Drawframe from the given Parameters.

Note:

1. The laboratory syllabus consists of PART-A and PART-B. While PART-A has 6 conventional experiments, PART-B has 6 typical open-ended experiments. The maximum marks for the laboratory course are 100.
2. Both PART-A and PART-B are considered for CIE and SEE.
3. Students have answer 1(one) question from PART-A and 1(one) question from PART-B.
    a. The questions set for SEE shall be from among the experiments under PART-A. It is evaluated for **70 marks** out of the maximum 100 marks.
    b. The open-ended question set for SEE shall be any other open-ended question and not selected from the experiments under PART-A. It shall be evaluated for **30 marks.**
4. For Continuous Internal Evaluation (CIE) during the semester, classwork shall typically include open-ended questions from **Part-B**, along with other similar questions designed to enhance the students' skills.

PART – A
FIXED SET OF EXPERIMENTS

1. Passage of material through the blow room and different openers and beaters of blow room and calculations of speeds of different parts of each machineries
2. Calculation of cleaning efficiency at all beaters and openers. Working on Trash Analyzer and related Calculations
3. Study of piano feed regulating motion and calculation of cone drum speed, feed Roller speed
4. and beats/inch
5. Calculation of Shell roller speeds at normal & doffing time. Calculation of Tension draft at Scutcher
6. Speed and draft calculation of different parts of carding with the help of gearing and driving
7. Draft constant and its calculation of card. Draft change pinion calculation and machine operation to get different hank of slivers.
8. Break draft, main draft and total draft calculation Drawframe.
9. Production, delivery speed, calculation of hank of sliver, efficiency calculation of draw frame
   Experiments for Demonstration
10. Driving arrangements and demonstration of all machineries of Blow room
11. Settings of different parts and gauges used setup the machines
12. Passage of material through draw frame and list the parts and their functions.
13. Setting of drafting zone and processing of material as per the hank required in Draw frame.

PART – B
OPEN ENDED EXPERIMENTS

Open-ended experiments are a type of laboratory activity where the outcome is not predetermined and students are given the freedom to explore, design, and conduct the experiment based on the problem statements as per the concepts defined by the course coordinator. It encourages creativity, critical thinking, and inquiry-based learning.

1. Study and optimization of blowroom machine parameters for improved cleaning efficiency
2. Effect of card settings on sliver quality and production
3. Analysis of draft variation in drawframe process
4. Study of influence of machine speed on production and efficiency
5. Comparison of different process parameters for improved yarn quality
6. Troubleshooting and improvement of spinning preparatory processes

Suggested Learning Resources: (Text Book/ Reference Book/ Manuals):

Text books:

1. Technology of short-staple, spinning, Klein.W. Vol. I, II, Textile Institute, Manchester
2. Manual of Cotton Spinning, Opening and Cleaning' Vol. II Part-II, Shirley, The Textile Institute Publication,
3. 'Cotton Production and Blow Room' Dr. R. N. Narkhedkar, Research India Publication, Delhi.

Reference books / Manuals:

1. Manual of Cotton Spinning – Vol. II: Opening and Cleaning, The Textile Institute Publication, Manchester.
2. Cotton Opening and Carding, G.R. Merill, Lowell Mass Publication.
3. A Practical Guide to Spinning, K.R. Salhotra, Textile Association of India.
4. Essential Calculations of Practical Cotton Spinning, T.K. Pattabhiraman.

Web links and Video Lectures (e-Resources):

Web Links:

1. **NPTEL – Textile Engineering Courses**
2. **Textile Learner – Spinning Technology Resources**
3. **Textile School – Spinning Process Technology**
4. **Fibre2Fashion – Textile Industry Resources**

Video Lectures:

1. **Demonstration videos on Blowroom, Carding and Drawframe machines.**
2. **Videos on material passage and working principles of spinning preparatory machines.**
3. **Industrial videos on modern spinning preparatory processes.**
4. **Videos on production, efficiency and draft calculations in spinning machines.**

Teaching-Learning Process (Innovative Delivery Methods):

The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes.

- **Demonstration Based Learning:** Hands-on operation of Blowroom, Carding and Drawframe machines with study of machine parts and material passage.
- **Experimental Learning:** Performing laboratory experiments, calculations of draft, production, efficiency and analysis of machine parameters.
- **Problem Based Learning:** Open-ended experiments, troubleshooting activities and case studies to improve analytical and practical skills.

Assessment Structure:

The assessment for each course is equally divided between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each component carrying **50% weightage** (i.e., 50 marks each).

The CIE marks awarded shall be based on the continuous evaluation of the laboratory report using a defined set of rubrics. Each experiment report can be evaluated for **30 marks.** Total marks for the all report shall be scaled down to 30 marks. The laboratory test (duration 03 hours) at the end of the last week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and Marks scored shall be scaled down to **20 marks**. Final average of marks for report and test shall be out of 50 marks.

For both CIE and SEE, the student is required to conduct one experiment each from both Part A and Part B.

Rubrics for CIE – Continuous assessment:

Performance Indicator	Superior	Good	Fair	Needs Improvement	Unacceptable
Machine Knowledge & Operation (CO1)	Demonstrates excellent understanding of Blowroom, Carding and Drawframe machines, identifies parts and explains material passage accurately	Good knowledge of machines and operations with minor errors	Basic understanding of machine parts and functions	Requires guidance to identify parts and explain operations	Unable to identify machines/parts and explain working
Experimental Skills (CO1)	Performs experiments independently with correct procedure, machine settings and observations	Performs experiment with minor assistance and follows procedure	Performs experiment with guidance and partial observations	Incomplete procedure and requires continuous support	Unable to perform experiment
Calculation & Analysis (CO2/CO3)	Accurately calculates speed, draft, draft constant, production and efficiency with proper analysis	Performs calculations correctly with minor mistakes	Basic calculation ability with limited analysis	Requires assistance for calculations	Unable to perform calculations
Observation & Record Maintenance (CO2/CO3)	Maintains complete record with accurate observations, calculations and neat presentation	Record is complete with minor errors	Average record with missing details	Incomplete record and poor presentation	Record not maintained/submitted

Rubrics for SEE / CIE Test:

Performance Indicator	Superior	Good	Fair	Needs Improvement	Unacceptable
Understanding of Experiment Principle (CO1)	Explains experiment principle, machine mechanism and material passage clearly	Explains principle with minor errors	Basic understanding of experiment	Limited knowledge about experiment	No understanding of experiment
Execution of Experiment (CO1/CO2)	Performs experiment independently with correct machine operation and settings	Performs experiment with minor assistance	Performs with guidance	Partial execution with errors	Unable to perform experiment
Speed, Draft & Production Calculations (CO2)	Accurate calculations of speed, draft, draft constant, production and efficiency	Correct calculation with minor errors	Performs basic calculations	Requires support for calculations	Unable to calculate parameters
Result Interpretation (CO3)	Analyses results and relates machine parameters with process performance	Interprets results with minor errors	Gives basic interpretation	Limited analysis of results	Unable to interpret results

- To qualify and become eligible to appear for SEE, in the **CIE component**, a student must secure **a minimum of 40% of 50 marks**, i.e., **20 marks**.
- To pass the **SEE component**, a student must secure **a minimum of 35% of 50 marks**, i.e., **18 marks**.
- A student is deemed to have **successfully completed the course** if the **combined total of CIE and SEE is at least 40 out of 100 marks**.

Rubrics suggested for Practical continuous assessment				
Performance Indicators	**Excellent**	**Very Good**	**Good**	**Satisfactory**
Fundamental Knowledge (CO1) (PO1)	Student demonstrates in-depth knowledge of Blowroom, Carding and Drawframe machines, explains working principle, machine parts and material passage accurately. **(4)**	Student has good knowledge of machines, parts and operations with minor errors. **(3)**	Student can explain basic machine operations but lacks detailed technical understanding. **(2)**	Student has limited understanding of machine concepts and requires guidance. **(1)**
Experimental Skills & Machine Operation (CO1) (PO2 & PO5)	Student performs experiment independently, operates machines correctly, follows settings and completes procedure accurately. **(5)**	Student performs experiment with minor assistance and understands machine operation. **(4)**	Student performs experiment with guidance and partial understanding of procedure. **(3)**	Student is able to perform only with continuous support and incomplete procedure. **(1-2)**
Calculation & Analysis (CO2/CO3) (PO1 & PO4)	Student accurately calculates speed, draft, draft constant, production and efficiency with proper analysis of results. **(5)**	Student performs calculations correctly with minor errors and interprets results. **(4)**	Student performs basic calculations with limited analysis. **(3)**	Student requires support for calculations and unable to analyse results. **(1-2)**
Observation, Record & Result (CO2/CO3) (PO9)	Laboratory record is well organized with complete observations, calculations, graphs and proper conclusion. **(8)**	Record is maintained properly with minor missing details and good presentation. **(5-6)**	Record contains basic observations but lacks proper analysis and presentation. **(3-4)**	Record is incomplete, poorly maintained or not submitted. **(1-2)**
Safety Practices & Demonstration (CO1) (PO9)	Student follows all safety practices, demonstrates experiment confidently and explains technical aspects clearly. **(8)**	Student follows safety rules and demonstrates experiment with minor assistance. **(5-6)**	Student follows basic safety practices but requires guidance during demonstration. **(3-4)**	Student shows poor safety awareness and lacks confidence in demonstration. **(1-2)**

Note: Can add Engineering & IT tool usage based on the nature of the course

WET PROCESSING LAB-I			
Course Code	**1BTXL307**	Scheme	2025

Type of Course	Ability Enhancement Course (Laboratory)	Semester	III
Teaching Hours/Week (L :T : P)	0:0:2	CIE Marks	50
Total Hours of Pedagogy L :T:P:SL:TW	0:0:28:2	SEE Marks	50
Credits	1	Total Marks	100
Type of Examination	Practical	Exam Hours	2h

Course outcome (Course Skill Set)

At the end of the course, the student will be able to:

1. Formulate the recipe and conduct preparatory wet processing on cotton, silk, wool and manmade textiles.
2. Formulation recipe and conduct dyeing of fabrics/yarns using Direct, Reactive, Vat dyes, Acid dyes, Metal complex and Sulphur dyes,

SET OF EXPERIMENTS

Experiments for Conduction

1. Desizing of cotton fabric using acid and enzymes.
2. Scouring and bleaching of cotton and wool.
3. Degumming of Silk using soap and soda method.
4. Optical whitening of bleached cotton fabrics.
5. Mercerization and dyeing of cotton fabrics.
6. Dyeing of cotton and silk using Direct and Acid dyes.
7. Dyeing of cotton and silk using basic dyes.
8. Dyeing of cotton using reactive and vat dyes.
9. Dyeing of cotton using Sulphur dyes.
10. Dyeing of cotton using Azoic dyes.

Experiments for Demonstration

11. Demonstration of Dyeing of cotton fabric using winch and jigger machine.
12. Evaluation of fastness properties of dyed materials.
13. Determination of BAN, Copper number and Methylene blue absorption of mercerised fabrics.

Suggested Learning Resources: (Text Book/ Reference Book/ Manuals):

Text books:

1. Chemical Technology in the pre-treatment process of textiles, S R Karmakar, Elsevier Science.
2. Technology of Bleaching and Dyeing of textile fibres-Chakraborthy, -Cox town Publications.
3. Textile Preparation and Dyeing, A K R Choudhury, Oxford and IBH Publishing Co. New Delhi.
4. Fundamentals and Practices in Coloration of Textiles J.N. Chakraborty-Wood head Publishing.

Reference books / Manuals:

1. Technology of Textile Processing-Vol. III-A Shenai-Sevak Publications
2. Textile Scouring & Bleaching. E.R.Trotman, B.I. Publications, New Delhi
3. Dyeing Of Textile Substrates, I – COTTON; Woodhead Publishing.
4. NPTEL Courses: Textile chemical Processing: Theory and practice of Preparatory Processes,
5. Dr. B S Butola, IIT Delhi.
6. NPTEL Courses: Textile Effluent and its Management, Dr. Padma S Vankar, IIT Kanpur.

Web links and Video Lectures (e-Resources):

Web Links:

1. **NPTEL – Textile Chemical Processing Courses**
2. **Textile Learner – Textile Processing Resources**
3. **Textile School – Textile Wet Processing Technology**
4. **Fibre2Fashion – Textile Dyeing and Processing**

Video Lectures:

1. **Demonstration videos on desizing, scouring and bleaching processes.**
2. **Videos on dyeing of cotton and silk using different classes of dyes.**
3. **Industrial videos on winch, jigger and other dyeing machines.**
4. **Videos on evaluation of colour fastness properties of dyed fabrics.**

Teaching-Learning Process (Innovative Delivery Methods):
The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes.

- **Demonstration Based Learning:** Practical demonstration of textile preparatory processes, dyeing techniques and finishing operations.
- **Experiential Learning:** Hands-on laboratory experiments, sample preparation, chemical handling and evaluation of dyed materials.
- **Problem Based Learning:** Analysis of dyeing problems, selection of suitable dyes and optimization of processing parameters.

Assessment Structure:

The assessment for each course is equally divided between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each component carrying **50% weightage** (i.e., 50 marks each).

The CIE marks awarded shall be based on the continuous evaluation of the laboratory report using a defined set of rubrics. Each experiment report can be evaluated for 30 marks. Total marks for the all report shall be scaled down to 30 marks. The laboratory test (duration 03 hours) at the end of the last week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and Marks scored shall be scaled down to 20 marks. Final average of marks for report and test shall be out of 50 marks.

Rubrics for CIE – Continuous assessment:

Performance Indicators	**Superior**	**Good**	**Fair**	**Needs Improvement**	**Performance Indicators**
Knowledge of Wet Processing Concepts (CO1/CO2)	Demonstrates excellent knowledge of preparatory processes, dyeing principles, dyes, chemicals and auxiliaries with clear explanation	Good understanding of processes with minor errors	Basic understanding of processes and dyeing methods	Limited knowledge and requires guidance	**Knowledge of Wet Processing Concepts (CO1/CO2)**
Recipe Preparation & Chemical Selection (CO1/CO2)	Accurately prepares recipes, selects suitable chemicals/dyes and explains process parameters	Prepares recipes correctly with minor assistance	Prepares basic recipes with guidance	Improper selection of chemicals/dyes	**Recipe Preparation & Chemical Selection (CO1/CO2)**
Experimental Skills & Procedure (CO1/CO2)	Performs desizing, scouring, bleaching, dyeing experiments independently with correct procedure and safety	Performs experiments with minor assistance	Performs experiments with guidance	Incomplete procedure and observations	**Experimental Skills & Procedure (CO1/CO2)**
Observation, Result & Analysis (CO2)	Records accurate observations, evaluates shade/fastness properties and gives proper analysis	Records results and gives good interpretation	Records observations with limited analysis	Incomplete observations and analysis	**Observation, Result & Analysis (CO2)**

Rubrics for SEE / CIE Test:

Performance Indicators	Superior	Good	Fair	Needs Improvement	Performance Indicators
Understanding of Experiment Principle (CO1)	Clearly explains principle, objectives, chemicals and process mechanism of experiment	Explains principle with minor errors	Basic understanding of experiment	Limited understanding	**Understanding of Experiment Principle (CO1)**
Recipe Formulation & Execution (CO1/CO2)	Prepares accurate recipe and conducts experiment independently with proper parameters	Performs experiment correctly with minor assistance	Performs with guidance and partial accuracy	Requires continuous support	**Recipe Formulation & Execution (CO1/CO2)**
Chemical Handling & Process Control (CO1/CO2)	Handles chemicals safely and controls temperature, time, pH and process conditions accurately	Follows process conditions with minor errors	Basic handling with guidance	Improper handling and control	**Chemical Handling & Process Control (CO1/CO2)**
Result Evaluation & Technical Analysis (CO2)	Analyses dyed sample, fastness results and explains effect of parameters scientifically	Gives correct analysis with minor errors	Gives basic interpretation	Limited interpretation	**Result Evaluation & Technical Analysis (CO2)**

- To qualify and become eligible to appear for SEE, in the **CIE component**, a student must secure **a minimum of 40% of 50 marks**, i.e., **20 marks**.
- To pass the **SEE component**, a student must secure **a minimum of 35% of 50 marks**, i.e., **18 marks**.
- A student is deemed to have **successfully completed the course** if the **combined total of CIE and SEE is at least 40 out of 100 marks**.

Rubrics suggested for Practical continuous assessment

Performance Indicators	Excellent	Very Good	Good	Satisfactory
Fundamental Knowledge (CO1/CO2) (PO1)	Student demonstrates in-depth knowledge of textile preparatory processes, dyeing principles, dyes, chemicals and auxiliaries with proper explanation. **(4)**	Student has good knowledge of wet processing concepts, dye classes and processes with minor errors. **(3)**	Student explains basic concepts of desizing, scouring, bleaching and dyeing but lacks detailed understanding. **(2)**	Student has limited understanding of chemical processing concepts and requires guidance. **(1)**

Recipe Preparation & Experimental Procedure (CO1/CO2) (PO2 & PO3)	Student independently prepares accurate recipes, selects chemicals/dyes, follows process parameters and completes experiment successfully. **(5)**	Student prepares recipes and performs experiments with minor assistance. **(4)**	Student performs experiments with guidance and partial understanding of recipe formulation. **(3)**	Student requires continuous support and unable to prepare proper recipe. **(1-2)**	Note: Can add Engineering & IT tool usage based on the nature of the course
Implementation / Laboratory Skills (CO1/CO2) (PO3 & PO8)	Student conducts preparatory and dyeing processes correctly with proper chemical handling, machine operation and safety practices. **(7-8)**	Student performs processes correctly with minor errors and explains procedure. **(5-6)**	Student performs experiment with assistance and follows basic procedure. **(3-4)**	Student is able to perform only with continuous guidance. **(1-2)**	
Result & Analysis (CO2) (PO4)	Student evaluates dyed samples, analyses shade, fastness properties and relates results with process parameters. **(5)**	Student evaluates results with minor errors and gives suitable interpretation. **(4)**	Student records results and gives basic analysis. **(3)**	Student records results but unable to analyse or interpret findings. **(1-2)**	
Laboratory Record & Demonstration (CO1/CO2) (PO9)	Laboratory record is well organized with complete recipe, procedure, observations, calculations, results and conclusion. Demonstrates experiment confidently. **(7-8)**	Record is properly maintained with minor missing details and good demonstration. **(5-6)**	Record contains basic details but lacks proper presentation and analysis. **(3-4)**	Record is incomplete/not submitted and demonstration is poor. **(1-2)**	

COMMUNITYPROJECT/SOCIETALPROJECT			
Course Code	**1BCP308**	Scheme	2025
Type of Course	SDC	Semester	III
TeachingHours/Week(L:T:P)	30(0:0:0)	CIEMarks	50
TotalHoursofPedagogyCI(L:T):LI(P):SL:TW	30(0:0:0:30)	SEEMarks	50
Credits	1	TotalMarks	100
Type of Examination	Practical	ExamHours	02

Course objective:

Course objective:

Rapid urbanisation, population growth, environmental concerns, energy demand, water scarcity, waste management, transportation issues and rural development challenges have created practical problems affecting communities and public welfare. This course aims to integrate technical knowledge, field exposure and societal engagement so that students identify real community issues, frame problem statements and attempt appropriate, feasible and sustainable engineering responses within the scope of a one-semester project. .

Course outcome (Course Skill Set):

At the end of the course, the student will be able to:

CO1 (L2 – Understand): Identify and analyse societal problems through field interaction and technical assessment.

CO2 (L3 – Apply): Develop skills in project planning, field survey, data collection, implementation, documentation and reporting.

CO3 (L4 – Analyze): Formulate feasible engineering problem statements and solutions considering practical constraints and sustainability aspects.

CO4 (L3 – Apply): Apply principles of environmental responsibility, ethics and societal welfare in engineering practice through community-oriented interventions.

CO5 (L4 – Analyze): Exhibit multidisciplinary learning and problem-solving ability based on collected data, user feedback and baseline conditions.

CO6 (L5 – Evaluate): Demonstrate teamwork and communication skills while interacting with technical and non-technical stakeholders and reflect on project impact on society.

Restrictions and professional conduct:

Community / Societal Projects shall remain **academic, socially responsible, technically focused, and politically neutral**. Students and faculty shall maintain professionalism, ethical conduct, public respect and institutional integrity while interacting with communities, public groups, organisations and stakeholders.

Students and faculty **shall avoid** the following during project execution:

Projects must also recognise constraints related to **cost, resources, environment and safety, and stakeholder behaviour/cooperation/acceptance** when planning and implementing activities.

SET OF PROJECT ACTIVITIES (TW/SL =30HOURS)

Methods for project identification:

Students may identify the project topic using one or more of the following methods:

- Interaction with local rural or urban stakeholders such as local leaders, corporation/municipality personnel, NGOs, panchayat representatives, etc.
- Review of issues highlighted in print and electronic media, and social networks (WhatsApp,

Facebook,X,Instagram,etc.).

- After selecting a broad topic, students shall collect data, conduct a feasibility survey, estimate timelinesandresources,approximate expenditure,andthendefinetheproblemstatementand objectives clearly.

List of Project Topics and Engineering Outcomes:

The following structured sequence of activities is to be carried out during the semester:

Sl. No.	Projecttitle	Measurableengineeringoutcome	MappedPOs	SDGs
1	Ruralandurbanwater conservation and management systems	Prepare a site-specific water-saving plan, estimate water demand–supply gap, and propose a feasible conservation intervention with quantified savings.	PO1, PO2, PO3, PO4, PO10,PO11	SDG6, SDG11, SDG12
2	Wastemanagement and recycling	Conduct waste audit, classify waste streams, and design a segregation/recycling workflow with measurable reduction in mixed waste.	PO2, PO3, PO4, PO6, PO8,PO10	SDG11, SDG12, SDG13
3	Afforestation	Identify a degraded area, prepare plantation layout, and demonstrate survival-rate tracking and maintenance schedule for saplings.	PO2, PO3, PO4, PO6, PO7,PO11	SDG11, SDG13, SDG15
4	Biogasgenerationand power generation	Estimate organic waste availability, size a small biogas system, and document expected gas output or energy yield.	PO1, PO2, PO3, PO4, PO5,PO10	SDG7, SDG11, SDG12
5	DPRforsolarpower rural plant	PrepareaDPRwithloadassessment,panel sizing, cost estimate, and projected energy generation and payback.	PO1, PO2, PO3, PO4, PO5,PO10	SDG7, SDG9, SDG11
6	DPRforelectrification ofvillage/tribal community	Map unserved/underserved households, propose electrification layout, and estimate coverage,losses,andimplementationcost.	PO1, PO2, PO3, PO4, PO10,PO11	SDG7, SDG9, SDG10
7	DPRforruraldrainage system	Survey drainage bottlenecks, develop a drainage layout, and estimate runoff handlingcapacityandflood-riskreduction.	PO1, PO2, PO3, PO4, PO6,PO10	SDG6, SDG9, SDG11
8	Sustainability and environmentalhealth projects	Assess local environmental health issues and propose interventions with measurable improvement in hygiene, safety, or resource use.	PO2,PO3, PO4,PO6, PO7, PO8	SDG3, SDG6, SDG11, SDG12
9	Plastic free campaigns	Measure plastic usage before and after awareness intervention and report percentage reduction or behavioural change.	PO2, PO3, PO6, PO7, PO8,PO10	SDG11, SDG12, SDG13
10	Healthandnutrition awareness	Conduct baseline and post-program awareness survey and document improvementi n a w a r e n e s s scor eor	PO2, PO6, PO7, PO8, PO9,PO10	SDG2, SDG3, SDG11

		adoptionofhealthierpractices.		
11	Societalprojects involvinghealth wellness	Identify a community health need and develop an awareness/service module with measurable participation and feedback outcomes.	PO2, PO3, PO6, PO8, PO9,PO10	SDG3, SDG11, SDG17
12	Airqualitymonitoring system	Collect air-quality data, compare with reference limits, and present trends along with possible mitigation suggestions.	PO2, PO3, PO4, PO5, PO6,PO10	SDG3, SDG11, SDG13
13	Plasticwastereduction campaign	Track collection, segregation, and replacement actions, and quantify reduction in plastic waste generation or littering.	PO2, PO3, PO6, PO7, PO8,PO10	SDG11, SDG12, SDG13
14	Urbangreening projects	Prepare greening plan, identify planting locations, and assess environmental benefits such as shade, aesthetics, or heat mitigation.	PO2, PO3, PO4, PO6, PO7,PO11	SDG11, SDG13, SDG15
15	Smartagriculture solution	Design a low-cost monitoring or irrigation support solution and estimate improvement in water use efficiency or cropsupport.	PO1, PO2, PO3, PO4, PO5,PO10	SDG2, SDG6, SDG 9
16	Smartirrigation system	Estimatecropwaterrequirement,propose control logic, and quantify water savings compared with conventional irrigation.	PO1, PO2, PO3, PO4, PO5,PO10	SDG2, SDG6, SDG12
17	Youthmentoring programmes	Deliver a structured mentoring activity andmeasure participation, engagement, and skill/awareness improvement.	PO6, PO8, PO9,PO10, PO11	SDG4, SDG10, SDG17
18	Adulteducation	Conduct learner-needs assessment, prepare instructional content, and measure improvementinbasicliteracyornumeracy indicators.	PO6, PO8, PO9,PO10, PO11	SDG4, SDG10, SDG17
19	Foodsecurity initiatives/cold storage system	Estimate storage need, design a simple cold-chain concept, and document reduction in spoilage or wastage.	PO1, PO2, PO3, PO4, PO5,PO10	SDG2, SDG9, SDG12
20	Human rights awarenesswithlegal systems	Prepare and deliver an awareness module andassessincreaseinlegalawarenessand access-to-rights understanding.	PO6,PO7, PO8,PO9, PO10	SDG5, SDG10, SDG16
21	House tax collection throughdigitalmedia	Develop a simple digital workflow or awareness support and measure improvement in compliance, convenience, or response time.	PO2, PO3, PO4, PO5, PO10,PO11	SDG9, SDG11, SDG16
22	Use of application / applicationprogram	Build or demonstrate a useful community app and measure usability, adoption, or efficiency improvement.	PO1, PO3, PO4, PO5, PO9,PO10	SDG9, SDG11, SDG17

23	CreationofPanchayat library	Plan the library model, catalogue resources, and measure usage, accessibility, or participation outcomes.	PO6, PO8, PO9,PO10, PO11	SDG4, SDG10, SDG11, SDG17

SuggestedLearningResources:

Textbooks:

1. **Phadke,N.D**.CommunityEngagementandSocialInnovation.1sted.,OxfordUniversityPress,New Delhi.
2. **Garg,N.R**.Project-Based Learningin EngineeringEducation.1st ed.,Pearson IndiaEducation Services, Noida.
3. **Gupta,A.andP.Singh.**ServiceLearningandCommunityProjects.1sted.,McGraw-HillEducation (India), New Delhi.
4. **Wilson, G.**PracticalGuidetoCommunityDevelopmentProjects.2nd ed.,Routledge,London.

Referencebooks:

1. NPTEL courses onProject-BasedLearningandSocial Innovation.
2. SWAYAM courses oncommunity engagement andsustainability.
3. UNSustainableDevelopmentGoalsportal:https://sdgs.un.org
4. MyGovIndiaandlocalcivicbodyportalsforcommunityinitiatives.
5. YouTube resourcesondesignthinking, socialinnovation,and communityservicelearning.
6. NGOandgovernmentfield-actioncasestudiesrelatedtosanitation,water,health,education,and environment.

WeblinksandVideoLectures(e-Resources):

1. NPTELcoursesonEngineeringGeology(IITRoorkee,IIT Kharagpur).
2. NPTELcoursesonSoilMechanicsandFoundationEngineering(IITDelhi,IITBombay).
3. VirtualLabs–GeotechnicalEngineeringVirtualLab(IITKanpur):https://vlab.co.in
4. GeologicalSurveyofIndia(GSI)–Maps,reports,andpublications:https://www.gsi.gov.in
5. YouTubechannels:CivilEngineeringEssentials,TheEngineeringClassroom(soilmechanics experiments).
6. AmericanSocietyofCivilEngineers(ASCE)–Geotechnicalresourcesandstandards

TeachingLearningProcess:

ThesuggestedTLPforCommunity/SocietalProjectis asfollows;

Week/ Phase	Teaching–Learning Activity	FacultyRole	StudentActivity	Output/ Evidence
1	Courseintroduction, objectives,ethics, conduct,and assessmentbriefing	Explaincoursescope, rules, rubrics, and expecteddeliverables	Understandcourse requirementsandform teams	Teamlist,course plan
2	Communityproblem identificationand topicselection	Guidetopicframing andfeasibility	Identify local issues throughdiscussionand observation	Shortlistedproject topic
3	Stakeholder interactionand preliminarysurvey	Demonstratesurvey methodsand stakeholder engagement	Collectinitialdatafrom community/users	Survey notes, interviewrecord
4	Problemstatement andobjective	Review and refine problemstatement	Prepare problem statement,scope,and	Approvedproblem statement

	formulation		objectives	
5	Literature/casestudy review and baseline analysis	Suggestrelevant referencesand examples	Studyexistingsolutions andcompare approaches	Baselineanalysis summary
6	Projectplanningand roleassignment	Helpteamsorganize tasks, timeline, and responsibilities	Planactivities,divide roles, and prepare schedule	Workplan/Gantt chart
7	Feasibilityanalysis andsolution brainstorming	Checktechnical feasibilityand practicality	Generatepossible engineeringsolutions	Solutionalternatives sheet
8	Selection of final solutionanddesign approach	Reviewfinalconcept and design logic	Finalizeconcept, methods,andexpected outcome	Conceptnote/ designoutline
9	Data processing / calculations/sizing/ mapping	Support computationsand technicalreview	Analyzedata,perform calculations,prepare maps/charts	Technicalanalysis sheet
10	Prototype/model/ audit / DPR / app development	Monitorprogress andcorrecttechnical issues	Developtheselected output	Workingmodel/ draftDPR/map/ app
11	Testing,refinement, andimplementation planning	Evaluatetechnical correctnessand improvements	Test prototype or validateproposalwith users	Test results / revisedoutput
12	Fieldimplementation /demonstration/ awareness activity	Facilitatecommunity interactionand documentation	Conduct implementationor demonstration	Photos,attendance, implementation record
13	Documentationof outcomes,feedback, andimpact	Reviewreport structureand completeness	Compilefindings, stakeholderfeedback, andobservations	Draftreport
14	Presentation preparationandviva practice	Conductmock presentationand feedback	Prepareslides/poster andrehearse	Presentationdeck
15	Finalpresentation, submission,and reflection	Evaluate performanceusing rubrics	Presentproject,submit report, reflect on learning	Finalreport, presentation,viva

Assessmentstructure:

A.ContinuousInternalEvaluation(CIE)–50marks

- Students,inbatchesof3–4,shallundertakeatleastoneproject(oracombinationoftworelated activities) aiming, as far as possible, at a logical implemented or implementable outcome.
- CIEwill beconducted by adepartmental committee(HoD/nominee,guide and one seniorfaculty)using the following rubrics totalling 50 marks:

CIEpassrequirement:

- AstudentshallsecureaminimumOf20marksoutof50inCIEtobecomeeligibletoappearforSEE.

- StudentswhofailtoearntherequiredCIEmarksmaybegivenadditionalopportunitiesbeforeclosure of the semester; no re-doing of CIE is permitted after the end of the semester.

B.SemesterEndExamination(SEE)–100marks(scaledto50)

- Examinationduration:2hours.
- Maximumexaminationmarks:100(enteredas100intheVTUportal;theITI-SMUmodule automatically scales 100 → 50 for result processing).
- TheSEEshallbeconductedbatch-wisebyacommitteeofthreefaculty:projectguide,onefacultyfrom the same department and one from a different department.

SEEpassrequirement andoverallpassing rule:

- ForapassinSEE,astudentshallsecureminimum35marksoutof100.
- Fordeclarationofapassgrade,thesumofCIEmarks(outof50)andscaledSEEmarks(outof50)shall be ≥ 40; otherwise, the student is awarded grade F (Fail).

CIERubric —ContinuousInternal Evaluation(Total50marks):

Criterion	Weight (marks)	Excellent(Full marks)	Good	Fair	Needs Improvement
Problem identification& Relevance to society/industry/community	8	Problem is clearly identified with strongevidence ofsocietal relevance and well-defined scope.	Problem is relevant and scopeisclear withadequate supporting evidence.	Problem definedbut justification orevidence is weak.	Problemunclear ornotrelevant; little/no supporting evidence.
Formation of problemstatement; Engineering approach,innovation & feasibility	10	Problem statement is precise; approach is sound, innovativeand clearly feasible.	Problem statement adequate; approach feasible with minorgaps.	Problem statement partial; approach feasibilityis marginal.	Problem statement missing or approachnot feasible.
Interaction with stakeholders; Data collection,analysis&interpretation	8	Thorough stakeholder engagement; data collectionis comprehensive; analysis iswell-interpreted	Good engagement; data and analysis adequatewith minorgaps.	Limited engagement;data incomplete andanalysis superficial.	Little/no stakeholder contact; insufficientor nodata/analysis.
Project documentation; Clarity,organization & problem-solving demonstrated	10	Documentation is complete, well-organized, analytical, and shows strongproblem-solving	Documentation completeand clear with someanalytical content.	Documentation onbasic with omissions; problem-solvinglimited.	Documentation missing/poorly organized; no clear problem-solving.

Communication & Presentation skills	6	Presentationis confident, structured,and answersqueries fully; visuals effective.	Presentation clear and satisfactory; responds to most queries.	Presentation acceptable but lacks clarity or confidence; weak responses.	Presentation poororabsent; unable to respond.
Contribution & Benefit to society (impact, sustainability)	8	Clear, demonstrable societalbenefit and sustainability; realisticpathto implementation .	Benefit plausible; sustainability considered with minor gaps.	Limited or unclear societal benefit; sustainabilit y not welladdressed .	No evident benefit or sustainability; project not community-orie nted.

NotesforCIErubric:

- MinimumCIEpassrequirement:20/50tobeeligibleforSEE.[Usedepartmentalcommittee (HoD/guide + senior faculty) to apply the rubric and record marks.]

SEERubric—SemesterEndExamination(Entermarksoutof100;scaledto50later):

Criterion	Weight (marks)	Excellent (Fullmarks)	Good	Fair	Needs Improvement
Problem identification& Relevance to society/industry/ community	16	Problem and relevance are articulated clearly with strong evidence and context.	Problem relevanceclear with reasonable evidence.	Problem stated but evidence/ contextweak.	Problem poorly defined or irrelevant.
Formationof problem statement; Engineering approach, innovation& feasibility	20	Problemstatementis precise; approach demonstrates engineering depth, novelty and feasibility.	Approach is technically sound and feasible with minor limitations.	Approach basic; limited technical depth or feasibility concerns.	No viable engineering approachor infeasible plan.
Interactionwith stakeholders;Data collection, analysis & interpretation	16	Excellent stakeholder engagement; rigorous data collection and insightful analysis.	Good engagement andacceptable analysis.	Superficial datacollectiona nd limited analysis.	Inadequate ornodata; poor analysis.
Project documentation; Clarity,technical rigor& problem-solving demonstrated	20	Report is comprehensive, technically rigorous,and demonstrates systematic problem-solving.	Report is completeand technically correct with minorgaps.	Reportlacks technical depthorhas notable omissions.	Report missing key elementsor technically incorrect.

Communication, Presentation &Viva-voce responses	12	Candidate presents expertly, defends work persuasively and answers all queries correctly.	Good presentation and satisfactory answers to most queries.	Presentation adequatebut fails to answersome technical questions.	Poor presentation andunableto defendwork.
Contribution &Benefittosociety; Impact assessment &sustainability	16	Clear, evidence-based assessment of social impact and sustainability with scaling recommendations.	Reasonable impact discussionand sustainability considerations .	Limited evaluationof impact or sustainability .	Nocoherent assessment ofimpactor sustainability .

SEEpassrule:

- Studentmustsecureatleast35/100inSEEitselftobeeligibleforpassconsideration.
- Finalpassingisbased onCIE(outof 50)+SEE(scaledto50)>=40.Otherwise,gradeF(Fail)isawarded.

Suggestedimplementation notes(forBoS/examcommittees):

- Usenumericalscoresfromtherubricandkeepbriefevaluatorcommentsforeachcriterion.
- Forteamprojects:recordindividualcontributionwithinthedocumentationandadjustindividual marks using a peer-evaluation sheet or guide's assessment.
- Maintainevidence(fieldnotes,photos,questionnaires,DPRs,reports)asannexuresforSEE moderation.
- Usestandardizedscoresheet(spreadsheet)mappingrubricitemstocolumnsforeasyaggregationand archival.

TEXTILE FIBRE PHYSICS			
Course Code:	**1BTX401**	Scheme	2025
Type of Course	ASC/PCC	Semester	IV
Teaching Hours/Week (L:T:P)	42L:0T :0P	CIE Marks	50
Total Hours of Pedagogy per semester L /T/P/SL&TW:	42L:0T: 0P:48TW&SL	SEE Marks	50
Credits	**3**	Total Marks	100
Examination type (SEE)	Theory	Exam Hours	03

Course outcome (Course Skill Set)

At the end of the course, the student will be able to:

1. Basic concepts of fibre structure, properties and investigation of fibre structure
2. Basic concepts various mechanical, thermal, moisture, optical, electrical and frictional behavior of fibres.
3. This course work prepares students to face problems related to fibre behavior in various fields of textiles viz; Spinning, Weaving, Chemical processing and Garmenting.
4. As this subject deals with most fundamental aspects of textiles (fibres), in-depth knowledge in this subject helps in carrying out any kind of research in textile and allied fields.

Module-1

Introduction to structure of fibres. Approaches to polymer fibre structure. List of parameters for reasonable specification of fibre structure analysis of solid state structure of textile fibres using DGC, X-rays, IRS, NMR, SEM and TEM. Study of two phase and one phase model of fibre physical structure

Number of Hours:09

Module-2

Effect of moisture on various properties of fibres. Calculations of Mr and Mc of fibres. Descriptive studies on of physical structure of Cotton, Wool, Silk, PET, Nylon and Acrylic fibres.
Moisture relations: Concept of moisture equilibrium, moisture hysteresis, moisture regain, heat of absorption, swelling of textile fibres.

Number of Hours:09

Module-3

Mechanical properties: Analysis of Stress and strain behaviour, Expression of results of tensile properties, factors affecting tensile behaviour, structure and tensile property correlation, Elastic recovery and weak-link effect. Stress relaxation, creep, factors affecting stress relaxation and creep. Dynamic mechanical properties and their applications. Boltzmann super position principal.

Number of Hours:09

Module-4

Directional effects- Bending of fibres, Twisting of fibres, Shear modulus, Shear stresses and compression fibre masses. Frictional properties, Amonton's laws of friction, deviation of these laws in fibre friction. Nature of fibre friction, the friction of wool fibres

Number of Hours:09

Module-5

Introduction of Optical properties, measurement of birefringence, luster. Importance of optical properties Electrical properties: Electrical resistance, static electricity, dielectric properties and measurement of these properties. Thermal properties: Thermal conductivity, specific heat, thermal expansion and directional dependence of these thermal properties.

Number of Hours:09

Suggested Learning Resources: (Text Book/ Reference Book/ Manuals):

Text books:

1.Physical properties of Textile fibres, Morton & Hearle, J.W.S., TI, London.
2. **Manufactured fibre technology,** V.B.Gupta and Kotari V.K., Chapman & Hall,London.
3. **Mechanical properties of polymers,** Ward I.M., John wiley & sons, NY1971.

References:

1. **Mechanical properties of polymer,** Neilson L.E., VolI,II, III, Marcel Dekkar, NY, 1974.
2. **Polymer Characterization,** Cambel and White, Chapman & Hall, London1989.
3. Moisture relations in textiles, Hearle J.W.S., Textile Institute, London.

Web links and Video Lectures (e-Resources):

1. Quizzes, group discussions, seminars and report writing on various aspects of fibre physics.
2. Practical exposure to testing of structure and related properties of fibres.

Teaching-Learning Process (Innovative Delivery Methods):

The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes.

Assessment Structure:

The assessment in each course is divided equally between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage.

- To qualify and become eligible to appear for SEE, in the **CIE**, a student must score at least **40% of 50 marks**, i.e., **20 marks**.
- To pass the **SEE**, a student must score at least **35% of 50 marks**, i.e., **18 marks**.
- Notwithstanding the above, a student is considered to have **passed the course,** provided the combined total of **CIE and SEE** is at least **40 out of 100 marks**.

Continuous Comprehensive Assessments (CCA)+ Internal Assessment Test (IA) = Continuous Internal EvaluationCIE [25+25=50 marks]

A minimum of **two Internal Assessment Tests(IA)**shall be conducted, carrying a total of **25 marks**.

In addition, **Continuous Comprehensive Assessment (CCA)** shall be conducted for a total of **25 marks**.

It is recommended to include **a maximum of two learning activities** as part of the CCA to foster the **holistic development of students**. These activities shall be:

Sl. No.	Name of the Learning activity	Maximum Marks
1.	Study of different types of Polymers and their parameters	10
2.	Study of Modern Manufactring methods (currently used	15

Rubrics for Learning Activity (Based on the nature of learning activity, design the rubrics for each activity):

	Superior	**Good**	**Fair**	**Needs Improvement**	**Unacceptable**
Fibre identification & classification (CO1)	Accurate identification and detailed classification	Correct identification with minor errors	Basic identification	Limited knowledge	Unable to identify
Technical understanding (CO2/CO3)	Clear concepts with detailed explanation	Good understanding	Average understanding	Partial knowledge	Poor understanding
Report & Presentation (CO4)	Excellent report and presentation skills	Good report preparation	Satisfactory	Incomplete report	Not submitted

Suggested Learning Activities may include (but are not limited to):

- Course Project
- Case Study Presentation
- Programming Assignment
- Tool/Software Exploration
- Literature Review
- Open Book Test (preferably at RBL4 and RBL5 levels)
- GATE-based Aptitude Test
- Assignment (at RBL3, RBL4, or RBL5 levels)
- Any other relevant and innovative academic activity
- Use of MOOCs and Online Platforms

Suggested Innovative Delivery Methods may include (but are not limited to):

- Flipped Classroom
- Problem-Based Learning (PBL)
- Case-Based Teaching
- Simulation and Virtual Labs
- Partial Delivery of course by Industry expert/ industrial visits
- ICT-Enabled Teaching
- Role Play

Term Work (TW) and Self Learning (SL) components in Number of Hours per semester

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

Sl. No.	Term Work (TW) Activity	Number of Hours / Semester
1.	Collect different types of polymer products (preferably waste and classify them as thermoplastic / thermoset biodegradable/non-biodegradable products and listing of their harmful effects on environment.	12
2.	Collect various fabrics & classify them based on fibres used & list the benefits of each.	12

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

Sl. No.	Self-Learning (SL) Activity	Number of Hours / Semester
1.	Visit nearby Textile industry & prepare & present a report on the visit.	12
2.	In a group of 4 solve all the questions related to the syllabus from GATE question paper & discuss the same over the classmates.	12

Continuous Internal Evaluation (CIE)

1. The CIE marks shall be decided based on internal tests and other outcome-based activities. The continuous internal evaluation shall be carried out by the teacher handling the course.
2. Out of 50 marks earmarked for CIE, 25 marks shall be assigned for internal tests. The first test shall be conducted after completing two modules of the syllabus and the second one after completing the remaining three modules.
3. The remaining 25 marks shall be assigned for Continuous Course Assessment (CCA), conducted as per the rubrics listed in the assessment section of the respective syllabus.
4. A student shall obtain a minimum of 40% marks or 20 out of 50 marks allotted to CIE to become eligible to appear for the SEE.

Passing requirement in SEE

1. For a pass in the Semester End Examination (SEE), a student shall secure a minimum of 35 marks out of 100.
2. For the declaration of a pass grade, the sum of the Continuous Internal Evaluation (CIE) marks (out of 50) marks and the SEE marks scaled down to 50 shall be greater than or equal to 40 marks.
3. If the total (CIE + SEE) is less than 40 marks, the student shall be awarded the grade 'F' (Fail).

Spinning Technology-II			
Course Code:	1BTX402	Scheme	2025
Type of course	IPCC	Semester	4
Teaching Hours/Week (L:T:P)	42L: 0T:28P	CIE Marks	50
Total Hours of Pedagogy L:T:P:SL:TW	: 42L: 0T: 28P:50TW&SL	SEE Marks	50
Credits	**04**	Total Marks	100
Type of Examination (IPCC):	Theory- CIE +SEE, and Lab- CIE only.	Exam Hours	03

Course outcome (Course Skill Set)

At the end of the course, the student will be able to:

- To explain the students the basic spinning process in Textile Industry
- To understand the various spinning operations such as Combing, Speed frame ring frame, doubling, rotor and unconventional spinning techniques.
- Students will acquire theoretical knowledge about the machineries used.

Module-1

Objects of speed frame, study of different drafting systems and importance of apron drafting system. Principle of twisting and winding in speed frame. Study of different types of flyers, building mechanism, lift, chase length and their importance. Study of differential gearing mechanism and its importance. Different types of change point at speed frame. Modern developments in speed frame and salient features of the modern speed frame.

Number of Hours:09

Module-2

Objects of ring spinning, study of different drafting systems and type importance. Principles of twisting, factors affecting the twist Calculation, Difference between Actual and Practical TPI. Principal of winding. Types of builts Roller setting, draft and its calculation. Rings and Travellers. Different types of rings, selection of rings and manufacture of rings. Types of travellers, traveller numbering both in direct and indirect system. Manufacture of travellers.

Number of Hours:09

Module-3

Objects of ring spinning, study of different drafting systems and type importance. Principles of twisting, factors affecting the twist Calculation, Difference between Actual and Practical TPI. Principal of winding. Types of builts Roller setting, draft and its calculation. Rings and Travellers. Different types of rings, selection of rings and manufacture of rings. Types of travellers, traveller numbering both in direct and indirect system. Manufacture of travelers. Forces acting on traveller.

Number of Hours:09

Module-4

Faulty packages of Ring frame and remedial measures. Modern developments of Ring frame and salient features of the present day ring frame. Calculations of Ring frame such as production, efficiency, Traveller speed and count etc. Doubling frame – objects of doubling and conditions to get balanced double yarn. Preparation of doubling, Types of doubling systems. Study of Two for one twister. Threading through different types of wet doubling systems. Defects in doubling and remedies Study of Types of Sewing threads and their applications. Fancy yarns and their production and applications.

Number of Hours:09

Module-5

Open-end spinning – principle and objects of open-end spinning. Classification of open-end spinning. Principle and Technique of rotor spinning and detailed study of rotor spinning such as

initial drafting, transport zone, twisting and yarns formation Types of opening rollers and rotors and their effect on the performance of OE machine. Calculations of Open end spinning machines. Modern developments in OE machine. Study of, Air jet spinning.

Number of Hours:09

PRACTICAL COMPONENTS OF IPCC

FIXED SET OF EXPERIMENTS

1. Production, speed, efficiency, draft calculation of comber
2. Break draft, main draft, total draft and draft constant calculations. Spindle speed drafting rollers speed calculations of Speed frame
3. TPI and twist constant calculations. Bobbin speed calculation with the help of differential gear mechanism. Building mechanism.
4. Production, delivery speed, hank of roving and efficiency calculations of speed frame and their demonstration
5. Calculation of spindle speed, front roller speed TPI through gearing diagram and also by changing the pulleys and concerned change wheels.
6. Calculation of Twist constant through gearing and also TPI calculation for different TCP. Break Draft, Main Draft and Total draft calculation through gearing diagram
7. Calculation of Spindle Speed, TPI through gearing on doubling frame.
8. Demonstration and calculation on O.E. Spinning machine.

Suggested Learning Resources: (Text Book/ Reference Book/ Manuals):

Text books:

1 **Manual of Cotton Spinning** Coulson. A.F.W.(Ed.),Vol. I to IV Textile Institute, Manchester,1958
2 **Series on Textile processing** Zaloski.S ,The Institute of Textile Technology, USA1983
3 **Technology of short-staple spinning,** Klein.W. Vol .I, II, III and IV**,** Textile Institute Pub., Manchester**,**1989
4 **Spun Yarn Technology** Oxtoby Butterworths, London 1987
5 **Contemporary Textile Engineering** Happy. F. (Ed.), Academic Press, Inc 1981
6 **Hand Book of Cotton Spinning,** TaggartWilliam Universal Pub. Cor 1979
7 **Essential Facts of Practical cotton spinning** Pattabhiraman T.K Soumya Pub., Bombay 1979
8 **Cotton Spinning Calculation** Soumya Pub., Bombay 1979
9 **Cotton Opening & Carding** Merril. G.R. G.R. Merril, Lowell Mass 1955

Web links and Video Lectures (e-Resources):

- https://archive.nptel.ac.in/courses/116/102/116102055/#watch
- https://archive.nptel.ac.in/courses/116/102/116102038/

Teaching-Learning Process (Innovative Delivery Methods):

The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes.

1.
2.

Assessment Structure:

The assessment for each course is equally divided between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each component carrying **50% weightage** (i.e., 50 marks each).
The CIE Theory component will be **25 marks** and CIE Practical component will be **25 marks**.

The CIE Theory component consists of IA tests for 25 marks.The CIE Practical component for continuous assessments will be for 15 marks through rubrics and for lab tests will be for 10 marks.

- To qualify and become eligible to appear for SEE, in the **CIE theory component**, a student must score at least **40% of 25 marks**, i.e., **10 marks**.
- To qualify and become eligible to appear for SEE, in the **CIE Practical component**, a student must secure **a minimum of 40% of 25 marks**, i.e., **10 marks**.
- To pass the **SEE**, a student must secure **a minimum of 35% of 50 marks**, i.e., **18 marks**.
- A student is deemed to have **successfully completed the course** if the **combined total of CIE and SEE is at least 40 out of 100 marks**.

CIE Practical component:

The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report using a defined set of rubrics. Each experiment report can be evaluated for 30 marks. The summation of all the experiments marks to be scaled down to 15 marks.
The laboratory test (duration 03 hours) at the end of the last week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and scaled down to 10 marks.For laboratory test, the student is required to conduct one experiment.

Rubrics for Learning Activity (Based on the nature of learning activity, design the rubrics for each

Performance Indicator	Superior	Good	Fair	Needs Improvement	Unacceptable
Understanding of Spinning Preparatory Processes (CO1)	Demonstrates excellent understanding SPEED FRAME and drawframe processes with detailed technical explanation	Good understanding of processes with minor errors	Basic understanding of preparatory processes	Limited understanding and requires guidance	Unable to explain the processes
Machine Knowledge & Working Principle (CO1/CO3)	Clearly explains machine parts, material passage, working principles and mechanisms of speed frame and ring spinning	Explains machine operations with minor errors	Basic knowledge of machine functions	Limited knowledge about machine mechanisms	Unable to identify machine parts and functions
Process Parameter Analysis (CO2)	Accurately explains and analyses draft, speed, production and efficiency parameters	Good analysis with minor calculation errors	Basic knowledge of process parameters	Requires support for analysis and calculations	Unable to explain process parameters
Modern Developments (CO3/CO4)	Effectively explains modern machines, automation , applications with suitable examples	Good awareness of latest developments and applications	Basic awarenes s of advancements	Limited information about modern developments	No knowledge of recent developments

Rubrics for SEE / CIE Test:

Performance Indicator	Superior	Good	Fair	Needs Improvement	Unacceptable
Understanding of Experiment / Theory (CO1)	Complete understanding of principles, processes and applications	Good understanding with minor errors	Basic understanding	Limited understanding	No clarity
Execution of Experiment (CO2/CO5)	Performs experiment accurately with proper settings and observations	Performs with minor assistance	Requires guidance during experiment	Incomplete execution	Unable to perform
Calculation & Result Analysis (CO3)	Correct calculations with logical interpretation of results	Minor errors in calculations	Basic analysis of results	Incomplete analysis	Incorrect results
Viva & Technical Knowledge (CO1/CO4)	Answers confidently with detailed technical explanation	Answers most questions correctly	Answers basic questions	Limited response	Unable to answer

Note: Can add Engineering & IT tool usage based on the nature of the course

Suggested Learning Activities may include (but are not limited to):

- Course Project
- Case Study Presentation
- Programming Assignment
- Tool/Software Exploration
- Literature Review
- Open Book Test (preferably at RBL4 and RBL5 levels)
- GATE-based Aptitude Test
- Assignment (at RBL3, RBL4, or RBL5 levels)
- Any other relevant and innovative academic activity
- Use of MOOCs and Online Platforms

Suggested Innovative Delivery Methods may include (but are not limited to):

- Flipped Classroom
- Problem-Based Learning (PBL)
- Case-Based Teaching
- Simulation and Virtual Labs
- Partial Delivery of course by Industry expert/ industrial visits
- ICT-Enabled Teaching
- Role Play

Suggested rubrics for Practical continuous assessment:

Performance Indicators	Excellent	Very Good	Good	Satisfactory
Fundamental Knowledge (4) (PO1)	The student has well depth knowledge of the topics related to the course (4)	Student has good knowledge of some of the topics related to course (3)	Student is capable of narrating the answer but not capable to show in depth knowledge(2)	Student has not understood the concepts clearly (1)
Design Of Experiment (5) (PO2 & PO3)	Student is capable of discussing more than one gearing mechanism for his/her problem statement (5)	Student is capable of discussing few problem statement but not capable of selecting best(4)	Student is capable of discussing its merits and de-merits(3)	Student is capable of explaining (1-2)
Implementation (8) (PO3 &PO8)	Student is capable of implementing differential gearing mechanism and types of change point . (7-8)	Student is capable of implementing differential gearing mechanism and types of change point and should be capable of explaining it (5-6)	Student is capable of implementing differential gearing mechanism and types of change point with proper explanation.(3-4)	Student is capable of implementing differential gearing mechanism and types of change point. (1-2)
Result &Analysis (5) (PO4)	Student is able to understand various spinning and operations . (5)	Student will be able to understand spinning process and operations 4)	Student will be able to acquire theoretical knowledge about the machineries used (3)	Student will acquire only theoretical knowledge but nit able to understand the whole mechanism (1-2)
Demonstration (8) (PO9)	The lab record is well-organized, with clear sections (e.g.,gearing calculations and identification of parts . (7-8)	The lab record is organized, with clear sections, but some sections are not well defined. (5-6)	The lab record lacks clear organization or structure. Some sections are unclear or incomplete. (3-4)	The lab record is poorly organized, with missing or unclear sections. (1-2)

Note: Can add Engineering & IT tool usage based on the nature of the course

Suggested Learning Activities may include (but are not limited to):

- Course Project
- Case Study Presentation
- Programming Assignment
- Tool/Software Exploration
- Literature Review
- Open Book Test (preferably at RBL4 and RBL5 levels)
- GATE-based Aptitude Test
- Assignment (at RBL3, RBL4, or RBL5 levels)
- Any other relevant and innovative academic activity
- Use of MOOCs and Online Platforms

SuggestedInnovative Delivery Methods may include (but are not limited to):

- Flipped Classroom
- Problem-Based Learning (PBL)
- Case-Based Teaching
- Simulation and Virtual Labs
- Partial Delivery of course by Industry expert/ industrial visits
- ICT-Enabled Teaching
- Role Play

Term Work (TW) and Self Learning (SL) components in Number of hours per semester		
Term work (includes assignments, seminars, micro projects, industrial visits, any other student activities etc.)		
Sl. No.	**Term Work (TW) Activity**	**Number of Hours / Semester**
1.	Study of SPEED frame process and preparation of report	7hrs
2.	Study of ring frame machine working with process flow diagram	10hrs
3.	Study of o e machine machine working with process flow diagram	8hrs
4.		
SL: Self Learning, MOOCs, spoken tutorials, online educational resources etc.		
Sl. No.	**Self-Learning (SL) Activity**	**Number of Hours / Semester**
1.	Industrial visit to spinning related industries and preparation of report	7hrs
2.	Solve GATE questions related to spinning technology and group discussion	10hrs
3.	Online learning through MOOCs/NPTEL on spinning processes	8hrs

Continuous Internal Evaluation (CIE)

(i)Theory component

The CIE marks of 25 shall be earmarked for two tests.

The first test shall be conducted after completing two modules of the syllabus and the second one after completing the rest three modules.

Each test shall be conducted for 25 marks. The average of the two tests scaled down to 25 marks shall constitute the test marks for a maximum of 25 marks.

(ii) Laboratory component

Out of 25 marks, 15 marks shall be assigned for assessment as per the rubrics listed in the course syllabus.

The remaining 10 marks shall be based on the practical test conducted by two Internal examiners appointed by the HoD. The allotment of marks shall be as per the rubrics defined for regular class work and practical test as indicated in the Table – ICs/IPCCs 1.

(i) To qualify and become eligible to appear for the SEE of the IC/IPCC, a student shall secure at least 40 % of 25 marks, i.e., 10 marks, in the CIE theory component, and at least 40 % of 25 marks, i.e., 10 marks in the CIE Practical component.

Table – ICs/IPCCs 1Distribution of marks		
Component	**Description**	**Marks**
Allotment of marks for regular class work		
Ability in Conducting Experiments	Initiative, skill, safety practices, teamwork, and independent handling of equipment during regular lab sessions.	5 marks
Laboratory Record / Journal	Regular and neat maintenance of lab record, accuracy of results, and timely submission.	10 marks
	Subtotal	**15**
Allotment of marks for CIE practical test		
Laboratory Test / Experiment Performance	Ability to set up apparatus, follow procedure, take observations, and obtain correct results in the test experiment.	5 marks
Viva-Voce	Understanding of theory, concepts, and experimental procedure; ability to explain results and answer related questions.	5 marks
	Subtotal	**10**
	Total	**25**

Passing requirement in SEE

For a pass in the Semester End Examination (SEE), a student shall secure a minimum of 35 marks out of 100.

For the declaration of a pass grade, the sum of the Continuous Internal Evaluation (CIE) marks (out of 50) marks and the SEE marks scaled down to 50 shall be greater than or equal to 40 marks.

If the total (CIE + SEE) is less than 40 marks, the student shall be awarded the grade 'F' (Fail).

Weaving Technology-II			
Course Code	1BTX403	Scheme	2025
Type of Course	PCC	Semester	04
Teaching Hours/Week (L:T:P)	42L:28T:0P	CIE Marks	50
Total Hours of Pedagogy per semester L /T/P/SL&TW:	42L:28T:0P:50TW&SL	SEE Marks	50
Credits	**04**	Total Marks	100
Examination type (SEE)	Theory	Exam Hours	03

Course outcome (Course Skill Set)

At the end of the course, the student will be able to:

- Fundamental aspects of Secondary and auxiliary motions of weaving.
- Demonstrate weft patterning, automatic looms, fabrics defects; causes and remedies
- Principle of working of different types of dobby and jacquards.
- Interpret and explain unconventional methods of weaving.

Module-1

Take up motion - Objects - types of Take up motions Intermittent, continuous Take up motion, 5 wheel take up and 7 wheel take up motions, comparisons and dividend calculations. Continuous worm & warm wheel take up motion, anti-crack motion. Let-off motions – Types of let- off motions and negative let off : Break let off frictional rope or chain lever &wt let off motion construction & working, Positive let off : Basic requirements, advantages, Rapier, Toyoda, Ruti let Off mechanisms. Construction & working of electronic let off Motion. Different types of back rests.

Number of Hours:09

Module-2

Auxiliary Motions- Objects, Necessity & different types. Warp protector motions objects types - loose reed and fast reed. Electromagnetic warp protector - construction & working. Warp stop motions, drop wires – mechanical & electrical type. Weft stop motions - side weft fork and center weft fork motions. Construction & working comparisons. Warp easing motions loom banging off.

Number of Hours:09

Module-3

Study of temples choice & suitability: Functions different types of temples. Defects caused by temples. Multiple box motions: weft patterning, 2x1, 4x1, 4x4 motions - construction & working. Automatic Looms - Different types - Cop changing, shuttle changing looms, feelers, types of feelers, shuttle eye cutters, temple eye cutters, construction & working. Fabric defects causes & remedies. Filament weaving: Loom modification & requirements. Speed and production calculations of plain looms.

Number of Hours:09

Module-4

Jacquard functions, Types of Jacquard, principle parts of jacquard. Working principle of single lift single cylinder, double lift single cylinder Double lift double cylinder and cross border jacquard, Special jacquard m/c. Developments in mechanical Jacquard, open shed Jacquards, Jacquard harness tie-ups card cutting m/c and producers, casting out, increasing figuring capacity of Jacquard, Electronic Jacquard, programming possibilities in jacquard. Introduction to unconventional looms, disadvantages of conventional looms. Unconventional selvedges, classification of shuttle less looms, weft accumulators,

Number of Hours:09

Module-5

Weft insertion by Projectile, Weft insertion stages. Torsion bar picking, salient features of projectile looms. Classification of Rapier looms. Weft insertion stages in Dewas & Gabler system, salient features. Air quality requirements for Air Jet looms, method of weft insertion on Air jet, water Jet looms, water quality requirements, multiphase weaving; flat multiphase, circulars looms. Narrow looms, Triaxial looms. Management of loom shed, plant layout, ventilation & humidification, lighting & material handling.

Number of Hours:09

Suggested Learning Resources: (Text Book/ Reference Book/ Manuals):

Text books:

Books

1. Weaving machines, mechanisms, Management. M.K.Talukdar. Mahajan Pub. Ahmedabad.
2. Principles of weaving mechanism by Robinson &Marks
3. Weaving Mechanism, Fox
4. Weaving mechanism, BannerjeeN.N
5. Weaving tablets, Textiles Association of India, Bombay,1985.
6. Cotton weaving, Gordev. V and Volkov. P., Mir Pub., Moscow1987.
7. Automatic weaving, Aitken, Colombia press, Manchester1969.
8. An Introduction to Automatic weaving, Bennet G.A. - Bennet G.A. 1958.
Modern preparation and weaving machinery, Orme rod. A., Butterworth publication Co.1993

Reference books / Manuals:

1. .
2. .
3. .

Web links and Video Lectures (e-Resources):

Teaching-Learning Process (Innovative Delivery Methods):

The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes.

1.
2.

Assessment Structure:

The assessment in each course is divided equally between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage.

- To qualify and become eligible to appear for SEE, in the **CIE**, a student must score at least **40% of 50 marks**, i.e., **20 marks**.
- To pass the **SEE**, a student must score at least **35% of 50 marks**, i.e., **18 marks**.
- Notwithstanding the above, a student is considered to have **passed the course,** provided the combined total of **CIE and SEE** is at least **40 out of 100 marks**.

Continuous Comprehensive Assessments (CCA)+ Internal Assessment Test (IA) = Continuous Internal EvaluationCIE [25+25=50 marks]

A minimum of **two Internal Assessment Tests(IA)**shall be conducted, carrying a total of **25 marks**.

In addition, **Continuous Comprehensive Assessment (CCA)** shall be conducted for a total of **25 marks**.

It is recommended to include **a maximum of two learning activities** as part of the CCA to foster the **holistic development of students**. These activities shall be:

Sl. No.	Name of the Learning activity	Maximum Marks
4.	Study of modern weaving machines with report	10
5.	Visit to weaving industry and prepare industrial visit report	15

Performance Indicator	Superior	Good	Fair	Needs Improvement	Unacceptable
Understanding of Weaving Processes (CO1)	Demonstrates excellent understanding of take up and let off motions of different Types of looms	Good understanding with minor errors of secondary motions	Basic understan ding of secondary motions	Limited knowledge and requires guidance of secondary motions	Unable to expla types of secondary motions
Machine Knowledge & Operation (CO2/CO5)	Clearly explains construction and working of auxillary motions jet looms	Good knowledge of machinefunctio ns of auxillary motions jet looms	Basic knowledge of machine operation	Requires assistance to identify parts and functions of machines	Unable to iden machine components ar functions of machines
Process Parameter Analysis (CO3/CO4)	Accurately determines speed, production, efficiency and analyses machine parameters	Performs calculations with minor errors	Basic calculation s with limited analysis	Requires support for calculations	Unable to calculate proce parameters

Suggested Learning Activities may include (but are not limited to):

- Course Project
- Case Study Presentation
- Programming Assignment
- Tool/Software Exploration
- Literature Review
- Open Book Test (preferably at RBL4 and RBL5 levels)
- GATE-based Aptitude Test
- Assignment (at RBL3, RBL4, or RBL5 levels)
- Any other relevant and innovative academic activity
- Use of MOOCs and Online Platforms

Suggested Innovative Delivery Methods may include (but are not limited to):

- Flipped Classroom
- Problem-Based Learning (PBL)
- Case-Based Teaching
- Simulation and Virtual Labs
- Partial Delivery of course by Industry expert/ industrial visits
- ICT-Enabled Teaching
- Role Play

Term Work (TW) and Self Learning (SL) components in Number of Hours per semester

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

Sl. No.	Term Work (TW) Activity	Number of Hours / Semester
3.	Study of Secondary motions in detail	07

4.	Collection of Data of Modern weaving machines which are invented in between year 2000 to 2026	10
5.	Study of water and air jet looms	08
SL: Self Learning, MOOCs, spoken tutorials, online educational resources etc.		
Sl. No.	**Self-Learning (SL) Activity**	**Number of Hours / Semester**
3.	Visit nearby weaving industry and prepare industrial visit report	08
4.	Solve GATE questions related to weaving technology and discuss in groups	08
5.	Online learning through NPTEL/MOOCs on fabric manufacturing	09

Rubrics for CIE – Continuous assessment:

Performance Indicator	**Superior**	**Good**	**Fair**	**Needs Improvement**	**Unacceptable**
Concept Understanding (CO1)	Excellent understanding of take up and let off motions of different Types of looms	Good understanding with minor errors	Basic understanding of concepts	Partial knowledge	No clarity of concepts
Machine Operation & Experimental Skills (CO2/CO5)	Performs experiments independently with correct procedure and machine handling	Performs experiments with minor assistance	Performs experiments with guidance	Incomplete procedure	Unable to perform experiment
Calculation & Analysis (CO3)	Accurate calculation of production, efficiency, speed and weaving parameters with interpretation	Correct calculation with minor errors	Basic calculation ability	Requires guidance for calculations	Unable to calculate parameters
Laboratory Record & Documentation	Complete record with accurate results, diagrams and neat presentation	Proper record with minor mistakes	Average record maintenance	Incomplete record	Record not maintained

Rubrics for SEE / CIE Test:

Performance Indicator	Superior	Good	Fair	Needs Improvement	Unacceptable
Understanding of Experiment / Theory (CO1)	Complete understanding of principles, secondary motions	Good understanding with minor errors	Basic understanding	Limited understanding	No clarity
Execution of Experiment (CO2/CO5)	Performs experiment accurately with proper jet looms	Performs with minor assistance	Requires guidance during experiment	Incomplete execution	Unable to perform
Calculation & Result Analysis (CO3/co2)	Correct calculations	Minor errors in calculations	Basic analysis of results	Incomplete analysis	Incorrect results
Viva & Technical Knowledge (CO1/CO4)	Answers confidently with detailed technical explanation	Answers most questions correctly	Answers basic questions	Limited response	Unable to answer

Suggested rubrics for Practical continuous assessment:

Performance Indicators	Excellent	Very Good	Good	Satisfactory
Machine Knowledge & Identification (CO1) (PO1)	Student identifies all parts of weaving machines and explains their functions clearly. **(4)**	Student identifies most machine parts and explains functions with minor errors. **(3)**	Student identifies basic machine parts but lacks detailed knowledge. **(2)**	Student requires guidance to identify machine parts and functions. **(1)**
Experimental Procedure & Machine Setting (CO1/CO2) (PO2 & PO3)	Student independently performs experiments, sets machine parameters, timings. **(5)**	Student performs experiments with minor guidance and understands machine settings. **(4)**	Student follows procedure with assistance and has basic understanding of settings. **(3)**	Student requires continuous guidance to perform experiments. **(1-2)**
Operation & Handling of Machines (CO2/CO5) (PO3 & PO8)	Student efficiently loom mechanisms safely and explains working principles. **(7-8)**	Student operates machines properly with minor assistance and explains operations. **(5-6)**	Student operates machines with guidance and limited understanding. **(3-4)**	Student is unable to operate machines independently. **(1-2)**
Calculations & Result Analysis (CO3) (PO4)	Student accurately calculates speed, production, efficiency, and analyses results. **(5)**	Student performs calculations with minor errors and interprets results. **(4)**	Student performs basic calculations with limited analysis. **(3)**	Student requires support for calculations and result interpretation. **(1-2)**

Laboratory Record & Demonstration (CO5) (PO9)	Lab record is complete with observations, calculations, diagrams and effective demonstration of experiment. **(7-8)**	Record is properly maintained with good presentation and demonstration. **(5-6)**	Record contains basic information with incomplete observations. **(3-4)**	Record is incomplete/not maintained and unable to demonstrate experiment. **(1-2)**

Note: Can add Engineering & IT tool usage based on the nature of the course

Suggested Learning Activities may include (but are not limited to):

- Course Project
- Case Study Presentation
- Programming Assignment
- Tool/Software Exploration
- Literature Review
- Open Book Test (preferably at RBL4 and RBL5 levels)
- GATE-based Aptitude Test
- Assignment (at RBL3, RBL4, or RBL5 levels)
- Any other relevant and innovative academic activity
- Use of MOOCs and Online Platforms

Suggested Innovative Delivery Methods may include (but are not limited to):

- Flipped Classroom
- Problem-Based Learning (PBL)
- Case-Based Teaching
- Simulation and Virtual Labs
- Partial Delivery of course by Industry expert/ industrial visits
- ICT-Enabled Teaching
- Role Play

Continuous Internal Evaluation (CIE)

5. The CIE marks shall be decided based on internal tests and other outcome-based activities. The continuous internal evaluation shall be carried out by the teacher handling the course.
6. Out of 50 marks earmarked for CIE, 25 marks shall be assigned for internal tests. The first test shall be conducted after completing two modules of the syllabus and the second one after completing the remaining three modules.
7. The remaining 25 marks shall be assigned for Continuous Course Assessment (CCA), conducted as per the rubrics listed in the assessment section of the respective syllabus.
8. A student shall obtain a minimum of 40% marks or 20 out of 50 marks allotted to CIE to become eligible to appear for the SEE.

Passing requirement in SEE

4. For a pass in the Semester End Examination (SEE), a student shall secure a minimum of 35 marks out of 100.
5. For the declaration of a pass grade, the sum of the Continuous Internal Evaluation (CIE) marks (out of 50) marks and the SEE marks scaled down to 50 shall be greater than or equal to 40 marks.
6. If the total (CIE + SEE) is less than 40 marks, the student shall be awarded the grade 'F' (Fail).

Chemical Processing of Textiles-II			
Course Code	1BTX404	Scheme	2025
Type of Course	PCC	Semester	04
Teaching Hours/Week (L:T:P)	28: 28 : 00	CIE Marks	50
Total Hours of Pedagogy per semester L /T/P/SL&TW:	28: 28 : 00: 34	SEE Marks	50
Credits	**03**	Total Marks	100
Examination type (SEE)	Theory	Exam Hours	03

Course outcome (Course Skill Set)

At the end of the course, the student will be able to:

This subject helps the student to acquire knowledge of Textile Chemical process

- This subject prepares the student work in chemical processing industry.
- Students are exposed to research field in chemical finishing technology.
- Learn the chemistry of the various finishing and dyeing processes carried out in chemical processing department.
- Exposed to actual mechanisms involved in various dyeing and finishing operations and processes carried out in the industry.

Module-1

Introduction to natural dyes and their methods of application. Mordant dyes - Classification, properties, dyeing conditions and application. Preparatory process for garment dyeing, specialty chemicals and dyes used for garment dyeing.

Disperse dyes - Classification, properties, dyeing conditions and application. Various after treatments given to synthetic dyed goods. Concepts in cross dyeing. Method of dyeing of P/C, P/V and P/W blends.

Module-2

Different types of dyeing practices for various types of garments, precautions to be taken for effective dyeing of garments. Quality control in garment dyeing and garment dyeing machines. Working principles of dyeing machines for yarns and fabrics such as Winch, Jigger, Jet dyeing, HTHP dyeing machines etc. Modern developments in dyeing machinery. Introduction to colour measurement and computer colour matching concepts. Spectrophotometers and determination of K/S value, Yellowness, Whiteness and Brightness indices. Modern developments in garment dyeing.

Module-3

Introduction to Textile Printing. The constituents and characteristic of printing paste. Brief study of different binders, thickeners, solvents, discharging agents and other ingredients of printing paste. Styles of Printing-Chemicals and mechanisms used for the various Styles of Printing. Methods of Printing-Hand block, Roller, Development of screens, hand screen, semi -automatic screen, flatbed and rotary screen printing methods. Transfer Printing-Principle, mechanisms of transfer printing and various methods. Methods of Print Fixation-Drying, curing by dry heat, steam fixation etc. Introduction to Textile Digital Printing. Modern developments in printing of textiles

Module-4

Introduction to Textile Finishing. Need of textile finish. Classification of various finishes based on Functional, Aesthetic, Chemical, Mechanical and degree of performance. Classification of Various finishing chemicals and their properties. Calendaring-Need and its Principle, various types of calendaring machines used based on its end uses and their working principle. Sanforization-Need and its principle, working of Pre-shrinking machine Wrinkle Recovery Finish-Selection of fibres, Mechanism of Crease formation, various types of cross linking agents and its suitability, types of catalyst used, Method of application on various types fabrics.

Module-5

Water repellence finish-Principle, various types chemicals used and method of application. Water proof finishes- Principle, various types chemicals used and method of application. Fire retardant finishes- Limiting Oxygen Index and its importance. Finishing of silk-Various finishing treatment given to silk fabric, Heat setting-Need of heat setting, Heat setting of various synthetic fiber and its mechanism. De-lustring of various regenerated textiles. Soil release finish-Reasons for textile fibers attracted by soil, relation between soil release and anti-static finish, types of fabric need soil release finish and method of application. Modern developments in finishing of textiles

Suggested Learning Resources: (Text Book/ Reference Book/ Manuals):

Text books:

1. Textile Chemistry, Vol. III- The physical chemistry of dyeing-R. H. Peters Elsevier, Amsterdam, The Netherlands 1975
2. Chemical Processing of Cotton, Polyester Cotton Blends J.R.Modi and A.R. Garde TAI Publications 1960

3. Textile printing V.A.Shenai Sevak publications 1996
4. Textile printing L.W.C. Miles Society of Dyers & Colourists 1981
5. An Introduction to Textile Finishing J T Marsh Butterworths publications 1979
6. Principles of Textile Finishing A K Roy Choudhury Woodhead Publishing 2017

Web links and Video Lectures (e-Resources):

https://nptel.ac.in/courses/116102054

- https://archive.nptel.ac.in/courses/116/102/116102054/
- https://www.slideshare.net/RuchiSardana1/textile-finishes-38312735

Teaching-Learning Process (Innovative Delivery Methods):

The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes.

- Quiz/Group discussion.
- Practical demonstration of dyeing process and finishing of all five modules content.
- NCUTE NPTEL and YouTube videos.

Assessment Structure:
The assessment in each course is divided equally between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage.

- To qualify and become eligible to appear for SEE, in the **CIE**, a student must score at least **40% of 50 marks**, i.e., **20 marks**.
- To pass the **SEE**, a student must score at least **35% of 50 marks**, i.e., **18 marks**.
- Notwithstanding the above, a student is considered to have **passed the course,** provided the combined total of **CIE and SEE** is at least **40 out of 100 marks**.

Continuous Comprehensive Assessments (CCA)+ Internal Assessment Test (IA) = Continuous Internal EvaluationCIE [25+25=50 marks]

A minimum of **two Internal Assessment Tests(IA)**shall be conducted, carrying a total of **25 marks**.

In addition, **Continuous Comprehensive Assessment (CCA)** shall be conducted for a total of **25 marks**.

It is recommended to include **a maximum of two learning activities** as part of the CCA to foster the **holistic development of students**. These activities shall be:

Sl. No.	Name of the Learning activity	Maximum Marks
6.	Review literature, prepare and present report on recent trends in finishing of Textiles.	12.5
7.	Review literature, prepare and present report on recent trends in printing of Textiles.	12.5

Rubrics for Learning Activity (Based on the nature of learning activity, design the rubrics for each activity):

Performance Indicator (CO/PO Mapping)	Superior	Good	Fair	Needs Improvement
Understanding of Preparatory Processes (CO1/PO1)	Demonstrates excellent understanding of natural dyes, disperse dyes & there methods of applications , classifications , properties and dyeing conditions for garment industrial applications	Good understanding of different types dyes & methods of applications	Basic understanding of different types dyes & methods of applications	Limited understanding and requires guidance
Knowledge of Dyeing Principles & Dyes (CO2/PO1)	Clearly explains classification, properties, mechanism and application of different dyes with suitable examples	Explains major dye classes with minor errors	Basic knowledge about dyes and dyeing methods	Partial understanding o dye selection and application

Suggested Learning Activities may include (but are not limited to):

- Course Project
- Case Study Presentation
- Programming Assignment
- Tool/Software Exploration
- Literature Review
- Open Book Test (preferably at RBL4 and RBL5 levels)
- GATE-based Aptitude Test
- Assignment (at RBL3, RBL4, or RBL5 levels)
- Any other relevant and innovative academic activity
- Use of MOOCs and Online Platforms

Suggested Innovative Delivery Methods may include (but are not limited to):

- Flipped Classroom
- Problem-Based Learning (PBL)
- Case-Based Teaching
- Simulation and Virtual Labs
- Partial Delivery of course by Industry expert/ industrial visits
- ICT-Enabled Teaching
- Role Play

Term Work (TW) and Self Learning (SL) components in Number of Hours per semester

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

Sl. No.	Term Work (TW) Activity	Number of Hours / Semester
6.	Collection of different dyes and auxiliaries with their applications	09
7.	Study report on modern textile processing machines	08

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

Sl. No.	Self-Learning (SL) Activity	Number of Hours / Semester
6.	Visit to textile processing industry and preparation of industrial visit report	09
7.	Study recent developments in sustainable and eco-friendly	08

Continuous Internal Evaluation (CIE)

9. The CIE marks shall be decided based on internal tests and other outcome-based activities. The continuous internal evaluation shall be carried out by the teacher handling the course.
10. Out of 50 marks earmarked for CIE, 25 marks shall be assigned for internal tests. The first test shall be conducted after completing two modules of the syllabus and the second one after completing the remaining three modules.
11. The remaining 25 marks shall be assigned for Continuous Course Assessment (CCA), conducted as per the rubrics listed in the assessment section of the respective syllabus.
12. A student shall obtain a minimum of 40% marks or 20 out of 50 marks allotted to CIE to become eligible to appear for the SEE.

Passing requirement in SEE

7. For a pass in the Semester End Examination (SEE), a student shall secure a minimum of 35 marks out of 100.
8. For the declaration of a pass grade, the sum of the Continuous Internal Evaluation (CIE) marks (out of 50) marks and the SEE marks scaled down to 50 shall be greater than or equal to 40 marks.
9. If the total (CIE + SEE) is less than 40 marks, the student shall be awarded the grade 'F' (Fail).

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Weaving Technology Lab -II		Scheme	2025
Course Code	1BTXL405	Semester	4
Teaching Hours/Week (L:T:P)	00:00 :28	CIE Marks	50
Total Hours of PedagogyL:T:P:SLTW	: : :28:	SEE Marks	50
Credits	01	Total Marks	100
Examination type (SEE)	**Practical**	Exam Hours	03

Course outcome (Course Skill Set)

At the end of the course, the student will be able to:

1. Demonstrate the secondary motions of weaving, settings, constructions.
2. Explain the importance of various auxiliary motions, working &settings.
3. Demonstrate the different types of box motions, dobby mechanisms
4. Summarize the different jacquard mechanisms and a weft insertion stages of projectile looms rapier, jet looms
5. Produce fabrics on power loom, simple designed fabrics on dobby.

Note:

1. The laboratory syllabus consists of PART-A and PART-B. While PART-A has 6 conventional experiments, PART-B has 6 typical open-ended experiments. The maximum marks for the laboratory course are 100.
2. Both PART-A and PART-B are considered for CIE and SEE.
3. Students have answer 1(one) question from PART-A and 1(one) question from PART-B.
   a. The questions set for SEE shall be from among the experiments under PART-A. It is evaluated for **70 marks** out of the maximum 100 marks.
   b. The open-ended question set for SEE shall be any other open-ended question and not selected from the experiments under PART-A. It shall be evaluated for **30 marks.**
4. For Continuous Internal Evaluation (CIE) during the semester, classwork shall typically include open-ended questions from **Part-B**, along with other similar questions designed to enhance the students' skills.

PART – A
FIXED SET OF EXPERIMENTS

1 Dismantling, assembling, setting and timing of Take-up mechanism, calculation of dividend, PPI and pick spacing, anti-crack motion & Let-off mechanism
2 Dismantling, assembling, setting and timing of Loose-reed mechanism and Fast- reed mechanism
3 Dismantling, assembling, setting and timing of side weft fork, centre weft form motion& warp stop motion.
4 Study of different types of box motions. Preparation of weft patterns and drop box chains to control box motions.
5 Study of working of dobby& jacquard mechanism.
6 Demonstration, setting, timing of cop changing mechanism on automatic looms. Setting of feeler mechanism, shuttle eye cutter, and temple eye cutter.
7 Pattern preparation for dobby loom by using pegs and lags.
8 Study of harness and harness tie-ups. Preparation of squared paper design for 100 hooks jacquard and card punching.
9 Preparation of weft patterns and drop box chains to control box motions
10. Working on unconventional loom and Study of weft insertion mechanism on unconventional loom
11 Study of features various types of shuttle less looms, weft accumulators, and

unconventional selvedges.

9.

PART – B

OPEN ENDED EXPERIMENTS

Open-ended experiments are a type of laboratory activity where the outcome is not predetermined and students are given the freedom to explore, design, and conduct the experiment based on the problem statements as per the concepts defined by the course coordinator. It encourages creativity, critical thinking, and inquiry-based learning.

1. Concept 1
2. Concept 2
3. Concept 3
4. Concept 4
5. Concept 5
6. Concept 6

Suggested Learning Resources: (Text Book/ Reference Book/ Manuals):

Text books:

1. .
2. .
3. .

Reference books / Manuals:

4. .
5. .
6. .

Web links and Video Lectures (e-Resources):

Teaching-Learning Process (Innovative Delivery Methods):

The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes.

1.
2.

Assessment Structure:
The assessment for each course is equally divided between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each component carrying **50% weightage** (i.e., 50 marks each).

The CIE marks awarded shall be based on the continuous evaluation of the laboratory report using a defined set of rubrics. Each experiment report can be evaluated for **30 marks.**Total marks for the all report shall be scaled down to 30 marks. The laboratory test (duration 03 hours) at the end of the last week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and Marks scored shall be scaled down to **20 marks**.Final average of marks for report and test shall be out of 50 marks.

For both CIE and SEE, the student is required to conduct one experiment each from both Part A and Part B.

Rubrics for CIE – Continuous assessment:

	Superior	**Good**	**Fair**	**Needs Improvement**	**Unacceptable**
Concept Understanding (CO1)	Excellent understanding of weaving principles, secondary motions	Good understanding with minor errors	Basic understanding of concepts	Partial knowledge	No clarity of concepts
Machine Operation & Experimental Skills (CO2/CO5)	Performs experiments independently with correct procedure and machine handling	Performs experiments with minor assistance	Performs experiments with guidance	Incomplete procedure	Unable to perform experiment
Calculation & Analysis (CO3)	Accurate calculation of production, efficiency, speed and weaving parameters with interpretation	Correct calculation with minor errors	Basic calculation ability	Requires guidance for calculations	Unable to calculate parameters
Laboratory Record & Documentation	Complete record with accurate results, diagrams and neat presentation	Proper record with minor mistakes	Average record maintenance	Incomplete record	Record not maintained

Rubrics for SEE / CIE Test:

	Superior	Good	Fair	Needs Improvement	Unacceptable
Understanding of Experiment / Theory (CO1)	Complete understanding of principles, processes and applications	Good understanding with minor errors	Basic understanding	Limited understanding	No clarity
Execution of Experiment (CO2/CO5)	Performs experiment accurately with proper settings and observations	Performs with minor assistance	Requires guidance during experiment	Incomplete execution	Unable to perform
Calculation & Result Analysis (CO3)	Correct calculations with logical interpretation of results	Minor errors in calculations	Basic analysis of results	Incomplete analysis	Incorrect results
Viva & Technical Knowledge (CO1/CO4)	Answers confidently with detailed technical explanation	Answers most questions correctly	Answers basic questions	Limited response	Unable to answer

- To qualify and become eligible to appear for SEE, in the **CIE component**, a student must secure **a minimum of 40% of 50 marks**, i.e., **20 marks**.
- To pass the **SEE component**, a student must secure **a minimum of 35% of 50 marks**, i.e., **18 marks**.
- A student is deemed to have **successfully completed the course** if the **combined total of CIE and SEE is at least 40 out of 100 marks**.

Rubrics suggested for Practical continuous assessment				
Performance Indicators	**Excellent**	**Very Good**	**Good**	**Satisfactory**
Fundamental Knowledge (4) (PO1)	The student has well depth knowledge of the topics related to the course (4)	Student has good knowledge of some of the topics related to course (3)	Student is capable of narrating the answer but not capable to show in depth knowledge(2)	Student has not understood the concepts clearly (1)
Design Of Experiment (5) (PO2 & PO3)	Student is capable of discussing all machine parts there uses (5)	Student is capable of discussing few discussing all machine parts there uses (4)	Student is capable of discussing single discussing all machine parts there uses (3)	Student is capable of discussing machine parts there uses (1-2)
Implementation (8) (PO3 & PO8)	Student is capable of assemble the machine parts with accuracy. (7-8)	Student is capable of assemble the machine parts (5-6)	Student is capable of assemble the machine parts 3-4)	Student is capable of implementing the design. (1-2)
Result &Analysis (5) (PO4)	Student is able to do machine assembly and production calculations (5)	Student will be able to machine assembly and production calculations 4)	Student will be able machine assembly and production few calculations .(3)	Student will machine assembly and production calculations .(1-2)
Demonstration (8) (PO9)	The lab record is well-organized, with clear sections (e.g., Introduction, Method, Results, Conclusion and all related diagrams). Transitions between sections are smooth. (7-8)	The lab record is organized, with clear sections, but some sections are not well-defined. (5-6)	The lab record lacks clear organization or structure. Some sections are unclear or incomplete. (3-4)	The lab record is poorly organized, with missing or unclear sections. (1-2)

Note: Can add Engineering & IT tool usage based on the nature of the course

Weaving Technology Lab -II		Scheme	2025
Course Code	1BTXL405	Semester	4
Teaching Hours/Week (L:T:P)	00:00 :28	CIE Marks	50
Total Hours of PedagogyL:T:P:SLTW	: : :28:	SEE Marks	50
Credits	01	Total Marks	100
Examination type (SEE)	**Practical**	Exam Hours	03

Course outcome (Course Skill Set)

At the end of the course, the student will be able to:

1. Demonstrate the secondary motions of weaving, settings, constructions.
2. Explain the importance of various auxiliary motions, working &settings.
3. Demonstrate the different types of box motions, dobby mechanisms
4. Summarize the different jacquard mechanisms and a weft insertion stages of projectile looms rapier, jet looms
5. Produce fabrics on power loom, simple designed fabrics on dobby.

Note:

5. The laboratory syllabus consists of PART-A and PART-B. While PART-A has 6 conventional experiments, PART-B has 6 typical open-ended experiments. The maximum marks for the laboratory course are 100.
6. Both PART-A and PART-B are considered for CIE and SEE.
7. Students have answer 1(one) question from PART-A and 1(one) question from PART-B.
   c. The questions set for SEE shall be from among the experiments under PART-A. It is evaluated for **70 marks** out of the maximum 100 marks.
   d. The open-ended question set for SEE shall be any other open-ended question and not selected from the experiments under PART-A. It shall be evaluated for **30 marks.**
8. For Continuous Internal Evaluation (CIE) during the semester, classwork shall typically include open-ended questions from **Part-B**, along with other similar questions designed to enhance the students' skills.

PART – A
FIXED SET OF EXPERIMENTS

1 Dismantling, assembling, setting and timing of Take-up mechanism, calculation of dividend, PPI and pick spacing, anti-crack motion & Let-off mechanism
2 Dismantling, assembling, setting and timing of Loose-reed mechanism and Fast- reed mechanism
3 Dismantling, assembling, setting and timing of side weft fork, centre weft form motion& warp stop motion.
4 Study of different types of box motions. Preparation of weft patterns and drop box chains to control box motions.
5 Study of working of dobby& jacquard mechanism.
6 Demonstration, setting, timing of cop changing mechanism on automatic looms. Setting of feeler mechanism, shuttle eye cutter, and temple eye cutter.
7 Pattern preparation for dobby loom by using pegs and lags.
8 Study of harness and harness tie-ups. Preparation of squared paper design for 100 hooks jacquard and card punching.
9 Preparation of weft patterns and drop box chains to control box motions
10. Working on unconventional loom and Study of weft insertion mechanism on unconventional loom

11 Study of features various types of shuttle less looms, weft accumulators, and unconventional selvedges.

10.

PART – B

OPEN ENDED EXPERIMENTS

Open-ended experiments are a type of laboratory activity where the outcome is not predetermined and students are given the freedom to explore, design, and conduct the experiment based on the problem statements as per the concepts defined by the course coordinator. It encourages creativity, critical thinking, and inquiry-based learning.

7. Concept 1
8. Concept 2
9. Concept 3
10. Concept 4
11. Concept 5
12. Concept 6

Suggested Learning Resources: (Text Book/ Reference Book/ Manuals):

Text books:

4. .
5. .
6. .

Reference books / Manuals:

7. .
8. .
9. .

Web links and Video Lectures (e-Resources):

Teaching-Learning Process (Innovative Delivery Methods):

The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes.

1.
2.

Assessment Structure:
The assessment for each course is equally divided between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each component carrying **50% weightage** (i.e., 50 marks each).

The CIE marks awarded shall be based on the continuous evaluation of the laboratory report using a defined set of rubrics. Each experiment report can be evaluated for **30 marks.**Total marks for the all report shall be scaled down to 30 marks. The laboratory test (duration 03 hours) at the end of the last week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and Marks scored shall be scaled down to **20 marks**.Final average of marks for report and test shall be out of 50 marks.

For both CIE and SEE, the student is required to conduct one experiment each from both Part A and Part B.

Rubrics for CIE – Continuous assessment:

	Superior	**Good**	**Fair**	**Needs Improvement**	**Unacceptable**
Concept Understanding (CO1)	Excellent understanding of weaving principles, secondary motions	Good understanding with minor errors	Basic understanding of concepts	Partial knowledge	No clarity of concepts
Machine Operation & Experimental Skills (CO2/CO5)	Performs experiments independently with correct procedure and machine handling	Performs experiments with minor assistance	Performs experiments with guidance	Incomplete procedure	Unable to perform experiment
Calculation & Analysis (CO3)	Accurate calculation of production, efficiency, speed and weaving parameters with interpretation	Correct calculation with minor errors	Basic calculation ability	Requires guidance for calculations	Unable to calculate parameters
Laboratory Record & Documentation	Complete record with accurate results, diagrams and neat presentation	Proper record with minor mistakes	Average record maintenance	Incomplete record	Record not maintained

Rubrics for SEE / CIE Test:

	Superior	Good	Fair	Needs Improvement	Unacceptable
Understanding of Experiment / Theory (CO1)	Complete understanding of principles, processes and applications	Good understanding with minor errors	Basic understanding	Limited understanding	No clarity
Execution of Experiment (CO2/CO5)	Performs experiment accurately with proper settings and observations	Performs with minor assistance	Requires guidance during experiment	Incomplete execution	Unable to perform
Calculation & Result Analysis (CO3)	Correct calculations with logical interpretation of results	Minor errors in calculations	Basic analysis of results	Incomplete analysis	Incorrect results
Viva & Technical Knowledge (CO1/CO4)	Answers confidently with detailed technical explanation	Answers most questions correctly	Answers basic questions	Limited response	Unable to answer

- To qualify and become eligible to appear for SEE, in the **CIE component**, a student must secure **a minimum of 40% of 50 marks**, i.e., **20 marks**.
- To pass the **SEE component**, a student must secure **a minimum of 35% of 50 marks**, i.e., **18 marks**.
- A student is deemed to have **successfully completed the course** if the **combined total of CIE and SEE is at least 40 out of 100 marks**.

Rubrics suggested for Practical continuous assessment				
Performance Indicators	**Excellent**	**Very Good**	**Good**	**Satisfactory**
Fundamental Knowledge (4) (PO1)	The student has well depth knowledge of the topics related to the course (4)	Student has good knowledge of some of the topics related to course (3)	Student is capable of narrating the answer but not capable to show in depth knowledge(2)	Student has not understood the concepts clearly (1)
Design Of Experiment (5) (PO2 & PO3)	Student is capable of discussing all machine parts there uses (5)	Student is capable of discussing few discussing all machine parts there uses (4)	Student is capable of discussing single discussing all machine parts there uses (3)	Student is capable of discussing machine parts there uses (1-2)
Implementation (8) (PO3 & PO8)	Student is capable of assemble the machine parts with accuracy. (7-8)	Student is capable of assemble the machine parts (5-6)	Student is capable of assemble the machine parts 3-4)	Student is capable of implementing the design. (1-2)
Result &Analysis (5) (PO4)	Student is able to do machine assembly and production calculations (5)	Student will be able to machine assembly and production calculations 4)	Student will be able machine assembly and production few calculations .(3)	Student will machine assembly and production calculations .(1-2)
Demonstration (8) (PO9)	The lab record is well-organized, with clear sections (e.g., Introduction, Method, Results, Conclusion and all related diagrams). Transitions between sections are smooth. (7-8)	The lab record is organized, with clear sections, but some sections are not well-defined. (5-6)	The lab record lacks clear organization or structure. Some sections are unclear or incomplete. (3-4)	The lab record is poorly organized, with missing or unclear sections. (1-2)

Note: Can add Engineering & IT tool usage based on the nature of the course

Wet Processing Lab - II		Scheme	2025
Course Code	1BTXL406	Semester	4
Teaching Hours/Week (L:T:P)	00:00 :28	CIE Marks	50
Total Hours of PedagogyL:T:P:SLTW	: : :	SEE Marks	50
Credits	01	Total Marks	100
Examination type (SEE)	**Practical**	Exam Hours	03

Course outcome (Course Skill Set)

At the end of the course, the student will be able to:

1. Demonstrate the secondary motions of weaving, settings, constructions.
2. Explain the importance of various auxiliary motions, working &settings.
3. Demonstrate the different types of box motions, dobby mechanisms
4. Summarize the different jacquard mechanisms and a weft insertion stages of projectile looms rapier, jet looms
5. Produce fabrics on power loom, simple designed fabrics on dobby.

Note:

9. The laboratory syllabus consists of PART-A and PART-B. While PART-A has 6 conventional experiments, PART-B has 6 typical open-ended experiments. The maximum marks for the laboratory course are 100.
10. Both PART-A and PART-B are considered for CIE and SEE.
11. Students have answer 1(one) question from PART-A and 1(one) question from PART-B.
    e. The questions set for SEE shall be from among the experiments under PART-A. It is evaluated for **70 marks** out of the maximum 100 marks.
    f. The open-ended question set for SEE shall be any other open-ended question and not selected from the experiments under PART-A. It shall be evaluated for **30 marks.**
12. For Continuous Internal Evaluation (CIE) during the semester, classwork shall typically include open-ended questions from **Part-B**, along with other similar questions designed to enhance the students' skills.

PART – A
FIXED SET OF EXPERIMENTS

1 Dyeing of polyester using disperse dyes by carrier and HTHP method

2 Dyeing of cotton, silk and wool using important natural dyes.

3 Dyeing of garments with reactive class of dyes.

4 Preparation of colour charts by light, pigment, chromatic circle and Brewster's theory.

5 Printing practice using Hand blocks and screens with various classes of dyes.

6 Preparation of screens for screen-printing.

7 Resist style (batik) of printing on fabrics.

8 Discharge style of printing on cotton, PET and silk.

9 Anti-crease finishing of cotton using non-formaldehyde based chemicals.

10 Softening of cotton fabric using softeners

PART – B

OPEN ENDED EXPERIMENTS

Open-ended experiments are a type of laboratory activity where the outcome is not predetermined and students are given the freedom to explore, design, and conduct the experiment based on the problem statements as per the concepts defined by the course coordinator. It encourages creativity, critical thinking, and inquiry-based learning.

13. Concept 1 Evaluation of washing fastness of Printed goods.
14. Concept 2 Evaluation of rubbing fastness of Printed goods.
15. Concept 3 Evaluation of rubbing fastness of dyed goods.
16. Concept 4 Evaluation of rubbing fastness of dyed goods.

Suggested Learning Resources: (Text Book/ Reference Book/ Manuals):

Text books:

7. .
8. .
9. .

Reference books / Manuals:

10. .
11. .
12. .

Web links and Video Lectures (e-Resources):

Teaching-Learning Process (Innovative Delivery Methods):

The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes.

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For both CIE and SEE, the student is required to conduct one experiment each from both Part A and Part B.

Rubrics for CIE – Continuous assessment:

	Superior	**Good**	**Fair**	**Needs Improvement**	**Unacceptable**
Recipe Preparation & Chemical Selection (CO1/CO2)	Accurately prepares recipes, selects suitable chemicals/dyes and explains process parameters	Prepares recipes correctly with minor assistance	Prepares basic recipes with guidance	Improper selection of chemicals/dyes	**Recipe Preparation & Chemical Selection (CO1/CO2)**
Experimental Skills & Procedure (CO1/CO2)	Performs DYEING with different dyes	Performs experiments with minor assistance	Performs experiments with guidance	Incomplete procedure and observations	**Experimental Skills & Procedure (CO1/CO2)**
Observation, Result & Analysis (CO2)	Records accurate observations, evaluates shade/fastness properties and gives proper analysis	Records results and gives good interpretation	Records observations with limited analysis	Incomplete observations and analysis	**Observation, Result & Analysis (CO2)**

Rubrics for SEE / CIE Test:

	Superior	Good	Fair	Needs Improvement	Unacceptable
Understanding of Experiment Principle (CO1)	Clearly explains principle, objectives, chemicals and process mechanism of experiment	Explains principle with minor errors	Basic understanding of experiment	Limited understanding	**Understanding of Experiment Principle (CO1)**
Recipe Formulation & Execution (CO1/CO2)	Prepares accurate recipe and conducts experiment independently with proper parameters	Performs experiment correctly with minor assistance	Performs with guidance and partial accuracy	Requires continuous support	**Recipe Formulation & Execution (CO1/CO2)**
Chemical Handling & Process Control (CO1/CO2)	Handles chemicals safely and controls temperature, time, pH and process conditions accurately	Follows process conditions with minor errors	Basic handling with guidance	Improper handling and control	**Chemical Handling & Process Control (CO1/CO2)**
Result Evaluation & Technical Analysis (CO2)	Analyses dyed sample, fastness results and explains effect of parameters scientifically	Gives correct analysis with minor errors	Gives basic interpretation	Limited interpretation	**Result Evaluation & Technical Analysis (CO2)**

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Rubrics suggested for Practical continuous assessment				
Performance Indicators	**Excellent**	**Very Good**	**Good**	**Satisfactory**
Fundamental Knowledge (4) (PO1)	The student has well depth knowledge of the topics related to the course (4)	Student has good knowledge of some of the topics related to course (3)	Student is capable of narrating the answer but not capable to show in depth knowledge(2)	Student has not understood the concepts clearly (1)
Design Of Experiment (5) (PO2 & PO3)	Student is capable of discussing more than one design for his/her problem statement and capable of proving the best suitable design with proper reason (5)	Student is capable of discussing few designs for his/her problem statement but not capable of selecting best(4)	Student is capable of discussing single design with its merits and de-merits(3)	Student is capable of explaining the design (1-2)
Implementation (8) (PO3 & PO8)	Student is capable of implementing the design with best suitable algorithm considering optimal solution. (7-8)	Student is capable of implementing the design with best suitable algorithm and should be capable of explaining it (5-6)	Student is capable of implementing the design with proper explanation.(3-4)	Student is capable of implementing the design. (1-2)
Result &Analysis (5) (PO4)	Student is able to run the program on various cases and compare the result with proper analysis. (5)	Student will be able to run the program for all the cases.(4)	Student will be able to run the code for few cases and analyze the output.(3)	Student will be able to run the program but not able to analyze the output.(1-2)
Demonstration (8) (PO9)	The lab record is well-organized, with clear sections (e.g., Introduction, Method, Results, Conclusion). Transitions between sections are smooth. (7-8)	The lab record is organized, with clear sections, but some sections are not well-defined. (5-6)	The lab record lacks clear organization or structure. Some sections are unclear or incomplete. (3-4)	The lab record is poorly organized, with missing or unclear sections. (1-2)

Note: Can add Engineering & IT tool usage based on the nature of the course

Environmental Science Project			
Course Code	**1BEP408**	Scheme	20525
Type of Course	Societal Development Course (SDC)	Semester	04
Teaching Hours/Week (L:T:P)	30 (0:0:0)	CIE Marks	50
Total Hours of Pedagogy per semester L /T/P/SL&TW:	30 (0:0:0:30)	SEE Marks	50
Credits	**1**	Total Marks	100
Examination type (SEE)	Theory	Exam Hours	03

Course outcome (Course Skill Set):

At the end of the course, the student will be able to:

1. **CO1:** Identify and define a relevant environmental problem in the local or regional context (e.g., water quality, solid waste management, air pollution, campus sustainability, etc.).
2. **CO2:** Design an environmental project with clear objectives, methodology, and data collection plan (field/lab/survey based).
3. **CO3:** Collect, analyze, and interpret environmental data using appropriate techniques and tools (e.g., basic lab tests, GIS, surveys, SWOT, etc.).
4. **CO4:** Propose feasible remedial or mitigation measures and communicate findings through a technical report and presentation.
5. **CO5:** Collaborate in a team, manage time effectively, and demonstrate ethical and scientific responsibility in project execution and documentation.

Module-1

Problem Identification and Project Planning:

- Identification of local environmental issues: water quality, groundwater depletion, wastewater, solid waste, plastic and e-waste, air/noise pollution, and campus biodiversity.
- Selection of project topic and formulation of title and objectives.
- Defining project scope, expected outcomes, and deliverables.
- Brief literature review and study of relevant standards/guidelines (CPCB, AQI, SWM Rules 2016, etc.).

Number of Hours:

Module-2

Methodology and Data Collection:

- Types of projects: field-based, lab-based, and awareness/social survey projects.
- Data collection methods: sampling, questionnaires, observations, and photographic documentation.
- Safety measures, ethical considerations, and permissions for field work.
- Data recording, documentation, and logbook maintenance.

Module-3

Data Analysis and Interpretation:

- Organizing data using tables, spreadsheets, and charts.
- Basic statistical analysis and comparison with standards (BIS, CPCB, etc.).
- Mapping and visualization of pollution hotspots or green cover areas (GIS if applicable).
- Identification of issues, gaps, and strengths in existing practices.

Number of Hours:

Module-4

Mitigation Measures and Report Writing:

• Recommendations for water conservation, waste management, energy saving, renewable energy, and biodiversity enhancement.
• Preparation of technical project report with introduction, methodology, results, conclusions, and references.

Number of Hours:

Module-5

Presentation, Viva, and Ethics:

• Preparation and delivery of technical presentations.
• Viva voce and discussion of project findings.
• Academic integrity, plagiarism awareness, and ethical reporting practices.
• Peer review and constructive feedback on fellow student projects.

Number of Hours:

Suggested Learning Resources: (Text Book/ Reference Book/ Manuals):

Suggested Learning Resources:

Text Books:

1. Benny Joseph, *Environmental Studies*, Tata McGraw-Hill, 2nd Edition.
2. R. Rajagopalan, *Environmental Studies: From Crisis to Cure*, Oxford University Press, 2005.
3. Erach Bharucha, *Textbook of Environmental Studies*, University Press, latest edition as available in library.

4. M. P. Poonia and S. C. Sharma, *Environmental Studies*, Vikas Publishing House, latest edition as available

Reference Books:

1. R. Sivakumar, Principles of Environmental Science and Engineering, Cengage Learning, 2nd Edition.
2. G. Tyler Miller Jr., Environmental Science: Working with the Earth, Thomson Brooks/Cole, 11th Edition.
3. Pratibha Singh, Anoop Singh, and Piyush Malaviya, Text Book of Environmental and Ecology, Acme Learning Pvt. Ltd.,
1st Edition.
1. 4. S. M. Prakash, Environmental Studies, Elite Publishing House, Mangalore, 3rd Edition, 2018.

Web links and Video Lectures (e-Resources):

1. VTU e-Learning Centre: http://elearning.vtu.ac.in
2. VTU e-Resources / e-Content: http://elearning.vtu.ac.in/e-Res.php
3. VTU e-Shikshana Lecture Videos: http://elearning.vtu.ac.in/esk3.php
4. VTU Consortium Digital Resources: https://access.vtuconsortium.com/msec
5. VTU e-Learning Centre: http://elearning.vtu.ac.in
6. VTU e-Resources / e-Content: http://elearning.vtu.ac.in/e-Res.php
7. VTU e-Shikshana Lecture Videos: http://elearning.vtu.ac.in/esk3.php
8. VTU Consortium Digital Resources: https://access.vtuconsortium.com/msec

Teaching-Learning Process (Innovative Delivery Methods):

The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes.

1.
2.

Rubrics for CIE:

Criterion	Marks
Problem identification and topic relevance	**15**
Objectives and scope	**10**
Methodology and data collection plan	**10**
Presentation and progress review	**15**

Rubrics for SEE:

Criterion	Marks
Final report quality	**20**
Technical content and findings	**10**
Oral presentation	**10**
Viva-voce	**10**