VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

B.Tech.in Silk Technology

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

III SEMESTER

FIBRE TECHNOLOGY		Semester	III
Course Code	**BTX301**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	2:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40-45	Total Marks	100
Credits	03	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

Course objectives:

This course aims at updating the knowledge of students in the following fields of fibre technology:

1. Different types of natural fibres, their production, grading etc.
2. Fundamental aspects of manufactured fibres and production of commodity fibers like regenerated fibres, PET, Nylon, PP PAN and high performance fibres.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adopted so that the delivered lesson can progress the students in theoretical, applied and practical skills. Seminars and Quizzes may be arranged for students in respective subjects to develop skills. Encourage the students for group learning to improve thir creativity and analytical skills. Support and guide the students for self-study. Encourage students to observe working of various textile machineries to understand mechanisms Actual production ofnatural fibres can be demonstrated to students by taking them to agricultural fields. Arrange industrial visits to manufactured fibre industries.

Module-1

Introduction to textile fibres and essential requirements of textile fibres. Classification of textile fibres. **Cotton fibres** – Origin, History, Cultivation, Grading, organic and BT cotton. **Bast fibres -** Introduction,Types of bast fibres, method of extraction of bast fibres, Introduction to Banana, coir fibres. Flow chart for the conversion of fibres to yarn and fabric. Position of India with respect to world in fibre production.

Module-2

Protein fibres: - Introduction to natural protein fibres. **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. **Wool** – origin, different types of wool, grading of wool

Introduction to manufactured fibres.- Types of manufactured fibres, comparison of manufactured fibres with natural fibres. Concepts of manufactured fibres spinning, Spin ability concept of polymeric fluids. Brief out line on melt, dry and wet spinning. Comparison of these spinning methods. Process variables in melt spinning. Instabilities in melt spinning, High speed melt spinning. Introduction to post spinning operations i.e. drawing, heat setting, texturing and tow to top conversion.

Module-3

Brief outline on special shaped fibres, micro denier, ultrafine and Nano fibres. **Spin finish applications**- objectives, formulations and methods of applications. **Regenerated fibres** - types of fibres, Chemistry and production of regular Viscose rayon, Di-acetate, Tri acetate, Cuprammonium and Eco-friendly rayon fibres. Studies on modification of viscose rayon. Studies on regenerated Bamboo fibres

Module-4

PET fibres. Raw materials for production of PET. Study of production of PET by DMT & TPA routes - study of side reactions, degradation reactions during PET production. Modification of PET fibres Biodegradable polyester fibres. **Polyamide fibres**, Discussion on Production of polyamides, study of semi-continuous & integrated continuous process for Production of nylon-6, Production of nylon-66. Modification of nylon fibers. **PAN fibers** – introduction, Types, different methods of Production of PAN polymer & Spinning of PAN fibers. **Polypropylene fibres**: Brief outline on production of isotactic polypropylene fibres.

Module-5

Course outcome (Course Skill Set)

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

Course outcome (Course Skill Set)

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

1. Illustrate and recall history and growth of textile fibers, textile industry and explain productionand properties of cotton and bast fibers
2. Demonstrate production and properties of natural protein fibers and concepts of manmade fibre spinning
3. Classify regenerated bio based fibers and explain production of regenerated fibres and ecofriendly for bio based fiber and summarize different shapes of fibres.
4. Demonstrate concepts synthetic fibers, their effect on environment and explain about mostcommonly used synthetic fibres.
5. Summarize and compare production of inorganic high performance fibers, LCPs, polyethyleneand their applications in various field of engineering.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books Suggested Learning Resources:

Text Books:

1. **Hand book of Textile fibre,** Cook J. Vol.1 & II, Marrow Wat Ford, England.
2. **Textile fibres,** Shenai V.A., Sevak Bombay, 1980.
3. **Manufactured fibre technology,** Gupta V.B, Kothari V.K., Chapman Hall, London, 1997.
4. **Introduction to Textile fibres,** Srinivasa Murthy H.V, T.A.I., Mumbai
5. **Handbook of natural fibres**. Vol. - I R.M.Kozlowski Wood-Head. London- 2012.

References

1. **Manmade fibre science and Technology,** Mark Atlas, Vol.I& II, Wiley, NT 1967.
2. **Fundamentals of fibre formation,** Ziabicki A. Wiley NY 1976.
3. **Formation of synthetic fibres,** Walczalk.K. Gordon & Sci. London 1977.
4. **High speed fibre spinning,** Ziabicki A. Wiley NY., 1985.
5. **Manmade fibres,** Moncrief R.W. John Wiley and sons, N.Y. 1966
6. **High Performance fibres**, J.W.S.Hearle, Wood Head,UK-4005.
7. **Gohl E P G and Vilensky LD**, "Textile Science", CBS Publishers, Delhi, 1983.

Web links and Video Lectures (e-Resources):

1. NPTEL course on Textile fibres
2. NPTEL course on Manufactured Fibre Technology
3. NPTEL course on High Performance and Specialty Fibres

Activity Based Learning (Suggested Activities in Class)/ Practical Based

Quizzes, group discussions, seminars and report writing on various aspects of textile fibres. Practical exposure to various natural and manufactured fibres and demonstrating environmental effect of synthetic fibres.

CHEMICAL PROCESSING OF TEXTILES - I		Semester	III
Course Code	**BTX302**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory + 8-10 Lab slots	Total Marks	100
Credits	04	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

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

Teaching-Learning Process (General Instructions)

These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes.

- Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching methods may be adopted to develop the outcomes.
- Use PowerPoint/Videos/Animations to explain various concepts.
- Encourage group discussion in the classes.
- Ask some creative and higher-order thinking questions in classes which helps critical thinking.
- Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it
- Support and guide the students for self-study.

MODULE-1

Introduction to Chemical processing, preparatory operations and sequences, Chemicals and auxiliaries used and their functions. Shearing and cropping - objects and working. Singeing–objects, methods and working of various singeing machines, Desizing– objects, mechanism, and various methods of Desizing. Scouring-objects, mechanism, method of scouring of cotton and synthetic textiles. Degumming of silk, Scouring of wool and jute.

Modern developments in Desizing and scouring.

MODULE-2

Bleaching mechanism and methods of various bleaching. Optical whitening and method of application of OBA on various textiles. Quality control methods used for determination of degradation of cotton during scouring and bleaching. Machineries used for Preparatory Process, Batch, Semi-continuous and continuous processes. Objects of mercerization, physical and chemical changes in cotton due to mercerization, various factors affecting mercerization, degree or efficiency of mercerization process. Modern developments in Bleaching.

MODULE-3

Various methods and Machines used for yarn and fabric mercerization, Principle of hot mercerization, Modern developments in mercerization. Brief study on eco-friendly processes. Water and energy management in preparatory processes. Classification of dyes and principles of dyeing. Chemicals and auxiliaries used for textile dyeing and their functions. Chemical constitution of dyes. Effect of fibre structure on dyeing behaviour.

MODULE-4

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. Evaluation of fastness properties of dyed materials. Direct dyes – Classification, properties, application, and after treatments. Reactive dyes – Classification, properties, dyeing conditions, and applications.
MODULE-5
Vat dyes - Classification, properties, dyeing conditions, application. Sulphur dyes - Classification, properties, dyeing conditions, application. Azoic dyes - Classification, properties, dyeing conditions, application. Acid dyes - Classification, properties, dyeing conditions and application. Metal Complex Dyes - Classification, properties, dyeing conditions and application. Basic dyes - Classification, properties, dyeing conditions and application.

PRACTICAL COMPONENT OF IPCC

Sl.No	Experiments
1	Desizing of cotton fabric using acid and enzymes
2	Scouring and Bleaching of cotton and wool
3	Degumming of Silk and Mercerization of cotton yarn
4	Dyeing of cotton and silk using Direct and Acid dyes
5	Dyeing of cotton using reactive and vat dyes
6	Dyeing of cotton using Sulphur dyes
7	Dyeing of cotton using Azoic dyes
8	Dyeing of cotton and silk using basic dyes
9	Demonstration of Dyeing of cotton fabric using winch and jigger machine

Course outcomes (Course Skill Set):

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

- Explain the fundamental concept of chemical preparatory process, chemicals used and their functions, shearing and cropping, singeing, Desizing, Scouring and Degumming of silk
- Explain the bleaching process of various textile fibres, Basic concepts of optical whitening, Summarize the various machineries used, Mercerization of cotton, degree or efficiency of mercerization
- Explain the methods and machines used for mercerization. Test methods, water energy consumption, eco-friendly preparatory process, Classification of dyes, illustrate the use of chemicals and auxiliaries used in dyeing and their functions.
- Apply theories of dyeing and understand various parameters influencing dyeing process, Explain chemistry, properties and application of Direct and Reactive dyes on Cellulosic fibres
- Illustrate the chemistry, properties and application of Vat, Sulphur, Azoic, Basic and acid dyes on cotton and protein fibres.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CIE for the theory component of the IPCC (maximum marks 50)

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.

- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks)**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
- The laboratory test **(duration 02/03 hours)** after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks.**
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored by the student shall be proportionally scaled down to 50 Marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

Suggested Learning Resources:

Books

1. Technology of Textile Processing-Vol. III-A Shenai-Sevak Publications-1975
2. Technology of Bleaching and Dyeing of textile fibres-Chakraborthy, -Coxtown Publications-1972
3. Chemical Processing of Textiles-Preparatory, Processing and Dyeing-Dr. C.V.Koushik- Mr.Antao-Irwin Josico NCUTE, IIT, New Delhi 2003
4. Fundamentals and Practices in Colouration of Textiles J.N. Chakraborty-Wood head Publishing India Pvt. Ltd. 2009

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/116102016
- https://www.cbse.gov.in/publications/vocational/Textile%20Design/CBSE%20CIT%20Textile%20Chemical%20Processing-XII%20text.pdf
- http://www.nitttrc.edu.in/nptel/courses/video/116102052/lec1.pdf

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

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

WEAVING TECHNOLOGY -I		Semester	III
Course Code	**BTX303**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory + 8-10 Lab slots	Total Marks	100
Credits	04	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

This course aims at updating the knowledge of students in the fields of weavingpreparatory and waving technology.

- Fundamental aspects of warp and weft winding machines. Uster classimat systems and autowinding machines.
- Studies on sizing, sizing ingredients, sizing machines and various aspects of sizing and recenttrends in sizing.
- Fundamentals of weaving and basic motions of weaving.

Teaching-Learning Process (General Instructions)

These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes.

1. Apart from conventional lecture methods various types of innovative teaching techniques through videos, working models, animation films may be adopted so that the delivered lesson can progress the students in theoretical, applied and practical skills.
2. Hands on training may be arranged for students to learn practical aspects.
3. Encourage the students to learn machinery operations various settings and maintenance.
4. Support and guide the students for self-study

MODULE-1

Necessity, Objects and principles of winding. Classification and general features of winding machines, electronic yarn clearers. Clearing efficiency. Uster classimat systems. Classification of auto winding machines. Salient features ofAutoconer, Uniconer, and Schlrofhast B.C Spooler etc.

Practical component.

Passage of material through winding machines, setting of tensioners, yarn clearers, production and efficiency calculations on winding machines.

MODULE-2

Objects and systems of warping. Study of different types of creels. Study of different types of sectional warping& beam warping machines and their salient features. Special requirements of yarn preparatory for shuttle less weaving machines. Introduction to weft preparation, weft winders. Study of different types of weft winding machines.

MODULE-3

Objects of sizing. Study of Ingredients used for size preparation. Size formulation, study of mixing vessels such as pressure cookers, injection cookers, Techniques of sizing, types of Sizing. Sizing recipes for different fibre yarns. Salient features of modern sizing machines, Drying principles – multi-cylinder drying, hot air drying, radiation drying. Concept of single-end sizing.

MODULE-4

Controls in sow box - stretch and its control, moisture measurement and temperature control. Recent trends in sizing i.e. foam sizing, solvent sizing, hot melt sizing. High pressure squeezing, migrating behaviour of warp end. Post sizing operations - Drawing-in, leasing, knotting, automatic drawing in machine.
MODULE-5
Introduction to weaving and looms. Basic motions of weaving. Shedding - Different types of shed. Positive and negative tappet shedding. Merits and demerits of tappet shedding, timing, setting, early andlate shedding. Picking - Objectives of picking. Types of picking, picking accessories. Timings & setting methods to alter the timing & strength of picking mechanism. Shuttle checking devices for over & under picking mechanism. Beat-Up- Objects: Crank Beat up. Eccentricity of slay. Factors affecting the sley eccentricity. Cam beat-up mechanism. Different types of reed, reed count.

PRACTICAL COMPONENT OF IPCC

Sl.NO	Experiments
1	Passage of material through non-automatic and automatic winding machines. Study of the salient features, speed, production and efficiency calculations
2.	Working on double flanged bobbin winder. Speed, production and efficiency calculations of double flanged winding machine
3	Passage of material through non-auto pirn winding machine. Adjusting the bunch length, speed, production and efficiency calculations
4	Passage of material through automatic pirn winding machine. Adjusting the bunch length, speed, production and efficiency calculations
5	Passage of material through sectional &beam warping machine. Calculation of machine
6	Passage of material through sizing machine. Calculations related to speed, production and efficiency
7	Dismantling, assembling, setting and timing of tappet shedding mechanism.
8	Dismantling, assembling, setting and timing of cone over pick.
	Dismantling, assembling, setting and timing of Beat-up mechanism
9	Preparation of warp on sectional warping machine and related calculations
10	Plan of warp patterns for stripes and check fabrics
11	Study of different types of sizing ingredients, cooking and mixing beck
12	Knotting, drawing - in and denting of weavers beam.

Course outcomes (Course Skill Set):

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

1. Explain warp preparation, non-auto and auto winding machines and Demonstrate Winding operations.
2. Summarize warping &weft winding operation and requirements of yarn for shuttle less weaving.
3. Illustrate Sizing processes, ingredients, and post sizing operations
4. Classify and explain basic motions of weaving.
5. Determine production of winding, warping machines and power looms and dismantle and assemble of power loom parts and production of fabrics.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CIE for the theory component of the IPCC (maximum marks 50)

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks)**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
- The laboratory test **(duration 02/03 hours)** after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks.**
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored by the student shall be proportionally scaled down to 50 Marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

Suggested Learning Resources:
Books

1. **"An Introduction to Winding and Warping", Talukdar M K, Talukdar, Bombay Pvt. Circulation.**
2. **"Warp sizing mechanisms", Ramsbottom Columbia press, Manchester, 1965.**
3. **Weaving tablets, Textiles Association of India, Bombay, 1985.**
4. **Yarn preparation, Sengupta R. –Vol I & II Mahajan Pub. Ahmedabad, 1970.**
5. **Modern Preparation and weaving, Ormerod A. Butterworth publication Co. 1983**
6. **Textile Sizing by B.C.Goswamy**
7. **Principles of weaving mechanism by Robinson &Marks**

Weaving machines, mechanisms, Management.M.K.Talukdar. Mahajan Pub. Ahmedabad

Web links and Video Lectures (e-Resources):
NPTEL Courses on weaving preparatory

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

1. Demonstration of winding machines, accessories setting of winding machines.
2. Demonstration and setting of pirn winding and warping machines.
3. Collecting various sizing ingredients nearby industries and study their suitability for differentyarns.

4.Visiting nearby Textile industries to learn various aspects of weaving preparatory

SPINNING TECHNOLOGY -I		Semester	III
Course Code	**BTX304**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40-45	Total Marks	100
Credits	03	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

The objective of this Course is to describe

- The basic spinning processes in Textile Industry
- To understand the various spinning operations such as Blow Room, Carding and Drawing.
- Students acquire theoretical knowledge about the machineries used.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Use the related videos of Textile machineries so that student can understand more easily.
2. Show the students the working of these machines, by arranging to visit to spinning mills.
3. Inspire the students to have collaborative learning in the class.
4. Support and guide the students for Self-study.

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

Module-2

Objects of Blow room and identification of its components. 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.

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.

Module-4

Modern developments and salient features of modern cards. List out 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 name the types of draft in the drafting zone. Types of loading systems. Roller setting and procedure of roller setting. Auto levellers on draw frame

Module-5

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

Course outcome (Course Skill Set)

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

1 Explain the Importance of Ginning and Cotton Grading

2.Demonstrate the Working of Openers and Cleaners in Blow room

3 Demonstrate the Working of Carding Machine and its latest updates

4.Explain Working Principle of Draw Frame

5. Demonstrate the different types of draw frames and draw frame calculations.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1 **Manual of Cotton Spinning** Coulson Textile Institute,Manchester 1958

2 **Series on Textile processing** Zaloski. S Institute of Textiles Technology USA, 1983

3 **Technology of short-staple spinning** Klein. W Textile Institute Pub., Manchester**,** 1989 4 **Spun Yarn Technology** Oxatoby Butterworths, London 1987.

4 **Contemporary Textile Engineering** Happey. F Academic Press Inc 1981.

5 **Cotton Spinning Calculations** Pattabhiraman. T.K Soumya Pub., Bombay 1979

6 **Cotton Opening & Carding** Merril G.R G.R. Merill, Lowell Mass 1955

7 **Blowroom and carding** --- NCUTE 2000

Web links and Video Lectures (e-Resources):

NPTEL courses on spinning technology.
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning **Students can be taken to spinning industry to learn the actual process of spinning.** **Case studies can be done to understand the quality of lap, sliver etc.**

SPINNING TECHNOLOGY LAB-I		Semester	III
Course Code	BTXL305	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	50
Credits	01	Exam Hours	03
Examination nature (SEE)	Practical		

Course objective:

- To understand the various spinning operations such as Blow Room, Carding and Drawing. Students acquire theoretical knowledge about the machineries used.

Sl.NO	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 and beats/inch
4	Calculation of Shell roller speeds at normal & doffing time. Calculation of Tension draft at Scutcher
5	Speed and draft calculation of different parts of carding with the help of gearing and driving
6	Draft constant and its calculation of card. Draft change pinion calculation and machine operation to get different hank of slivers.
7	Break draft, main draft and total draft calculation Drawframe.
8	Production, delivery speed, calculation of hank of sliver, efficiency calculation of draw frame
	Demonstration Experiments (For CIE)
1	Driving arrangements and demonstration of all machineries of Blow room
2	Settings of different parts and gauges used setup the machines
3	Passage of material through draw frame and list the parts and their functions.
4	Setting of drafting zone and processing of material as per the hank required in Draw frame.

Course outcomes (Course Skill Set):

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

1. Explain the Passage of Material and Working of Various Machines in Blow Room Line

2.Determine the Speeds of Various parts of Blow Room Machineries

3. Demonstrate settings and Quality Studies in Blow room and explain the Working of Carding Machine, draw frame and their settings

4. Determine the speeds and draft in of carding and draw frame

5.Produce sliver from draw frame and carding machines and determine production , sliver linear density of card and draw frame

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are**50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.

The minimum duration of SEE is 02 hours

Suggested Learning Resources: Spinning manuals, charts and hand-outs on spinning, visit to spinning industry.

SERICULTURE AND SILK TECHNOLOGY		Semester	III
Course Code	**BST306A**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40-45	Total Marks	100
Credits	03	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

- Status of sericulture and growth of silk industry in India & abroad.
- Principles of Rearing silk worms, environmental condition of rearing, grainages.
- Physical and commercial characteristic of cocoon reeling machine and technology advancements.
- Silk by products, wet processing and recent developments in wet processing.

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teacher can use to accelerate the attainment of the various course outcomes.

1. Apart from conventional lecture methods various types of innovative teaching techniques through videos, animation films may be adopted so that the delivered lesson can progress the students in theoretical, applied and practical skills.
2. Seminars and Quizzes may be arranged for students in respective subjects to develop skills.
3. Encourage the students for group learning to improve their creativity and analytical skills.
4. Support and guide the students for self-study.
5. Actual production of mulberry plants can be demonstrated to students by taking them to agricultural fields.
6. Arrange Sericulture fields to visit mori-culture and sericulture cottage industries.
7. Encourage students to observe growth of mulberry plants to understand moriculture and sericulture.
8. Students can be taken to research laboratories to demonstrate about modern tools and techniques used for the production of silk.

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 and Environmental conditions for silkworm rearing, various methods. Chawki rearing, Late age silkworm rearing, recent developments in rearing. Seed production & grainage activities. Silkworm diseases, pests & their control.

Module-2

Introduction to Mulberry and Non-mulberry (wild) silks and their applications. Different types of cocoons, Physical and commercial characteristics, sorting and testing of cocoons. Stifling of cocoons & Cocoon storage: objectives. Cocoon cooking: process and various methods: open pan, three pan, Conveyor cooking etc. Merits & Demerits of silk reeling, systems of reeling, charka, cottage basin, multi-end filature, automatic reeling machine, re-reeling process, recent developments in silk reeling.

Module-3

Silk throwing: Objectives. Winding, Doubling, Rewinding and Twisting, Manufacture of silk yarns for ordinary, Soft, Chiffon, Crape, Georgette and Voile silk fabrics. Recent developments in silk throwing machines. Silk weaving preparatory for warp & weft yarns. Silk handloom & power looms special features, modifications required to weave silk fabrics.

Module-4

Introduction to spun silk industry, Different source of silk waste, Sequence of operations in spun silk production. Italian & Japanese silk spinning systems. End uses of spun silk yarns. Noil yarns. Seri plane testing of silk yarns. Testing & Grading of silk yarns.

Module-5

Dyeing of silk yarns & fabrics. Advantages and disadvantages of loom finished silk fabrics in India. Printing & finishing of silk fabrics. Recent developments in wet processing of silk fabrics, silk by-products: properties and application. Silk Sericin: extraction, characterization and applications.

Course outcome (Course Skill Set)

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

- Explain status of Sericulture & Silk industry in India and World and Classify and explain the mulberry cultivation and silkworm rearing
- Explain the physical and commercial characteristics of silk and stifling, cooking an dressing of silk
- Demonstrate the silk throwing and manufacture of silk fabrics.
- Explain the spun silk production and Test, and grade the silk and illustrate chemical processing of silk.
- Explain dyeing of silk fabrics and silk by-products, their applications

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Hand Book of Practical Sericulture, S R Ullal and M N Narasimhanna, Central Silk Board, India, 1987

2. Manuals on Sericulture, Vol – I, &II, Various Authors, FAO Publication, 1976
3. Handbook of Sericulture Technologies, S.B. Dandin, Central Silk Board, 2003
4. Mulberry Silk Reeling Technology, D. Mahadevappa, V G Halliyal, D G, Shankar, Ravindra, Bhandiwad, Oxford and IBH Publishing Company Pvt. Ltd, 2000
5. Handbook of Silk Technology, T N Sonwalkar, Taylor and Francis, 1993
6. Silk Wet Processing, Dr. M. L.Gulrajani, IIT Publication
7. Silk Weaving Compiled by Zhejiang Silk Engineering Institute, Science Pub Inc. 2002

Web links and Video Lectures (e-Resources):

- Central Silk Board: https://csb.gov.in/publications/
- Karnataka State Sericulture Research and Development Institute: https://kssrdi.karnataka.gov.in/english
- Food and Agriculture Organization of the United Nations (FAO): https://agris.fao.org/agris-search/search.do?recordID=XF7601187

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Collection of various silk properties from literature and studying their properties
- Collecting various silk cocoons, filaments and fabrics from silk industries/R&D centres and studying their appearance, feel etc.
- Seminars, quizzes, group discussions, seminars and report writing on various silk cultivation & productions.
- Finding out various parameters of cocoons and silk filaments in textile testing laboratory / textile committee

SUSTAINABLE TEXTILE TECHNOLOGIES		Semester	III
Course Code	**BTX306B**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40-45	Total Marks	100
Credits	03	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

This course aims at updating the knowledge of students in the following fields sustainable textiles

1. Sustainability and its significance in the pretext of textile industries.
2. Energy efficient processes Waste reduction techniques**,**
3. Modified technologies for chemical processes
4. Recycling of textiles and its waste

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adopted so that the delivered lesson can progress the students in theoretical, applied and practical skills. Seminars and Quizzes may be arranged for students in respective subjects to develop skills. Encourage the students for group learning to improve the creativity and analytical skills. Support and guide the students for self-study. Encourage students to observe sustainable technologies. Make students to create awareness about sustainable technologies among publics.

Module-1

Introduction: Present scenario in various sectors of textile industries and its consequences on growth of industry. Sustainability and its significance in the pretext of textile industries Approaches to different forms of sustainable procedures, logistics systems, value chains and Greentechnology in textiles.

Module-2

Modified technologies for chemical processes: Modified technologies of colouration, Processing with low liquor ratio, Mass coloration of textiles, Continuous application techniques, Dyeing of blends, Bioprocessing of textiles, Controlled application techniques, Combination of various processes like, desizing - scouring, scouring – bleaching etc. Dyeing at room temperature, viz. vat, reactive and direct dyeing of cotton.

Module-3

Energy efficient processes: Various techniques to reduce wastage of energy. Ascertaining boiler capacity with production volume, Precautions to reduce wastage of steam and electricalenergy.

Module-4

Waste reduction techniques: Need for solid and hazardous waste management in textile industry, types and sources of solid and hazardous waste management in textile industry. Wastewater management, Norms of using water in processing and discharge to public sewage. Various technical approaches to reduce waste water load. Analysis of effluent, Zero Dischargeof Hazardous Chemicals (ZDHC).

Module-5

Recycling of textiles and its waste: Life cycle of textile products, Recycling of polymer and fibre waste, Recycling of waste fibres and fabrics for nonwoven fabric production.

Course outcome (Course Skill Set)

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

1. Recognize the importance of sustainable technologies in textiles
2. Summarize modified technologies for chemical processes with respect to sustainability and compare conventional chemical process with modified processes
3. Interpret energy efficient process in textile processes
4. Classify and explain waste reduction techniques in textile industry.
5. Recognize the need for recycling and illustrate recycling of textiles and its waste

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Books:

1. Youjiang Wang, "Recycling in Textiles", Woodhead Publishing Limited, Cambridge 2006.

2. Sabit Adanur, "Wellington Sears Handbook of Industrial Textiles", Technomic Publications Co. Inc., Lancaster, 2006.

3. Miraftab M and Horrocks R, "Eco-Textiles", Woodhead Publishing Limited, Cambridge 2007.

4. Schindler W D and Houser P J, Chemical finishing of textiles, Woodhead Publishing Co, Chembridge, 2004

5. Smethwurst G, " Basic water treatment", IBT Publications, Delhi, 1989

6. Cavaco-Paulo A and Gubitz G M, Textile processing with enzymes, Woodhead Publishing, Cambridge, UK. 2003,

7. Nierstrasz V A and Cavaco-Paulo, Advances in textile Bio-technology, Woodhead Publishing, Cambridge, 2010

8. Gardetti, M.A., Torres, A.L. Sustainability in fashion and textiles: Values, Design, Production and Consumption, Greenleaf Publishing (latest edition). Pal, R.Managing fashion apparel value chains (latest edition).
Web links and Video Lectures (e-Resources):
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Activity Based Learning (Suggested Activities in Class)/ Practical Based learning Quizzes, group discussions, seminars and report writing on various aspects of sustainable technologies in textiles. Case studies on benefits of sustainable technologies in textiles.

FIBRE REINFORCED COMPOSITES		Semester	III
Course Code	**BTX306C**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40-45	Total Marks	100
Credits	03	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

This course aims at updating the knowledge of students in the following fields textile technology

1. Raw materials for composites
2. Production of composites
3. Properties and applications of composites

Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective

1. Apart from conventional lecture methods various types of innovative teaching techniques through videos, animation films may be adopted so that the delivered lesson can progress the students in theoretical, applied and practical skills.
2. Seminars and Quizzes may be arranged for students in respective subjects to develop skills.
3. Encourage the students for group learning to improve their creativity and analytical skills.
4. Support and guide the students for self-study.
5. Encourage students to observe working of various moulding machines

Arrange industrial visits to composite manufacturing sectors

Module-1

Introduction to composites. Basic nomenclatures – reinforcing phase, continuous phase, matrix, interface etc. Classification of composites with respect to fibre used, matrix used, limitations of engineering metals.

Meaning of bio composites, advantages of bio composites. Different forms of fibres for composites, 3D fabrics for composites

Module-2

Study of mechanical & thermal properties various fibres Viz. Carbon, glass, silicon carbide, boron, Kevlar, polyethylene, thiozole etc. used in the production of fibre reinforced composites.

Matrix materials for composites Classification of resins, thermoset, thermoplastic metal matrix and their production properties, advantages, disadvantages (phenolic, epoxy, polyester, vinyl esters) Meaning of bio composites, advantages of bio composites.

Module-3

Composites manufacturing techniques-Introduction-Meaning of interphase, types of bond set interphase, meaning of lamina, laminates, and representation of laminates. Pre-peg technology, Hand lay-up-spray-up -filament winding.

Compression moulding, injection moulding, poltrusion techniques. Brief outline of mechanical and thermal properties of various composites viz. Glass, boron, carbon, aramid.

Study of various applications of composites mainly in the field like Aero plane, aerospace, medical, sports, ship building automobiles and industries

Module-4

Brief outline on testing of composites - Characterization of physical constituents of composites - composite density, fibre volume fraction, void content.

Testing of tensile strength of composites, 3 & 4 point bending of composites, comparison testing of composites. NDT tests of composites.

Composite mechanics-failure mechanism in composites. Derivations of various equations related to composite structures viz. Axial modulus, transverse modulus, breaking strength of continuous

filament reinforced composites, effect of volume of fibres on mechanical properties of fibre reinforced composites.
Fatigue and creep process in fibre reinforced composites

Module-5

Applications of composites: Study of various applications of composites mainly in the field like Aero plane, aerospace, medical, sports, ship building, automobiles and industries. Brief introduction to use of Nano-fibres in composite production and their applications.

Course outcome (Course Skill Set)

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

1. Describe basic concepts of fibre /textile reinforced composite materials and the raw materials for composites and
2. Explain the properties of fibres and resins used for composite production
3. Demonstrate methods of manufacturing of composites and list the properties of composites n
4. Test and analyse the composites for physical and mechanical properties
5. Explain the applications of composites

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. **Fibre Reinforced Material Technology-**N.J.Parratt Van Nostrand Reinhold Co, Inc 1972
2. **High Performance Fibre Composites-** J.H.Morely, Academic Press
3. **Composite materials**:- Krishan K. Chawla, Springer 2005
4. **High Performance Fibres:-** J.W.S. Hearle, Woodhead UK 2005

5. **Composites Engineering Hand Book** - Ed. Mallik P.K., Marcell Dekker, N.Y., 1997
Web links and Video Lectures (e-Resources):
NPTEL Courses on textile fibres, NPTEL Course on Technical textiles, NPTEL Course on composite technology, composite processing.
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning • Students can be taken to fibre and composite manufacturing industry and can be made to do case study on composite materials using ready available data • Hands on training on composite production by hand lay-up techniques can be practiced

CHARACTERIZATION OF FIBRES AND POLYMERS		Semester	III
Course Code	**BTX306D**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40-45	Total Marks	100
Credits	03	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives: This course aims at updating the knowledge of students in characterizing structural parameters and thermal characteristics of fibres and polymers.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adopted so that the delivered lesson can progress the students in theoretical, applied and practical skills. Seminars and Quizzes may be arranged for students in respective subjects to develop skills. Encourage the students for group learning to improve the creativity and analytical skills. Support and guide the students for self-study.

Module-1

Introduction to fibres and polymers. Requirements of fibre forming polymers, Requirements of a good textile fibre. Need for characterization of fibres and polymers.

Analysis of polymers for molecular weight: concept of molecular weight in polymers, importance of molecular weight of polymers. Effect of molecular weight on processing and properties of polymers and fibres, concept of molecular weight averages.

Module-2

Determination of molecular weight of polymers and fibres: End group analysis and its limitations, principal of osmometry and working of osmometry for determination of Mn, different types of viscosity and their importance in conversion of fibres to polymers, determination of intrinsic viscosity and Mn of polymers using viscometry.Detremination of Mw and Mn by GPC techniques detailed working of GPC. Light scattering techniques for determination of molecular weight.

Module-3

Historical details of X- Rays, brief outline on principle of working of WAXS and SAXS,detrmination of cristallinity, crystal size, crystal density fc, fa, using WAXS.Principal of working of DGC, determination of density crystallinIty using DGC and comparison of DGC and WAXS.

Module-4

IR spectroscopy; quantitative and qualitative Characterization of structure of polymers and fibres using IR spectroscopy, principal of working of FTIR. Detailed studies on electron microscopy (SEM and TEM) Methods of preparation of fibre and polymer samples for SEM and TEM,. Applications of UV and NMR spectroscopy in characterizing fibre and polymer structure.

Module-5

Thermal analysis of polymers : Importance of thermal characterization of polymers**,** Tg, Tm of polymers, Factors affecting Tg and Tm. Characterization of polymers and fibres using DSC,DTA,TGA,TMA,DMTA and Dilatometer.

Determination of sonic modulus of fibres,

Non-destructive methods of characterization of fibre reinforced polymeric composites.

Course outcome (Course Skill Set)

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

1.Identify the need for characterization of polymers and explain the concept of molecular weight in polymers

2.Analyse polymers and fibre and polymers for molecular weight

3. Characterize polymers and fibres using WAXS, SAXS and DGC

4. Explain the working of IRS, TEM, SEM, UVS and NMR.

5. Summarize the working of thermal characterizing instruments i.e. Dilatometer, DTA, DSC, TMA, TGA, DMTA.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. "Polymers; Polymer characterization and analysis", ED., J I Kroschwitz, John Wiley andSons, 1990.
2. "Thermal characterization of polymeric materials", Ed., E A Turi, Vol I and II, AcademicPress, 1997.
3. "Text book of polymer science", Billmeyer F W, John Wiley and Sons, 1984.
4. **Manufactured fibre technology,** Gupta V.B, Kothari V.K., Chapman Hall, London, 1997

Web links and Video Lectures (e-Resources):

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

Quizzes, group discussions, seminars and report writing on various aspects of textile fibres.
Students can be taken to research centers of polymers and fibres/textiles to learn about various characterization techniques.

INTRODUCTION TO POLYMERS		Semester	III
Course Code	**BTX358A**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	1:0:0:0	SEE Marks	50
Total Hours of Pedagogy	15	Total Marks	100
Credits	01	Exam Hours	02
Examination type (SEE)	Theory(MCQ TYPE)		

Course objectives: Course objectives:

- As the basic building block of all textile products is polymers, acquiring knowledge in this subject is necessary for all undergraduate Textile Technology students.
- This subject deals with basics of polymer science & Technology, general aspects of polymer production and applications

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. These are sample Strategies, which teacher can use to accelerate the attainment of the various courseoutcomes.
2. Quizzes, group discussions ,seminars and report writing on various mathematical concepts oftextiles
3. Effect of polymers on environment can be discussed.

Module-1

Introduction and definition of monomers and polymers. History and Classification of polymers. Characteristics of fibre forming polymers and their general applications

Module-2

Study of synthesis of polymers by chain, step and co-ordination polymerization. Techniques of polymerization, comparison of various Techniques. Study of various types of initiators for addition polymerization

Module-3

Comparison of different types of polymerization methods and techniques. Co-polymerization - Concept of co-polymerization.

Module-4

Kinetics of polymerization - estimation of kinetic chain length, illustration of effect of various parameters on kinetics of polymerization. Functionality in polymers. Carothers equation and extentof polymerization.

Module-5

Concept of molecular weight and molecular weight distribution and determination of molecular weight.

Course outcome (Course Skill Set)

1. At the end of the course the student will be able to: Define the basic concepts in polymers with special reference to textile polymers and classifydifferent types of polymers.
2. Explain about synthesis of polymers and polymerization methods and techniques
3. Interpret and compare polymerisation techniques and methods, copolymerization
4. Illustrate kinetics of polymerization
5. Analyse of polymers for molecular weight

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous internal Examination (CIE)

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of the 01 marks. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is **01 hour.** The student has to secure a minimum of 35% of the maximum marks meant for SEE.

OR

MCQ (Multiple Choice Questions) are preferred for 01 credit courses, however, if course content demands the general question paper pattern that followed for 03 credit course, then

- The question paper will have ten questions. Each question is set for 10 marks.
- There will be 2 questions from each module. Each of the two questions under a module may or may not have the sub-questions (with maximum sub-questions of 02, with marks distributions 5+5, 4+6, 3+7).
- The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources:

Books

1. **Text book of polymer Science**, Billmeyer.W., Wiley Int.Sc. New York 1984.
2. **Polymer Science,** Gowarikar V.R., Vishwanathan N.V., Jayadev Sridhara, Wiley Eastern Ltd., New Delhi, 1995.
3. **Principles of polymerization,** Odian G., John Wiley & sons, NY, 1976
4. **Manufactured fibre technology,** Gupta V.B, Kothari V.K., Chapman Hall, London, 1997

Web links and Video Lectures (e-Resources):

Quizzes, group discussions ,seminars and report writing on various aspects of polymers
Practical exposure to production of polymers and discussion on harmful effects of synthetic polymers

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

Quizzes, group discussions ,seminars and report writing on various aspects of polymers
Practical exposure to production of polymers and discussion on harmful effects of synthetic polymers

IDENTIFICATION OF FIBRES - LAB		Semester	III
Course Code	**BTXL358B**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	50
Credits	01	Exam Hours	01
Examination nature (SEE)	Practical		

Course objectives:

- This subject helps the student to acquire knowledge of various fiber identification by different techniques
- This subject helps to students identify the blend and its percentage of fibers in textile manufacturing industry.
- Students are exposed to research field in different fibers and their applications in various industries.

Sl.No.	Experiments
1	Identification of Natural fibers by physical, microscopically and burning tests
2	Identification of Natural fibers by chemical tests
3	Identification of protein fibers by physical, microscopically and burning tests
4	Identification of protein fibers by chemical tests
5	Identification of regenerated fibers by physical, microscopically and burning tests
6	Identification of regenerated fibers by chemical tests
7	Identification of synthetic fibers by physical, microscopically and burning tests
8	Identification of synthetic fibers by chemical tests
9	Analysis of blend ratio of cotton and polyester fibres by chemical method
	Demonstration Experiments (For CIE)
1	Analysis of binary and tertiary blend ratio of different fibres by chemical methods

Course outcomes (Course Skill Set):

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

1. Identifying of Natural textile fibers by standardt methods
2. Summarize the Identification of various Protein textile fibers .
3. Explain the Identification of various Regenerated textile fibers .
4. Explain the concept of Identification of various synthetic textile fibers .
5. Illustrate the various blend analysis of textile fibers .

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.

The minimum duration of SEE is 02 hours

Suggested Learning Resources:

Books

12.06.2023

1. Textile fibers by BITRA
2. Textile Fibers by by James Gordon Cook
3. Identification of Textile Fiber by Max M Houck

ENGINEERING WITH MICROSOFT OFFICE-LAB		Semester	III
Course Code	**BTXL358C**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	50
Credits	01	Exam Hours	01
Examination nature (SEE)	Practical		

Course objectives:

This course offers the students an insight into:

CLO 1 Understand the basics of computers and prepare documents and small presentations.

CLO 2. Attain the knowledge about spreadsheet/worksheet with various options.

CLO 3. Create simple presentations using templates various options available.

CLO 4. Demonstrate the ability to apply application software in an office environment.

CLO 5. Use MS Office to create projects, applications.

Sl.NO	Experiments
1	MS-Word -Working with Files, Insert and formatting text and paragraphs, Moving, copying and pasting text
2	Modifying a document- Bulleted and numbered lists, Nested lists
3	Controlling page appearance- Page formatting - Header and footers, page numbers, Mail Merge, Macros – Creating & Saving web pages, Hyperlinks.
4	Printing documents- selection paper, margins, print preview
5	Tables, formatting tables -Table Manipulations
6	Inserting graphic objects - Adding clip Art, add an image from a file, editing graphics
7	Use paint brush and Adobe Photoshop for development of textile designs
8	Excel Basics: Spread sheet concepts and exploring the Microsoft Office Excel environment. Create, open and view a workbook.
9	Save and print workbooks. Enter and edit data. Modify a worksheet and workbook.
10	Work with cell references. Learn to use functions and formulas. Create and edit charts and graphics. Filter and sort table data.
11	Work with pivot tables and charts. Import and export data. Using Excel Help
12	MS-Power Point -Create a Presentation from a template- Working with Slides – Insert a new slide
13	applying a design template, changing slide layouts – Resizing a text box, Text box properties, delete a text box
14	Video and Audio effects, Color Schemes & Backgrounds Adding clip art, adding an image from a file
15	MS-Access - Using Access database wizard, pages and projects. Creating Tables – Create a Table in design view.
16	Datasheet Records – Adding, Editing, deleting records, Adding and deleting columns Resizing rows and columns, finding data in a table & replacing, Print a datasheet. Queries - MS-Access.
17	Microsoft Outlook- Introduction, Starting Microsoft Outlook, Outlook Today, Different Views In Outlook, Outlook Data Files
	Demonstration Experiments (For CIE)
1	Use of textile design software for creating woven designs and fabric production
2	Use of textile design software for creating printing designs

3	Use of computer graphics for garment designing and manufacturing

Course outcomes (Course Skill Set):

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

1. Know the basics of computers and prepare documents, make small presentations with audio, video and graphs
2. Create spreadsheets, navigating the Excel user interface, entering, manipulating and formatting data
3. Demonstrate the creation of formulas and functions to perform calculations on data. Create charts and tables that effectively summarize raw data.
4. Create a Presentation from a template- Working with Slides, applying a design template, changing slide layouts. Demonstrate the ability to apply application software in an office environment.
5. Use Access database wizard, pages and projects. Use Google Suite for office data management tasks. Use of graphic software to develop woven designs and printing designs.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR**
- based on the course requirement evaluation rubrics shall be decided jointly by examiners.

- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.

The minimum duration of SEE is 02 hours

Suggested Learning Resources:

Excel for Scientists and Engineers: Numerical Methods, E. Joseph Billo, Wiley Online Library, November 2006, ISBN:9780471387343 2. Excel for Engineers and Scientists, S. C. Bloch, Wiley, 2000, ISBN, 0471321699, 9780471321699.

MEDICAL TEXTILES		Semester	III
Course Code	**BTX358D**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	1:0:0:0	SEE Marks	50
Total Hours of Pedagogy	15	Total Marks	100
Credits	01	Exam Hours	02
Examination type (SEE)	Theory (**general question paper pattern)**		

Course objectives:

- To provide the introductory knowledge about textile materials and medical textiles.

To impart the knowledge of various properties of Medical Textiles as per different domains of health care.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Acquire the knowledge of biocompatibility and related characterization methods of Medical textiles.
2. 2.Use PowerPoint/Videos/Animations to explain various concept

Module-1

BIOPOLYMERS: Classification of biopolymers used in medicine – Natural biopolymers - properties and applications. Synthetic biopolymers - raw material, synthesis, properties, storage stability and sterilization of biopolymers. Evaluation of biopolymers - In vitro tests- direct contact, agar diffusion, elution methods, In vivo assessment of biopolymers to tissue compatibility.

Module-2

Healthcare and Hygiene Products:

Classification of medical textiles, Functional requirements, materials used, design procedure. Antimicrobial finishing of medical textiles: Need for antimicrobial finishing, antimicrobial agents and their working mechanism, Antimicrobial test methods. Surgical Gowns, masks, wipes, Antibacterial Textiles, Super absorbent polymers.

Module-3

Implantable Textiles

Implantable textiles: hernia mesh – vascular prostheses – stents. Vascular textiles, Knitted cardiac biological valves, hollow fibres as dialysis membrane, Tissue engineering: properties and materials of scaffolds- relationship between textile architecture and cell behaviour – applications of textile scaffolds in tissue engineering.

Module-4

Extra-corporeal materials: Cartilage nerves – liver ligaments, kidney, tendons, cornea; Drug delivery textiles: classification – mechanism various fabrication methods – characterization – applications.

Module-5

Smart Medical Textiles and Legal Issues

Smart textiles – types, characteristics – smart textiles in wound care; applications of phase change and shape memory materials –mobile health monitoring; electronics in medical textiles; Smart textiles in rehabilitation and applications. legal and ethical values involved in the medical textile materials.

Course outcome (Course Skill Set)

- At the end of the course the student will be able to: Identify the requirement of medical textiles and explain the raw material requirement for the medical textiles
- Explain properties, types, applications of healthcare and hygiene products
- Summarize different types of Implantable and non-implantable textiles
- Illustrate the various extra-corporeal materials and devices

Demonstrate and compare the characteristics of different smart medical textiles and its applications

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous internal Examination (CIE)

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of the 01 marks. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is **01 hour.** The student has to secure a minimum of 35% of the maximum marks meant for SEE.

OR

MCQ (Multiple Choice Questions) are preferred for 01 credit courses, however, if course content demands the general question paper pattern that followed for 03 credit course, then

- The question paper will have ten questions. Each question is set for 10 marks.
- There will be 2 questions from each module. Each of the two questions under a module may or may not have the sub-questions (with maximum sub-questions of 02, with marks distributions 5+5, 4+6, 3+7).
- The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources:

Books

1. Manufactured Fibre Technology, Gupta, V.B., Kothari, V.K., Springer, 1997.
2. J B. Park, Roderic S. Lakes: Biomaterials: an Introduction, Plenum Press, New York, 1992.
3. Manmade Fibers – Moncrief, R.W., Halstead Press, New York, 1975.
   Donald L. Wise...[et al.] eds. :Encyclopedic handbook of biomaterials and bioengineering (4 vols.), Marcel Dekker, New York,1995

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

Students can be taken to nearby hospitals to demonstrate the application of textiles in medical field and industrial visit may be arranged to show the production of medical textiles.

IV SEMESTER

CHEMICAL PROCESSING OF TEXTILES - II		Semester	IV
Course Code	**BTX401**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	2:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40-45	Total Marks	100
Credits	03	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

- 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.

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

- Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching methods may be adopted to develop the outcomes.
- Use PowerPoint/Videos/Animations to explain various concepts.
- Ask some creative and higher-order thinking questions in classes which helps critical thinking.
- Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.
- Support and guide the students for self-study.

Module-1

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. 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.

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

Course outcome (Course Skill Set)

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

- Explain the application and properties of dye class viz. disperse, Natural dyes and concept of blend dyes
- Summarize the various dyeing machineries, Garment dyeing and computer colour matching concept.
- Explain the method of application styles and methods of printing, transfer printing and after treatment to printed goods.
- Explain the concept of textile finishing, finishing chemicals, Sanforization and other finishes
- Illustrate the various chemical finishes viz. water proof, flame retardant and synthetic fiber finishes

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

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

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

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

WEAVING TECHNOLOGY-II		Semester	IV
Course Code	**BTX402**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory + 8-10 Lab slots	Total Marks	100
Credits	04	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

This course aims at updating the knowledge of students in the fields of, dobby,Jacquard and unconventional methods of weaving.

- 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.

Teaching-Learning Process (General Instructions)

These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes.

. **This** course aims at updating the knowledge of students in the fields of, dobby,Jacquard and unconventional methods of weaving.

- 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

Introductions to Secondary motions –Objectives, Take up motion - Objects - types of Take up motions, 5 wheel take up and 7 wheel take up motions, comparisons and dividend calculations. Anti-crack motion. Let-off motions – Types of let- off motions. Negative and positive let off: construction & working, Positive let off motions. Roper, Bart let let-off Construction & working. Electronic let off motion.

MODULE-2

Auxiliary Motions- Objects, Necessity & different types. Warp protector motions, types - loose reed and fast reed. Electromagnetic warp protector. Warp stop motions, Weft stop motions - side weft fork and centre weft fork motions. Construction, working& comparisons. Study of temples, Functions, different types of temples, choice & suitability.

MODULE-3

Multiple box motions: weft patterning, 2x1, 4x1, 4x4 motions - construction & working. Automatic Looms-Different types - Cop changing, feelers, types of feelers, shuttle eye cutters, temple eye cutters, construction & working. Dobby shedding, working of different types of dobbies, keighly dobby, cam dobby, paper controlled dobby, cross border dobby, electronic dobby, lattice preparation for left and right dobby.

MODULE-4

Jacquard shedding, Principle and working of different types of jacquards, cross border jacquard, special jacquards, tie ups, Open shed jacquards, electronic jacquard, card cutting, Fabric defects causes& remedies. Introduction to unconventional looms, classification of shuttle less looms,weft accumulators ,Introduction to projectile looms, Weft insertion by Projectile, salient features, Weftinsertion stages. Torsion bar picking.

MODULE-5

Classification of Rapier looms salient features. Weft insertion stages in Dewas &Gabbler systems rapier. Air quality requirements for Air Jet looms, system of air jet weaving, method of weft insertion in Air jet, water Jet looms, water quality requirements. Comparisons of air jet and water jet looms.

12.06.2023

PRACTICAL COMPONENT OF IPCC

Sl.NO	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.

Course outcomes (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.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CIE for the theory component of the IPCC (maximum marks 50)

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks)**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
- The laboratory test **(duration 02/03 hours)** after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks.**
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scoredby the student shall be proportionally scaled down to 50 Marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

Suggested Learning Resources:

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

Web links and Video Lectures (e-Resources):

NPTEL course on weaving Technology-1

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Apart from conventional lecture methods various types of innovative teaching techniques through videos, working models, animation
- Hands training may be arranged for students to learn practical aspects.
- Encourage the students to learn machinery operations, various settings and maintenance of weavingmachines
- Students can visit nearby weaving industries to learn more of loom operations.

Support and guide the students for self-study.

SPINNING TECHNOLOGY-II		Semester	IV
Course Code	**BTX403**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory + 8-10 Lab slots	Total Marks	100
Credits	04	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

The objective of this Course is:

- 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.

Teaching-Learning Process (General Instructions)

These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes.

1. Use the related videos of Textile machineries so that student can understand more easily.
2. Show the students the working of these machines, by arranging to visit to spinning mills.
3. Inspire the students to have collaborative learning in the class.
4. Support and guide the students for Self-study.

MODULE-1

Hook theory and preparatory processes to comber. Objects of combing and study of combing cycle with the help of sketches and also index numbers. Detachment setting and its importance. Gauges used for setting the comber. Calculations in comber. Modern developments at comber and salient features of the present day comber.

MODULE-2

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 .Speed frame calculations.

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.

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

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.

PRACTICAL COMPONENT OF IPCC

Sl.NO	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.
9	Demonstration of comber working
10	Demonstration of Speed frame working
11	Demonstration of Ring frame working
12	Procuring different types of Fancy yarns and study of their constructional details.

Course outcomes (Course Skill Set):

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

1. Demonstrate the Working of Comber & Explain the Latest Developments in Combing Technology
2. Explain & Demonstrate about the Processing and developments in Speed frame
3. Demonstrate & Explain the Working Principle of Ring Spinning Technology
4. Demonstrate the Working Principle of Doubling Machine & O.E.Spinning and air jet spinning.
5. Determine the speeds of parts draft, production of comber, speed frame and ring frame.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CIE for the theory component of the IPCC (maximum marks 50)

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two

Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.

- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks)**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
- The laboratory test **(duration 02/03 hours)** after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks.**
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scoredby the student shall be proportionally scaled down to 50 Marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

Suggested Learning Resources:

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/

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

1.Gathering catalogues of recent textile machines and can have group discussion on comparison of different make & model.

2. Procuring different types of Fancy yarns and study of their constructional details.

CHEMICAL PROCESSING OF TEXTILES LAB - II		Semester	IV
Course Code	**BTXL404**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	50
Credits	01	Exam Hours	03
Examination nature (SEE)	Practical		

Course objectives:

- The students will be able to get hands on experience of dyeing and printing of different classes of fibres, fabrics and garments.
- They will get experience on various dyeing equipment, settings and handling.
- The students will be exposed to work on computer colour matching instruments and related software.
- They will get experience on various types of finishing process

Sl.No.	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
	Demonstration Experiments (For CIE)
1	Determination of K/S and matching of shades using spectrophotometer.
2	Evaluation of washing / rubbing fastness of dyed and Printed goods.

Course outcomes (Course Skill Set):

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

- Demonstrate dyeing of acrylic and polyester using basic and disperse dyes
- Explain the basics of printing of fabrics. Outline various dyes/pigments used,
- Demonstrate print paste preparation, constituents, their characteristics and suitability.
- Explain the styles of printing and methods of printing and outline the parameters involved
- Apply finishes on fabric outline the concepts of computerized colour measurement and colour matching

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).
- The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedules mentioned in the academic calendar of the University.
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero. The minimum duration of SEE is 02 hours
Suggested Learning Resources: 1. https://www.youtube.com/watch?v=uZN0iLLAaww 2. https://www.youtube.com/watch?v=g8_GvRoASV0 3. https://www.youtube.com/watch?v=9ND67gfwAyg

STRUCTURE AND PROPERTIES OF SILK		Semester	IV
Course Code	**BST405A**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:1	SEE Marks	50
Total Hours of Pedagogy	40-45	Total Marks	100
Credits	03	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

- To make students understand the basic concepts of structure of silk fibres, properties and investigation of silk fibre structure.
- To understand the physical and chemical structure of silk fibres and various physical, mechanical and other properties of silk fibres in detail.

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teacher can use to accelerate the attainment of the various course outcomes.

1. Apart from conventional lecture methods various types of innovative teaching techniques through videos, animation films may be adopted so that the delivered lesson can progress the students in theoretical, applied and practical skills.
2. Seminars and Quizzes may be arranged for students in respective subjects to develop kills.
3. Encourage the students for group learning to improve their creativity and analytical skills.
4. Support and guide the students for self-study.
5. Encourage students to observe various silks to understand structures.
6. Actual production of silk can be demonstrated to students by taking them to silk industries
7. Students can be taken to research laboratories to demonstrate about modern tools and techniques used for the production of silk.

Module-1

Introduction to structure of textile fibres. Physical structure of Silk, Cotton, Wool, PET, Nylon and Acrylic fibres. Study of two phase and one phase model of fibre physical structure. Introduction to textile fibre structure analysis using DSC, DMA, XRD, IRS, NMR, TGA, TMA, AFM, SEM & TEM.

Module-2

Descriptive studies on structure of mulberry silk. Composition of mulberry silk (fibroin/sericin, amino acid), microstructure and appearance, longitudinal and cross-sectional views, fibre density of silk fibre in comparison to other textile fibres. Microstructure of mulberry silk: crystal Structure, crystallinity, orientation, crystal size, sonic modulus. X-ray diffraction, IR Spectroscopy studies on mulberry silk and their importance.

Module-3

Textile Fibre-Moisture relations: Concept of moisture equilibrium, moisture hysteresis, moisture regain, heat of absorption, swelling of textile fibres. Effect of moisture on various properties of fibres. Calculations of Moisture Regain and Moisture Content of fibres invoice weight. Thermal properties & characterization of silk using TGA, DTA, DSC and TMA. Optical Properties, lustre and birefringence of mulberry silk.

Module-4

Introduction to properties of mulberry silk. Tensile properties – Stress-strain characteristics, visco-elastic behavior, creep and stress-relaxation, inverse stress-relaxation. Dynamic mechanical behavior. Structure-property correlations in mulberry silk.

Module-5

Structure, longitudinal and cross-sectional views and composition (fibroin/sericin, amino acid) of wild silks (Tasar, Muga and Eri silks).

Introduction to Spider silk and their applications: Types of spider silk fibres, chemical compositions, general properties, tensile properties and applications of spider silk.

Course outcome (Course Skill Set)

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

1. Summarize concepts structure and properties of silk fibres.
2. Explain structure and properties of silk fibre for suitable applications in industry.
3. Demonstrate moisture relations and optical properties of fibres and thermal characterization of silk fibre
4. Illustrate tensile and time dependent mechanical behaviour of mulberry silk fibres
5. Summarize and relate the structure of silk fibres, yarn and silk fabrics with their properties spider silk and compare mulberry silk with spider silk.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Silk-Processing, properties and Applications, K. Murugesh Babu, Woodhead Publishers (Elsevier Science), Oxford, UK, 2013
2. Advances in Silk Science and Technology, Arindam Basu (Editor), Woodhead Publishers (Elsevier Science), Oxford, UK, 2015
3. Physical properties of Textile fibres, Morton & Hearle, J.W.S., TI, London,2008.
4. Manufactured fibre technology, V.B.Gupta and Kotari V.K., Chapman & Hall,London.
5. Mechanical properties of polymers, Ward I.M., John wiley & sons, NY1971.
6. Handbook of Silk Technology, T N Sonwalkar, Taylor and Francis, 1993
7. Silk Wet Processing, Dr. M. L.Gulrajani, IIT Publication

Web links and Video Lectures (e-Resources):

- Central Silk Board: https://csb.gov.in/publications/
- Karnataka State Sericulture Research and Development Institute: https://kssrdi.karnataka.gov.in/english
- Food and Agriculture Organization of the United Nations (FAO): https://agris.fao.org/agris-search/search.do?recordID=XF7601187

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Collection of various silk properties from literature and studying their properties
- Collection of existing data on silk structure from literature and studying the same
- Collecting various silk filaments and fibres from silk industries/R&D centres and studying their structure & properties etc.
- Seminars, quizzes, group discussions, seminars and report writing on various silk structure.
- Practical exposure to various silk and methods of manufacturing demonstration & effect of processing on silk fibre structure-property relations.

SPECIALITY YARNS AND FABRICS		Semester	IV
Course Code	**BTX405B**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40-45	Total Marks	100
Credits	03	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

This course aims at updating the knowledge of students in various types, methods of manufacturing, and applications of special types of yarns and fabrics.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Apart from conventional lecture methods various types of innovative teaching techniques through videos, animation films may be adopted so that the delivered lesson can progress the students in theoretical, applied and practical skills.
2. Seminars and Quizzes may be arranged for students in respective subjects to develop skills.
3. Encourage the students for group learning to improve their creativity and analytical skills.
4. Support and guide the students for self-study.
5. Arrange industrial visits to industries in which special type of yarns and fabrics are produced.

Module-1

Introduction to specialty yarns and fabrics **Specialty yarns:** Design, manufacture, characterization and applications of specialty yarns. Hybrid yarns. High bulk yarns. Electro-conductive yarns. Technical sewing threads. Coated yarns. Reflective yarns. Elastomeric yarns. Yarn quality requirement for these yarns.

Module-2

Compound yarns. Core spun yarns types - production methods using conventional ring spinning and SIRO system applications, future trends.

Hybrid yarns: - Different production methods, structure and properties of hybrid yarns, Hybrid yarns for textile preforms used in thermoplastic composites.

Developments in rope structure -double partial, parallel –Strand and wire ropes, properties and applications.

Developments in fancy yarns: basic fancy yarn structures and recent methods of producing fancy yarns.

Module-3

Developments in 3-D knitted structures. Multi axial warp knitted 3D fabrics, space fabrics, full faced 3-D fabrics, properties and applications of different 3D knitted fabrics. Developments in 3Dwoven fabrics.

Production of leno weave fabrics, characteristic of leno weave fabrics, Applications, New technologies in leno fabric productions.

Production and application of lappet and swivel fabrics

Module-4

Pile carpets: Pile fabrics for home textiles, tufting in carpet manufacturing. Production on techniques and applications.

Developments in Jacquard woven fabrics: Recent developments in jacquard shedding systems, Flexibility in producing intricate designs.

Triaxial woven fabric: manufacturing technique and applications of triaxial weaving.

Interwoven fabrics 2D-3D interwoven fabrics methods of production and applications, 3D solid woven structures and 3Dcelullar fabrics.

Module-5

Jacquard shedding for smart textiles, industrial textiles. Shaped seam less garments

Developments in 3D nonwovens -development of 3D Non-woven, 3D shell structures, applications.

Flocked fabrics and structures: flocking techniques, application.

Knotted fabrics: types of producing, applications.

Developments in braided fabrics, applications, Contour fabrics. Polar fabrics. Spiral fabrics. Multi-functional fabrics, Spacer fabrics. Profiled fabrics.

Course outcome (Course Skill Set)

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

1. Recognize the need for specialty yarns and fabrics and summarize the production of specialty yarns
2. Explain production methods and applications of compound , hybrid, fancy yarns and ropes
3. Demonstrate production, properties and applications of 3D Knitted, woven and leno fabrics.
4. Illustrate production , properties and applications of Pile carpets, Jacquard woven fabrics Triaxial woven fabric
5. Summarize speciality of flocked, Jacquard woven smart fabrics,3D Non –Wovens,knotted

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

R.H. Hong. Specialist yarn and fabric structure Wood Head publishing-2011

Klein W, Manual of Textile Technology: New Spinning Systems, 1st Ed; The TextileInstitute, Manchester, UK 1993

Lawrence C A, Fundamentals of Spun Yarn Technology, 1st Ed; CRC Press LLC, Florida,USA(2003)

Chattopadhyay R and Ishtiaque S M, Advances in Yarn Manufacturing Process,Department of Textile Technology, IIT Delhi 1991.

AdanurSabit, "Handbook of Weaving ",CRC Press Fancy yarns R.H

Gony and RM Wright. wood Head Publishers -2002

X-Chen. Advances in 3D textiles Elsevier-2015

B.C.Goswami- Textile Yarns wood Head Publishers-2010

Web links and Video Lectures (e-Resources):

- .

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Students can be made to collect various types of fabrics and yarns and compare them for various characteristics.
- Students and be taken to spinning and weaving industries to demonstrate production special types of yarns and fabrics.

INTELLIGENT AND FUNCTIONAL TEXTILES		Semester	IV
Course Code	**BTX405C**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40-45	Total Marks	100
Credits	03	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

- To impart knowledge of intelligent systems of incorporating the sensor, processor and the actuator into textiles.
- To educate the concept of Intelligent and Functional Textiles

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

- Use PowerPoint/Videos/Animations to explain various concepts.
- Encourage group discussion in the classes

Module-1

Definition of smart and intelligent textiles, Passive and active functionality, Textile with high protection and comfort properties, Extreme winter clothing with low heat transmission, heat absorbing, heat storing systems. Phase change materials, incorporation of PCMs in fibres and fabrics.

Module-2

Shape memory polymers - Concepts, SMAs, SMPs, Principle of temperature dependent shape memory polymers, Applications of shape memory polymers. Introduction to Intelligent textile for personal protection, safety, environment protection etc.

Module-3

Breathable textile. Multifunctional textiles with incorporated electronics for integrated communication, music, health monitoring, defence support functions, wearable computers. Environmentally sensitive textiles- photochromic and thermochromics (chameleonic) fabrics, camouflage (radar shielding) fabrics, variable heat absorption surfaces, stimuli sensitive polymers such as temperature, pH, ionic, magnetic sensitive materials, design and their applications to textile.

Module-4

Introduction to plasma processing – The potential of plasma technology in the textile industry, Plasma reactors, Low-pressure plasmas, Atmospheric pressure plasmas, Effect of plasma on fibres and polymers, Plasma finishing of textiles. New high-tech fibres: Various categories of high-tech fibres, Development of Shingosen, Design of specialist fibres, Fabrics for relaxation using 1/ f fluctuations, new arrivals.

Module-5

Fibres for the next generation: High-tenacity and high-modulus fibres, micro denier (ultra-fine) fibres and biomimetic, the next stage: technological improvements, new frontier fibres (super-function fibre materials, etc.), super-biomimetic fibre materials, super-natural materials, resources recycling, fibres for health.

Smart technology for textiles and clothing – a brief introduction and overview. Smart clothing technology – interface technology, communication etc., applications like body monitoring, entertainment etc.

Course outcome (Course Skill Set)

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

- Illustrate the various properties of smart and intelligent textiles.
- Summarise the shape memory polymer concepts and applications to textile
- Explain the various functions and applications of smart and intelligent textiles
- Discuss various plasma technology in the textile industry
- Analyse the Smart and intelligent technology for textiles and clothing

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. New millennium fibers by Tatsuya Hongu, Glyn O. Phillips and Machiko Takigami
2. Plasma Technologies for Textiles by R L Shishoo
3. Shape memory polymers and textiles by Jinlian HU
4. Smart Clothing: Technology and Applications by Gilshoo Cho
5. High technology Fibres: Handbook of Fibre Science and Technology, Vol.III, Ed. by Lewin and Preston.

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=o91f2wmpJRQ&t=9s&ab_channel=Datacube%3Awesomefactsandinterestingtoplists
- https://www.youtube.com/watch?v=CzD9nz38l-E&t=2s&ab_channel=FASHIONTECHBerlin
- https://www.youtube.com/watch?v=sRZBS5wRm6A&ab_channel=Stuff

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

Students can be given mini projects to produce prototype smart textile materials.

Working of Smart textile materials may be demonstrated for students

EMERGING TRENDS IN APPAREL DESIGN, PRODUCTION AND RETAILING		Semester	IV
Course Code	**BTX405D**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40-45	Total Marks	100
Credits	03	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

- Introducing to apparel industry, challenges & future trends in Apparel Production.
- To understand advances in apparel product development & Future product development (PD) trends.
- Understanding smart clothes and wearable technology-based apparel products
- To understand high performance technical textiles-based Clothing
  Understanding sustainable apparel retail concepts, Apparel disposal and reuse & Apparel recycling.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Apart from conventional lecture methods various types of innovative teaching techniques through videos, animation films may be adopted so that the delivered lesson can progress the students in theoretical, applied and practical skills.
2. Seminars and Quizzes may be arranged for students in respective subjects to develop skills.
3. Encourage the students for group learning to improve their creativity and analytical skills.
4. Support and guide the students for self-study.
5. Arrange industrial visits to garment manufacturing industries.

Module-1

Apparel Industry: Introduction, Global scenario of apparel manufacturing, Challenges in apparel production, Role of various organisations, Future trends

Module-2

Advances in apparel product development: Introduction, Industrial change, Process model for clothing product
Development, Models of new product development, Product development tools and application Areas, Product lifetime management (PLM), Demand-led new product development.
Future product development (PD)trends: Compressing the PD cycle time, Fit customization and

Module-3

Smart clothes and wearable technology: Introduction, Definition, Smart wearable systems: Current status and future challenges.
End-user based design of innovative smart clothing: Introduction, Identification of design requirements – form & function. The technology layer: the impact of emerging smart technologies on the design process - Enhancing and changing the aesthetic, the culture of wearable technology,

Revisiting the demands of the body, Enhancing the functionality. Hybrid design process smart textiles and wearable electronics. Fashion & Artificial Intelligence Technology.
Module-4
High performance technical textiles Clothing: High Performance Applications – Sportswear. **Personal Protective Textiles and Clothing**: Protection Against Cold, Mechanical Cut Hazards, Flame and Heat. Global Brands dealing with personal protective garments
Module-5
Sustainable apparel retail: Introduction, The retail model, Sustainable retail, Retail impacts, Retail supply chains, Traceability and transparency, Consumer behaviour, Sustainable retail futures. **Apparel disposal and reuse**: Introduction, Fate of discarded apparel, Apparel reuse, Future trends. **Apparel recycling**: Introduction to the problem, Fashion and overconsumption, the root cause of the waste problem, the apparel recycling process, the future of retail using 3D models, Global examples
Course outcome (Course Skill Set) At the end of the course, the student will be able to : 1. Describe global scenario of garment industry and future of garment industry 2. Illustrate advances in apparel product development and future trends in product development. 3. Demonstrate smart cloths and wearable technology **4.** Explain High performance technical textiles Clothing 5. Describe Sustainable apparel retail and Apparel disposal and reuse

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Fairhurst, C. ed., 2008. Advances in apparel production. Elsevier.
2. Nayak, Rajkishore, and Rajiv Padhye, eds. Garment manufacturing technology. Elsevier, 2015.
3. McCann, Jane, and David Bryson, eds. "Smart clothes and wearable technology." (2009).
4. Blackburn, Richard, ed. Sustainable apparel: Production, processing and recycling. Woodhead Publishing, 2015.
5. Paul, Roshan, ed. High performance technical textiles. John Wiley & Sons, 2019.
6. Wong, Wai Keung. "Artificial Intelligence on Fashion and Textiles." In Conference proceedings AITA, p. 301. 2018.

Web links and Video Lectures (e-Resources):

- Challenges in Apparel Merchandising | garments industry, https://youtu.be/-hDGp_h00n8
- The Complete Fashion Design to Production Process, https://youtu.be/E5jH5T63I2s
- The Future of Product Development is Model-Based, https://youtu.be/jX3YOwzScLI
- op 10 Technology Trends Reshaping the Fashion Industry in 2022 and Beyond, https://youtu.be/rZNsFx8Czjc
- What is the clothing of the future: SMART wearables & e-textiles, https://youtu.be/o91f2wmpJRQ
- Technical Textile - Types and Application of Technical Textile,

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Demonstrate apparel production and fashion fundamentals
- Hands on training in apparel manufacturing
- Case studies on apparel retailing. Sustainable retailing and apparel recycling.

PROCESSING OF MMMFs AND BLENDS		Semester	IV
Course Code	**BTX456A**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	1:0:0:0	SEE Marks	50
Total Hours of Pedagogy	15	Total Marks	100
Credits	01	Exam Hours	02
Examination type (SEE)	Theory(general question paper pattern)		

Course objectives:

Course helps students understand the concepts of processing of MMFs and their blend in various systems, and their analysis

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

- Student can acquire the knowledge in synthetic fibres their processing on cotton system.
- Study of various blends and their manufacturing technique.

Module-1

Objectives of blending, ,Introduction to processing of synthetic fibre and their blend, tow to top conversion, importance and their methods, Blending principle and methodsDetailed study of the changes required in processing short and long staple man-made fibres on cotton system,

Module-2

Selection of blend constituents, Mechanics of blending, T Sequence of blow room machines and their specifications.Modification of carding machine for blends.

Module-3

Draw frame blending, roller setting and their specifications.
Modification in roving frame for blends.

Module-4

Ring frame modification for processing of synthetic fibers, spinning of dyed fibers.Open end spinning for blends. Properties of ring spun blended yarns. Assessment of blending at different stages of a spinning line.

Module-5

Properties of blended yarn with yarn tenacity and elongation. Blend migration, index of blend irregularity. Common yarn faults in blends, End use of linen blended and linen yarn and fabrics

Course outcome (Course Skill Set)

1. At the end of the course the student will be able to: Explain the basics processing of synthetic fibre and their blend.
2. Demonstrate sequence of blow room & carding machines.
3. Demonstrate Draw frame blending with Modification in roving frame for blends.
4. Explain the Ring frame modification for processing of synthetic fibers
5. Summarize Properties of blended yarn.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous internal Examination (CIE)

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.
- **Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.**

Semester End Examinations (SEE) SEE paper shall be set for 50 questions, each of the 01 marks. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is **01 hour.** The student has to secure a minimum of 35% of the maximum marks meant for SEE

OR

MCQ (Multiple Choice Questions) are preferred for 01 credit courses, however, if course content demands the general question paper pattern that followed for 03 credit course, then

- The question paper will have ten questions. Each question is set for 10 marks.
- There will be 2 questions from each module. Each of the two questions under a module may or may not have the sub-questions (with maximum sub-questions of 02, with marks distributions 5+5, 4+6, 3+7).
- The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources:

1. **Books** Salhotra K R, "Spinning of Manmades and blends on cotton system", 2nd Ed; The textileAssociation, India, 1989.
2. Lawrence C A, Fundamentals of Spun Yarn Technology, 1st Ed; CRC Press LLC, Florida,USA (2003)
3. Richards R T D and Sykes A B, "Manual of Textile Technology: Woollen YarnManufacture", The Textile Institute, Manchester 1994.
4. Chattopadhyay R, "Advance in Technology of yarn Production", 1st Ed; Nodal Centre forUpgradation of Textile Education, IIT, Delhi, 2002.

Web links and Video Lectures (e-Resources):

NPTEL Courses on spinning

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

Visit to spinning industries to demonstrate blended yarn production.

Case studies on comparisons of blended yarn and 100% cotton/polyester/viscose yarns

TEXTURED YARN TECHNOLOGY		Semester	IV
Course Code	**BTX456B**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	1:0:0:0	SEE Marks	50
Total Hours of Pedagogy	15	Total Marks	100
Credits	01	Exam Hours	02
Examination type (SEE)	Theory(general question paper pattern)		

Course objectives:

To enhance the ability of students in post spinning operations of manufactured fibres, especially in texturization

Teaching-Learning Process (General Instructions)

1. These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes. Quizzes, group discussions ,seminars and report writing on concepts of texturing
2. Teaching can be enhanced by creating awareness on subject using NPTEL course

Module-1

Introduction and history of texturing, general principles involved in manufacture of textured yarns, Broad classification of texturing process and textured yarns.

Module-2

False twist texturing- Principals, mechanism, process and material parameters, characterization and optimization.

Module-3

Draw texturing, sequential and simultaneous draw texturing, process parameters and their effects, Friction draw texturing, friction texturing NCV drives, Positorque system.

Module-4

Air texturing, principle, mechanism, texturing jets, process parameters and characterization.

Module-5

Interlacement-need and principals, bulked continuous filament yarns (BCF), High bulk yarns, Texturing of spun yarns, solvent texturing. Introduction to edge crimping, Stuffer box crimping, Knit-de-knit texturing gear crimping, turbo-du-twist texturing, bi-component and bi- constituent yarns

Course outcome (Course Skill Set)

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

1. At the end of the course the student will be able to: Demonstrate the concept of texturing
2. Summarize false twist texturing and determine characteristics of FTT
3. Illustrate draw and friction texturing methods
4. Summarize air texturing principles and process
5. Explain various minor texturing techniques

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous internal Examination (CIE)

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of the 01 marks. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is **01 hour.** The student has to secure a minimum of 35% of the maximum marks meant for SEE. OR

MCQ (Multiple Choice Questions) are preferred for 01 credit courses, however, if course content demands the general question paper pattern that followed for 03 credit course, then

- The question paper will have ten questions. Each question is set for 10 marks.
- There will be 2 questions from each module. Each of the two questions under a module may or may not have the sub-questions (with maximum sub-questions of 02, with marks distributions 5+5, 4+6, 3+7).
- The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources:

Books

1. **Yarn Texturing Technology. D.K. Wilson, J.W.S. Hearle and L. Hillock**
2. **False Twist textured Yarns- Principle, Process and applications- C. Atkinson**

Web links and Video Lectures (e-Resources):

NPTEL course on Textured Yarn Technology

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

Quizzes, group discussions, seminars and report writing on various techniques involved intexturing.

ECO-FRIENDLY PROCESS OF TEXTILES		Semester	IV
Course Code	**BTX456C**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	1:0:0:0	SEE Marks	50
Total Hours of Pedagogy	15	Total Marks	100
Credits	01	Exam Hours	02
Examination type (SEE)	Theory((general question paper pattern)		

Course objectives:

- To introduce students, understand eco-friendly processing of textiles aspects in textile and apparel industries.
- To understand environmental management aspects in textile Industries.
- To understand the significance of pollution control measures, quality of water and water treatments

Teaching-Learning Process (General Instructions)

1. These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes. Apart from conventional lecture methods various types of innovative teaching techniques through videos, animation films may be adopted so that the delivered lesson can progress the students in the theoretical, applied and practical skills.
2. Seminars and Quizzes may be arranged for students in respective subjects to develop skills.
3. Encourage the students for group learning to improve their creativity and analytical skills.
4. Support and guide the students for self-study.
5. Arrange industrial visits to textile processing industries.
6. Students can be taken to research laboratories to demonstrate about modern equipment's, auxiliaries and Chemicals used for the production of eco-friendly fibers, yarns and fabrics.

Module-1

Modern approaches to eco-friendly preparatory process to dyeing:-Desizing, Scouring, Degumming, bleaching and Mercerizing process of woven and knitted fabrics.

Module-2

Eco-friendly dyes and their method of dyeing of cellulosic, protein and synthetic fabrics. Red listed textile chemicals, their sources and remedies. Pollution aspects of textile dyeing.

Module-3

Eco friendly printing of natural, protein and synthetic fabrics. Finishing of textiles with various specialty chemicals and auxiliaries.

Module-4

Eco friendly finishing of natural, protein and synthetic fabrics. Eco-labelling and various Eco-standards.

Module-5

Methods of extraction of natural dyes. Latest developments in natural dyes and their application on various fibers

Course outcome (Course Skill Set)

1. At the end of the course the student will be able to: Identify the need for eco-friendly process.
2. Demonstrate functions of the chemicals used for eco-friendly textile processing.
3. Summarize speciality chemicals used for production of textiles
4. Illustrate methods of manufacturing of eco-friendly processing.
5. Demonstrate eco-friendly natural dyes on textiles.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous internal Examination (CIE)

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of the 01 marks. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is **01 hour.** The student has to secure a minimum of 35% of the maximum marks meant for SEE.

OR

MCQ (Multiple Choice Questions) are preferred for 01 credit courses, however, if course content demands the general question paper pattern that followed for 03 credit course, then

- The question paper will have ten questions. Each question is set for 10 marks.
- There will be 2 questions from each module. Each of the two questions under a module may or may not have the sub-questions (with maximum sub-questions of 02, with marks distributions 5+5, 4+6, 3+7).
- The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources:

Books Text Books:

1. Dyeing and printing with natural dyes - M.L.Gulrajani.
2. Eco-friendly Textile wet processing-co-ordinator,N CUTE Publication - Dr.R.Ashokan
3. Shenai V A, "Technology of Printing", Sevak Publishers, Mumbai, 1990.
4. 4.. Shore J, "Colorants & Auxiliaries", Vol. I & II, Society of Dyers and Colourists, UK, 1990.
5. Schindler W D and Hauser P J, "Chemical Finishing of Textiles", The Textile Institute, Wood head Publishing Ltd., Cambridge, 2004.
6. Heywood D.," Textile Finishing", Wood head Publishing Ltd.,2003

Reference books:

7. Environment Problems in chemical processing of Textiles, NCUTE Publication – Dr.A.Asokan, Ms.Yogita
8. Finishing of Khadi Garments - Dr.R.B.Chavan, R.Chattopadhyay, R.P.Tewari, IIT Delhi

9. Holme L, “New developments in chemical finishing of textiles”, Journal of Textile Institute, UK, 2008.
10. Tyler D, “Textile Digital Printing Technologies”, Textile Institute Publication UK, Vol.37, No.4, 2005.

Web links and Video Lectures (e-Resources):

- NPTEL course on Textile effluent and its measurement: https://nptel.ac.in/courses/
- NPTEL course on Textile finishing, Textile wet processing, Textile printing and natural dye

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Collection of textile processing effluents data’s from literature and comparing with the various standards
- Collecting textile processing effluents data’s from nearby industries (case study) and studying the same
- Seminars, quizzes, group discussions, seminars and report writing on eco parameters concepts.
- Finding out various textile processing effluents parameters of fibre, yarn and fabrics.
- Practical exposure to various eco-friendly dyes and chemicals used for textile processing

EVALUATION OF TEXTILES FIBRES USING MODERN TOOLS –LAB		Semester	IV
Course Code	**BTXL456D**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	1:0:0:0	SEE Marks	50
Credits	01	Exam Hours	01
Examination nature (SEE)	Practical		

Course objectives:

- Learn the use of modern tools for the measurement of fibre properties accurately
- Apply the knowledge of quality textile fibres using digital technology
- New methods of analysis of test results using statistical tools
- Interpretation of test results using computer software

Sl.NO	Experiments
1	Identification of textile fibres by using CARL ZEISS modern microscope with digital camera
2	Determining maturity of cotton fibres by using CARL ZEISS modern microscope with digital camera and polarised light
3	Evaluation of cotton fibre length and length uniformity using HVI
4	Evaluation of cotton fibre strength and elongation using HVI
5	Evaluation of cotton fibre fineness using HVI
6	Evaluation of cotton fibre maturity using HVI
7	Evaluation of cotton fibre moisture relations using HVI
8	Evaluation of cotton fibre colour using HVI
9	Analysis of trash content in cotton fibres using trash analyser
10	Analysis of trash content in cotton fibres using HVI
11	Evaluation of cotton fibre properties using AFIS
12	Determination of single fibre strength by using Electronic Universal Tester
	Demonstration Experiments (For CIE)
9	Effect of fibre length and length uniformity on yarn quality
10	Effect of fibre strength and elongation on yarn strength
12	Effect of fibre fineness and maturity on yarn quality
11	Analysis of nep data by AFIS test results

Course outcomes (Course Skill Set):

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

- Evaluate the properties of cotton fibres using modern tools
- Analyse the test results accurately using modern instruments and computer
- Interpret the test results and conclude precisely
- Relate the fibre properties with yarn and fabric properties

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedules mentioned in the academic calendar of the University.
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.

The minimum duration of SEE is 02 hours

Suggested Learning Resources:

1. **Principles of Textiles testing** J.E. Booth.
2. **Hand book of textile testing and quality control,** B. Glover, D.S. Hambi-Pu Wiley Estern.Ltd., Bangalore.
3. **Physical testing of textiles** – B.P. Soville, Wood Head – 1999
4. **Textile Testing,** James Lomak, Longmans, Green and Co. London.
5. **B.I.S. Handbook,** BIS publications, 1985.
6. **B.S. Handbook**, B S Publications 1985.
7. **ASTM standard** ASTM publication 1985.
8. **Handbook of Methods of tests for cotton fibres, yarn and Fabrics,** CTRL, Bombay
9. **Kock, Chemical Testing of Textiles**, Chapman and Hall, London.
10. **Cotton assessment and appreciation**, SITRA, Coimbatore.

V SEMESTER

MANAGEMENT AND ENTREPRENEURSHIP IN TEXTILE INDUSTRY		Semester	V
Course Code	**BTX501**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40-45	Total Marks	100
Credits	03	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

The Course aims at updating the knowledge of students in the following fields of management and entrepreneurship. Basic concepts of management, organisation in Textile and garment Industry. Basic concepts to become entrepreneurs.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

Module-1

Management: Introduction Meaning - nature and characteristics of management, Management and Administration roles of management, levels of management, Functions of management, Role of management in improving work quality Planning: Nature importance and purpose of planning, process types of plans, steps in planning, decision making. Steps in decision making. Planning in Textile and Garment industry.

Module-2

Organising and staffing: Nature and purpose of organization principles of organization - Types of organisation, Depart mentation, span of control - MBO and MBE, Nature and importance of staffing. Process of selection and recruitment procedure, Concept of team work, smart work and SWOC analysis in Textile industry. Directing and controlling: Meaning and nature of directing. Leadership types, Motivation theories, Communication and its importance, Coordination, Meaning and importance and Techniques of coordination. Steps in controlling

Module-3

Entrepreneurship: In Textile and Garment industry: Meaning of entrepreneur, Evolution of the concept, Functions of an entrepreneur, Types of Entrepreneur, In entrepreneur- an emerging class, Concepts of Entrepreneurship, Evolution of Entrepreneurship, stages in entrepreneurial process, different source of finance for an entrepreneur- Central and state level financial Institutions. Micro, Small & medium Enterprises (MSME): Definition Characteristics, Objectives, Scope, role of MSME in Economic Development, Advantages of MSME steps to start an MSME, Different schemes : TECKSOK, KIADB, KSSIDC, DIC Single window agency: SISI, NSIC, SIDBI, KSFC. Concept of GST and its importance.

Module-4

Business planning process: Meaning of business plan, Business plan process, advantages of business planning, Marketing plan, production / operations plan, Organization plan, Financial plan and final project report with feasibility study, preparing a model project report for starting a new venture. Business planning in Textile & Garment Industry. Study of MBO, MBE, Importance of decentralisation. Lean Manufacturing: History and definition. Objectives, Principles and benefits. Tools, Base for apparel industry 5M, 7waste, Concepts, Kaizan, Kamban, 5S, JIT just in time, PDCA, SQCD. Comparison of lean and 6-sigma.

Module-5

International Entrepreneurships Opportunities: The nature of international entrepreneurship, importance of international business to the firm, International versus domestic entrepreneurship, Stages of economic development, entrepreneurship entry in to international business, exporting, direct foreign investment, Barriers to international trade.

Course outcome (Course Skill Set)

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

- The course will prepare students to face problems of industry and to work effectively in various textile and Garment industry
- The course will motivate the students to become team leaders, entrepreneurs in industries.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Text Books:

1. Principles of management by Tirpathi P.C and P.N.Reddy MCgraw Hill education 2012
2. Entrepreneurship by Poornima Charinthimath Pearson india Ltd. 2005
3. Management by P.N.Reddy
4. Management & Entrepreneurship by Prof: Ramesh Burbure Rohan publishers 2008

REFERENCES::

1. Project management and control by Narendra Singh Himalaya publishing house 2005

2. Work Quality management in textile industry by B. Purushottam Woodhead publishing Ltd.
Web links and Video Lectures (e-Resources):
• **NPTEL video on Innovation, Business Models and Entrepreneurship**
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning • Quizzes, group discussions, seminars and project report writing.

FASHION DESIGN AND GARMENT MANUFACTURE		Semester	V
Course Code	**BTX502**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory + 8-10 Lab slots	Total Marks	100
Credits	04	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

- This subjects deals with various aspects of Fashion Concepts, Fashion theories and design elements consumer expectation about textiles.
- Sourcing, issues, fabric inspection, procedures, spreading and cutting, different types of sewing machines, seams and stitches, pattern making & garment making process.
- Production and planning, costing, industrial engineering, Garment inspection, SMVcalculations.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Apart from conventional lecture methods, various types of innovative teaching techniques throughvideos, animation films may be adopted so that the delivered lesson can progress the students in theoretical, applied and practical skills.
2. Seminars and Quizzes may be arranged for students in respective subjects to develop skills.
3. Encourage the students for group learning to improve their creativity and analytical skills.
4. Arrange visits to nearby garment industries to learn garment processes.
5. Encourage the students to learn pattern preparation, sewing machine operations, and accessories andgarment finishing operations.

MODULE-1

Consumer expectation of textiles. Consumer knowledge about textiles. Fashion Terminologies, elements of design, fashion theories, Factors influence fashion, Fashion cycle, Principles of design. Selection of fabrics for different end uses.

MODULE-2

Sourcing, Global sourcing, Role of sourcing discussion in Apparel firms. Material sourcing process.Fabric inspection methods. Principle and practices of pattern making. Grading, Computer aided pattern making spreading, cutting, Numbering & bundling.

MODULE-3

Study of different types of stitches & seams. Seams appearance & performance, study of sewing threads. Thread consumption calculation, sewing needles, Fundamentals of swing M/c, different types of sewing M/c. Workaids, puckering, reasons and remedies. Seam strength, seam efficiency, seam slippage - importance and measurement. Sewability, formability. Needle cutting.

MODULE-4

Pressing and Fusing processes - Equipment's, methods, support materials. Lining, Interlinings, Closures. Zippers, Buttons, trims, snaps, Hooks, loop tape, Elastics, embroidery etc Apparel productionsystems. Garment Quality control, Inspection of garments under different AQL standards.

MODULE-5

Concept of production planning, productivity, resource management, Ergonomics, Apparel Engineering, basic concepts, workflow and work study techniques, SMV Calculation. Costing-Procedures, systems of costing, stages of costing, pricing strategies.

PRACTICAL COMPONENT OF IPCC

Sl.NO	Experiments
1	Study of different types sewing machines
2	Study of basic components of sewing machine.
3	Study of tools and equipment used.
4	Types of measurements. Techniques of body measurements.
5	Practice of making a pattern of Bermuda and stitching.
6	Practice of making a pattern of men's shirt and stitching
7	Practice of making a pattern of salwar kameez and stitching.
8	Practice of making a pattern of kids wear and stitching.
9	Study and Practice of computer aided marker preparation for Men's, Women's and Children's Wear.
10	Different types of sewing M/c.Workaids, sweing threads.
11	Different types of sweing needles and support materials.
12	Pressing and fusing machines

Course outcomes (Course Skill Set):

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

- Develop the Knowledge on fashion, consumer expectation of Textiles, fashion cycle, theories, andfactors influences, measurement techniques and fabric selection for different end uses.
- Develop the knowledge on global sourcing issues, fabric inspection, grading techniques and patternmaking techniques
- Illustrate the different types of stitches, seams and sewing machines and importance of seamstrength, seam slippage, sew ability, and tailor ability and formability.
- Analyzing the importance of fusing, pressing, support materials and trims and garment inspectionusing AQL standards.
- Summarize the different apparel productions techniques, quality control, and different types of garment finishing SMV calculations and costing of garments

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CIE for the theory component of the IPCC (maximum marks 50)

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.

- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks)**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
- The laboratory test **(duration 02/03 hours)** after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks.**
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scoredby the student shall be proportionally scaled down to 50 Marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

Suggested Learning Resources:

Books

1. **The Technology Of Clothing Manufacture** - Carr H. & Latham B Blackwell Scientific Publication, Oxford England 1988
2. **Metric Pattern Cutting** - Aldrich W Blackwell Scientific Publication, Oxford England 1992
3. **Apparel Manufacturing** - Ruth E. Glock, Grace I Kunz PE Publication, UK 2005
4. **Apparel manufacturing handbook** - Jacob Solinger Van Nostrand Reinhold company. 2012

Reference Books

1. **Pattern Cutting for Women's Outwear** Gerry Cooklin Blackwell Scientific Publication, OxfordEngland 1996
2. **The NIFT Book of Grading and sizing** NIFT Faculty NIFT, New Delhi 1992
3. **Fashion Source Book** Kathryn Mikelvey Blackwell Scientific Publication, Oxford England 1994.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

Students can be taken to garment manufacturing industry as a part of industrial visit.

SILK REELING TECHNOLOGY		Semester	V
Course Code	**BST503**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory + 8-10 Lab slots	Total Marks	100
Credits	04	Exam Hours	3
Examination nature (SEE)	Theory		

Course objectives:

- To make students understand the basic concepts of silk reeling technology.
- This will enable them to study preparatory processes prior to silk reeling.
- The course will help the students to understand detailed methods of pre-reeling, silk reeling and post reeling operations.

Teaching-Learning Process (General Instructions)

These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes.

- Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adopted so that the delivered lesson can progress the students in theoretical, applied and practical skills.
- Seminars and Quizzes may be arranged for students in respective subjects to develop skills.
- Encourage the students for group learning to improve their creativity and analytical skills.
- Support and guide the students for self-study.
- Encourage students to observe working of various reeling machineries to understand mechanisms.
- Actual production of silk can be demonstrated to students by taking them to reeling industries.
- Students can be taken to research laboratories to demonstrate about modern machineries used for production of silk.

MODULE-1

Introduction to silk reeling. Status and distribution of mulberry silk reeling activities in India. Importance of mulberry silk cocoon quality, factors influencing quality of cocoon, Types of defective cocoons. Cocoon characteristics and their significance in silk reeling. Renditta and its estimation using cocoon characteristics. Pre-treatment of cocoons: Stifling of Cocoons-Objective, various methods, merits and de-merits. Cocoon storage, cocoon mixing, deflossing, riddling and cocoon sorting.

MODULE-2

Cocoon cooking – Objective, various methods such as open pan, three-pan, conveyor cooking etc., merits and demerits. Cocoon cooking for floating and sunken systems of reeling. Under cooking, over cooking and cooking efficiency.

MODULE-3

Silk Reeling. Process and Factors influencing silk reeling. Overview of silk reeling machinery & processes. Silk reeling machines: Salient features, passage of material and production aspects of country charka, cottage basin, multi-end filature, semi-automatic and automatic reeling machines. Working principle of Denier detector device and auto-casting device in automatic reeling machines. Permeation process for silk reels. Silk Re-reeling, Skein finishing & packing. Recent developments in reeling of silk.

MODULE-4

Post reeling processes (Silk Throwing) – objectives and importance. Sequence of operations in silk throwing - winding, doubling, re-winding and twisting. Manufacture of silk yarns for use in ordinary, chiffon, crepe, Georgette fabrics. Recent developments in silk throwing machinery.

MODULE-5

Quality Control in Reeling: Characteristics of water, treatment methods for water for reeling. Water quality in reeling clusters. Water recycling in silk reeling.
Raw silk testing & grading: Seriplane testing equipment. National & International methods of testing & grading of raw silk.

Course outcomes (Course Skill Set):

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

- Acquire the concepts of silk reeling and preparatory processes prior to silk reeling, Identify different types of Cocoons. Evaluate the quality of cocoons and production calculations.
- Understand and practice of silk reeling as a small scale activity.
- Identify the components of reeling machines
- Exposed to various methods of silk reeling, post reeling processes, quality aspects of silk.
- Enable them to start a small-scale silk reeling industry.
- Illustrate methods of producing of silk filaments from cocoons.
- Learn the method of testing and grading of silk.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.

- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.

Marks scored shall be proportionally reduced to 50 marks.

Suggested Learning Resources:

Books

7. Handbook of Silk Technology, T N Sonwalkar, Taylor and Francis, 1993
8. Mulberry Silk Reeling Technology, D. Mahadevappa, V G Halliyal, D G, Shankar, Ravindra, Bhandiwad, Oxford and IBH Publishing Company Pvt. Ltd, 2000
9. Silk Reeling and Testing Manual, Yong-woo Lee, National Sericulture and Entomology Institute, Seoul, Republic of Korea. FAO AGRICULTURAL SERVICES BULLETIN No. 136, FAO Publication, 1999.
10. Handbook of Sericulture Technologies, S.B. Dandin, Central Silk Board, 2003.

Web links and Video Lectures (e-Resources):

- Central Silk Board: https://csb.gov.in/publications/
- Karnataka State Sericulture Research and Development Institute: https://kssrdi.karnataka.gov.in/english
- Food and Agriculture Organization of the United Nations (FAO): https://agris.fao.org/agris-search/search.do?recordID=XF7601187

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Collect various types of silk cocoons from nearby cocoon market and study their properties.
- Visit silk reeling industries to understand the silk reeling activities.
- Collecting various silk cocoons, raw silk yarns and silk yarn test reports from silk reeling industries/R&D centres and studying them.
- Seminars, quizzes, group discussions, seminars and report writing on auction process in cocoon market and silk exchange.
- Finding out various parameters of cocoons and silk filaments in textile testing laboratory / textile committee / central silk board / dept. of sericulture.

SILK REELING TECHNOLOGY LAB		Semester	V
Course Code	**BSTL504**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	50
Credits	01	Exam Hours	100
Examination nature (SEE)	Practical		

Course objectives:

- To make students practically perform and understand sequence of different processes involved in silk reeling.
- The course will help the students to practically understand methods of pre-reeling, silk reeling and post reeling operations.
- This will enable them to practically study and evaluate cocoon quality and raw silk yarn quality along with assessment methods.

Sl.NO	Experiments
1	Determination of cocoon driage % after styfling/drying the green mulberry silk cocoons.
2	Determination of basic cocoon quality characteristics and Estimation of Renditta using cocoon quality parameters
3	Determination of cocoon cooking efficiency using open (floating) cooking method.
4	Determination of cocoon cooking efficiency using three pan (sunken) cooking method.
5	Determination of Reeling efficiency of mulberry silk cocoons
6	Determination of size (denier) deviation in raw silk yarn using silk kilchas (50 no.s of apx. 100-120 meters in each kilcha) and Determination of winding breaks in silk skeins for raw silk yarn quality assessment (silk winding process for 60 minutes at 100 meters/minute).
7	Determination of evenness and cleanliness defects in raw silk by preparing and using yarn appearance board.
8	Raw silk grading by determining tensile strength & elongation of silk yarn by testing and using other given data.
	Demonstration Experiments (For CIE)
9	Mulberry silk cocoon: identification of type, assessment of cocoon grading and identification/sorting of defective cocoons
10	Determination of brushing efficiency of cooked cocoons using stick & brush and estimation of silk waste during brushing process.
11	Determination of total silk waste generated during reeling process and preparation of silk sheets using pelade waste.
12	Raw silk testing and grading using Seriplane testing equipment.

Course outcomes (Course Skill Set):

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

- Acquire hands on practical's on silk reeling and preparatory processes prior to silk reeling, Identify different types of Cocoons. Evaluate the quality of cocoons and production calculations.
- Understand and practice of silk reeling as a small scale activity.
- Identify the different stages of silk reeling production and components of silk reeling machines
- Exposed to various methods of silk reeling, post reeling processes, quality aspects of silk.

- Illustrate methods of producing of silk filaments from cocoons.
- Learn the method of testing and grading of silk.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.

- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.
- General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)
- Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.
- The minimum duration of SEE is 02 hours

Suggested Learning Resources:

Books

11. Handbook of Silk Technology, T N Sonwalkar, Taylor and Francis, 1993
12. Mulberry Silk Reeling Technology, D. Mahadevappa, V G Halliyal, D G, Shankar, Ravindra, Bhandiwad, Oxford and IBH Publishing Company Pvt. Ltd, 2000
13. Silk Reeling and Testing Manual, Yong-woo Lee, National Sericulture and Entomology Institute, Seoul, Republic of Korea. FAO AGRICULTURAL SERVICES BULLETIN No. 136, FAO Publication, 1999.
14. Handbook of Sericulture Technologies, S.B. Dandin, Central Silk Board, 2003.

ADVANCED YARN AND FABRIC MANUFACTURE		Semester	V
Course Code	**BTX515A**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40-45	Total Marks	100
Credits	03	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

- Explain the students the unconventional spinning techniques.
- To understand the various modern spinning methods such as
- Students will acquire theoretical knowledge about the machineries used.
- Interpret and explain unconventional methods of weaving.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes:

1. Apart from conventional lecture methods various types of innovative teaching techniques throughvideos, working models, animation films may be adopted so that the delivered less on can progress the students in theoretical, applied and practical skills.
2. Hands on training may be arranged for students to learn practical aspects.
3. Encourage the students to learn machinery operations various settings and maintenance of weavingmachines.
4. Students can visit nearby weaving industries to learn more on advanced method of fabric manufacture methods.

Support and guide the students for self-study.

Module-1

Open-end spinning – principle and objects of open-end spinning. Classification of open-end spinning. Principle and Technique of rotor spinning and Rotor Spinning Raw material requirement and preparation; principle of operation - feeding, opening, cleaning, drafting, twisting and winding; process parameters influencing spinning performance and yarn quality; yarn structure, properties of ring and rotor spun yarns; limitations; applications, Latest developments in rotor spinning. Modern developments in OE machines. Calculation of Spindle Speed, Demonstration and calculation on O.E. Spinning machine.

Module-2

Fancy yarns and their production and applications. Study of Advanced Spinning systems such asDREF spinning, Air jet spinning, Twist less spinning, Bob-Tex Spinning, Core and Cover spun yarn spinning. Quality studies of all unconventional methods of spinning. Comparison between conventional and unconventional methods of spinning.

Module-3

Friction Spinning Principle of opening, cleaning, drafting, twisting and winding in DREF II and DREF III spinning; structure, properties and applications of friction spun yarns.

Module-4

Air-Jet and Air-Vortex Spinning- Principles of drafting, twisting and winding in air-jet and air-vortex spinning; structure, properties and applications of air-jet and air-vortex yarns. Principle of yarn production in self-twist, wrap, core, Siro and solo spinning systems. Properties and applications. Yarn Plying and Fancy Yarns Merits of plying; methods of plying-TFO, ring twisting; selection of twist level for plying; calculation of resultant count of plied yarns; Fancy yarns-types and production methods, applications.

Module-5
Multiphase weaving, circulars looms, Narrow looms,Triaxial looms and applications.

Course outcome (Course Skill Set)

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

1. Demonstrate & Explain the Working Principle of OE Spinning Technology
2. Demonstrate the Working Principle of Air-jet spinning, vortex Machine & O.E.Spinning.
3. self-twist, wrap, core, Siro and solo spinning systems
4. Explain the Production of Yarn on Unconventional Methods of Spinning Technology
5. Explain weft insertion stages in multiphase looms, Triaxial looms and circular looms.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Klein W., Vol. 4 & 5, "A Practical Guide to Ring Spinning" and "New Spinning Systems" The Textile Institute, Manchester, 1987.
2. Mahendra Gowda, "New Spinning Systems", NCUTE Publications, 2006.
3. **Weaving machines, mechanisums, Management.** M.K.Talukdar. Mahajan Pub. Ahmedabad

Reference(s) :

1. Lawrence C.A. and Chen K.Z, "Rotor Spinning", Textile Progress, Vol. 13, No.4, Textile Institute, U.K., 1981
2. Carl A.Lawerence, "Fundamentals of Spun Yarn Technology", CRC Press, 2003.
3. Lord P.R., "Handbook of yarn production", Wood Head publishing, 2003.
4. Salhotra K.R, Alagirusamy, Chattopadhyay R, "Ring Spinning, Doubling and Twisting", NCUTE Publications 2000.

Web links and Video Lectures (e-Resources):

- NPTEL Courses on weaving preparatory.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Demonstration of OE spinning machines settings of winding machines.
- Demonstration and setting of pirn winding and warping machines.
- Collecting various sizing ingredients nearby industries and study their suitability for differentyarns.
- Visiting nearby Textile industries to learn various aspects of weaving preparatory.

HIGH PERFORMANCE AND SPECIALITY FIBRES		Semester	V
Course Code	**BTX515B**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40-45	Total Marks	100
Credits	03	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

To make the students to have knowledge in the field of high performance and high function fibres.

Teaching-Learning Process (General Instructions):

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes:

1. Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adopted so that the delivered lesson can progress the students in theoretical, applied and practical skills.

2. Seminars and Quizzes may be arranged for students in respective subjects to develop skills. Encourage the students for group learning to improve their creativity and analytical skills. Support and guide the students for self-study.

Module-1

Definition, classification and structural requirements of high performance and specialty fibers, Polymerization, spinning and properties of aramids, aromatic polyesters, rigid rod and ladder polymers such as PBZT, PBO, PBI, PIPD Brief description on liquid crystalline behavior of these polymers and fibers, types of LCPS, their anisotropic behaviour.

Module-2

Manufacture of carbon fibres from polyacrylonitrile, viscose and pitch precursors, Concept of gel spinning and spinning of UHMWHDPE fibres, Elastomeric polymers and fibres, Lyocell fibre production, Conducting fibres, Thermallyand chemically resistant polymers and fibres

Module-3

Methods of synthesis, production and properties of: glass and ceramic fibres. Specialty fibres: profile fibres, optical fibres, bicomponent fibres and hybrid fibres, Superabsorbent polymers and fibres.

Module-4

High touch fibres: silk like fibre, skin like fabric power fibres which store solar energy, chameleonic fabrics perfumed pantyhose

Biomimetic chemistry and fibres: Application of morphology/structure. Hybridization technology**.**

Module-5

Biotechnology and fibres, electronics and fibres, cars and fibres, fibres in space, fibres and nuclear power, fibres in sports, fibres for geotextiles.

Course outcome (Course Skill Set)

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

1. Explain the production and properties of high-performance organic fibres.
2. Summarise the production of carbon, UHMWHDPE. elastomeric, lyocell optical bicomponent, hybrid and conducting fibres
3. Demonstrate the production of glass ceramic and speciality fibres

4. Illustrate High touch and biomimetic chemistry of fibres.
5. Identify the need of special fibres in biotechnology, electronics, cars space, nuclear power, sports and geotextiles.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

15. T. Hongu. Philips G.O. **New fibers** Ellis Fibers -1990
16. **High Performance fibres**, J.W.S.Hearle, Wood Head,UK-2005.
17. T. Hongu. Philips G.ONew Millamium Fibres .Wood Head,UK 2005
18. Gupta V.B. Kothari V.K. Manufactured Fibre Technology.Springer-1997

Web links and Video Lectures (e-Resources):

- NPTEL course on manufactured fibre technology and High Performance Fibres.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Samples of speciality and high-performance fibres may be demonstrated to students and practical utility of these fibres may be explained.
- Students may be taken to industries which make use of these fibres.

HUMAN RESOURCE MANAGEMENT IN TEXTILE INDUSTRY		Semester	V
Course Code	**BTX515C**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40-45	Total Marks	100
Credits	03	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

- To understand the HRM concepts and theory.
- To obtain an over view of various HRM functions and practices.
- To gain an insight in to the various statutory provisions

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes:

1. State the importance of Human Resource through related videos
2. Seminars & Quizzes may be arranged in respective topics to develop skills
3. Inspire the students by giving examples of present day Human Resource Management in various Textile activities.
4. Support and guide the students for Self-study.

Module-1

Human Resource Management: Introduction, meaning, nature, scope and objectives of HRM, Difference between Personnel Management and HRM - Importance and Evolution of the concept of HRM– Major functions of HRM – Principles of HRM and impact on Textile Industry.

Module-2

Environment and Strategies of HRM: Introduction, Strategic Management Process, Organizational and Human Resource Strategies.

Job Design, Job Analysis, Job Description, Job Specifications and Job Evaluation. Uses of Job Analysis.

Human Resource Planning: Introduction, Process and levels of HRP.

Module-3

Recruitment: Definition, Constraints and Challenges, Sources and Methods of Recruitment. **Selection:** Definition and Process of Selection. **Placement, Induction.**

Module-4

Training: Definition, Stages of training personnel for higher performance and productivity. Different types of **Evaluation,**

Basis of **Promotion, Demotion, Transfers**.

Performance Appraisal: Meaning, need of Performance Appraisal, Concept of Performance Appraisal, the Performance evaluation, Methods of Performance Appraisal.

Module-5

Employee Grievances: Employee Grievance procedure, Grievances Management in Indian Industry. **Discipline:** Meaning, approaches to discipline, essential of a good disciplinary system. **Recent trends in HRM:** Employer's Brand, Competency Mapping, Business Process Out Sourcing (HR issues).

Course outcome (Course Skill Set)

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

1. Summarize and measure the various importance of human resources and their effective management in organizations.
2. Discuss the various key aspects of forecasting the human resources needs of an organization
3. Analyze the role of recruitment and selection in relation to the organization's business and human resource management.
4. Adapt the organizational and individual benefits of training and development. Apply and discuss the appropriate practices involved in the grievance and discipline process

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Human Resource Management and Industrial Relations - Dr. P. Subba Rao, Himalaya Publishing House, Mumbai, 2009
2. Personal Management – Edvin B. Flippe
3. Human Resources Management – Rao V. S. P, Excel BOOKS - 2010
4. Personal Management – Subratha Ghosh
5. Human Resource Management - Dr. T. P Renuka Murthy, HPH
6. Management of Personnel in India - N. N Chatterjee

Web links and Video Lectures (e-Resources):
• https://youtu.be/C6q-ala_EkU
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning • Encourage the students to have group discussion taking case study of any textile industry

FINANCIAL MANAGEMENT		Semester	V
Course Code	**BTX515D**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3 : 0 : 0 : 0	SEE Marks	50
Total Hours of Pedagogy	40-45	Total Marks	100
Credits	03	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

1. To summarize the students with basic concepts of financial management.
2. To understand time value of money and cost of capital.
3. To analyze capital structure, capital budgeting and dividend decision.
4. To understand the short term and long term financing and working capital management.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes:

1. These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.
2. State the importance of Subject through related videos
3. Seminars & Quizzes may be arranged in respective topics to develop skills
4. Inspire the students by giving present day Financial management in various Textile activities.
5. Have the exposure to online trading (NSE & BSE)
6. Support and guide the students for Self study

Module-1

Finance function, goals of finance management, Financial planning, and Major financial decision areas. Sources of Financing**:** Shares, Debentures, Term loans, Lease financing, Hybrid financing, Venture Capital, Angel investing and private equity, Warrants and convertibles (Theory Only) Capital structure: measure of leverage, effects of lever - I, traditional approaches, MM theory of financial leverage and value of the forms. Designing of capital structure-EBIT-EPS analysis, risk-return trade-off.

Module-2

Investment decisions – Capital budgeting process, Investment evaluation techniques–Net present value, Internal rate of return, Modified internal rate of return, Profitability index, Payback period, discounted pay back period, accounting rate of return.

Module-3

Capital structure: measure of leverage, effects of lever- I, traditional approaches, MM theory of financial leverage and value of the forms. Designing of capital structure- EBIT- EPS analysis, risk-return trade-off. Dividend policy**:** Factors affecting dividend policy relevance of the dividend policy-Walters model, Gordon's model- M.M. theory, and types of dividend policies - Bonus shares – corporate dividend policy in practice.

Module-4

Market for corporate securities, trading procedures in stock exchange, financial services, leasing, mutual funds, SEBI and market regulation. Working capital management, receivables, inventories and cash management,

Merger and take - overs. Objects of costing **–** elements of costs, types of overheads, Allocation of factory over heads, Methods determination of selling price. Definition and objects of depreciation – break –even analysis.

Module-5
Definition and Advantages of Cost Accounting. Elements of cost. Introduction, classification, elements and allocation of Material cost. Labour cost and overhead cost. Process cost calculation-introduction, special features of Textile processing and its cost calculation. Introduction to standard costing and Budgetary control. Statutory guide lines on the maintenance of cost records

Course outcome (Course Skill Set)

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

1. Understand the basic financial concepts.
2. Apply time value of money.
3. Evaluate the investment decisions.
4. Analyze the capital structure and dividend decisions.
5. Estimate working capital requirements.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Financial Management - Rajiv Srivastava and Anil Misra, Oxford University Press, 2011
2. Financial Management - Shashi K Gupta and R K Sharma, Kalyani Publishers, 2014
3. Financial Management –Theory and Practice-8th Edition, Prasanna Chandra, McGraw Hill

Education, 2011
4. Financial Management – V K Bhalla, S. Chand Publishing, 2014
5. Fundamentals of Financial Management – 12th Edition, Brigham & Houston, C engage Learning,2012
19. Financial Management: Principles and Applications- 10th Edition, Arthur J. Keown, John H. Martin, John W. Petty and David F. Scott, Prentice Hall, 2004

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=vuC6fYPUuDU
- https://www.youtube.com/watch?v=CCQwz_Gwo6o

VI SEMESTER

TEXTILE MATHEMATICS-I		Semester	VI
Course Code	**BTX601**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory + 8-10 Lab slots	Total Marks	100
Credits	04	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

This Course aims at updating knowledge of students in following fields ofstatistical quality control

1. Concepts of statistics and quality control.
2. Analyze the data, use suitable statistical tool to draw suitable conclusions.
3. Comparing different processes, parameters etc. for quality control.

Teaching-Learning Process (General Instructions)

These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes.

1. Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adopted so that the delivered lesson can progress thestudents in theoretical, applied and practical skills.
2. Seminars and Quizzes may be arranged for students in respective subjects to develop skills.
3. Encourage the students for group learning to improve their creativity and analytical skills. Support and guide the students for self-study.

MODULE-1

The concept of individual population and samples-Frequency distribution and its representation-Construction of frequency diagrams with applications, probability curves.

Statistical measures and their practical applications. Measures of central tendency-different types of means, Measures of dispersion. Skewness, kurtosis

MODULE-2

Random sampling errors, relations between samples and populations, confidence interval. Determination CI for means, SD and difference in mean and SD. The normal distribution.

MODULE-3

Control charts, their uses and limitations in control of quality, concept of control limits, specificationlimits, ẌR, P, nP and C chart.

Time series, setting up of trend line, components of time series trend line by straight line quadratic and exponential method.

MODULE-4

Test of significance. Setting up of hypothesis. Significant tests for means and dispersions, chi- square test.

MODULE-5

Analysis of variance-One way & two way.

Correlation and Correlation co- efficient. Regression Analysis

PRACTICAL COMPONENT OF IPCC

Sl.NO	**Experiments**
1	Collection and presentation of data by conducting an experiment in testing laboratory.
2	Presentation of data in pictorial form by conducting an experiment in testing laboratory.

3	Determination of measures of central tendency and dispersion after collecting two set of data(by experiment) and comparing consistency of the data.
4	Testing the data for normal distribution, and determining Skewness and Kurtosis values.
5	Determination of confidence interval of the given set of data in testing lab.
6	Conducting significance test of given set of data (t test).
7	Conducting test significance test for variance.
8	Determining faults in yarn and preparing suitable control chart.
9	Conducting variance analysis of given set of data taken from various tests.
10	Conducting a case study on determination of correlation coefficient and regression analysis.
11	For a given AQL for a roll of fabric accept/ reject the roll- a case study.
12	Using the published data forecasting the data for future.

Course outcomes (Course Skill Set):

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

1. Define and apply basic concepts of statistics, data collection presentation and measures of centraltendency.
2. Make use of various statistical distribution and confidence interval.
3. Inspect quality, control quality and predict and analyse time series.
4. Analyse and choose significance of results and statistical hypothesis.
5. Conduct variance analysis, and compute correlation and regression.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CIE for the theory component of the IPCC (maximum marks 50)

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with
- 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks)**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
- The laboratory test **(duration 02/03 hours)** after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks.**
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scoredby the student shall be proportionally scaled down to 50 Marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

Suggested Learning Resources:

Books:

1. **Textile Testing,**-J.E. Booth, CBS Publishers, New Delhi, 1996
2. **Handbook of Textile Testing and Quality control**- Hamby Grower, Wiley Eastern Pvt. Ltd.Delhi 1969.
3. **Practical Statistics for Textile Industry**-Part-1 & 2, Gave-Leaf, Textile Institute, 1984
4. **A Textbook of statistics**, Rajamohan 1995 **Statistics For Textile Technologists-** L.H. C.Tippet, Textile Institute, Manchester 1973

Web links and Video Lectures (e-Resources):

NPTEL course on Evaluation of textile materials-Module- 2

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning:

1. Collection of existing data on textile materials from literature and applying statistical tools for the same
2. Collecting data from textile testing lab of the department and applying statistical concepts
3. Collecting various data related to textiles from nearby industries (case study) and applying statistical tools
4. Seminars, quizzes, group discussions, seminars and report writing on various statistical concepts.

TEXTILE TESTING-I		Semester	VI
Course Code	**BTX602**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:2:0:0	SEE Marks	50
Total Hours of Pedagogy	50-55	Total Marks	100
Credits	04	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

The objective of this Course is to make students to

- Explain the importance of textile testing and quality control in textile industry.
- Demonstrate and demonstrate different methods, standards, principles and working ofinstruments used for testing of fibres and yarns.
- Evaluate various properties and characteristics of fibres and yarns, calculate and analyse thetest results. Compare and draw suitable conclusions
- Evaluate and analyse effects of various parameters affecting test results
- Demonstrate various settings and calibration of testing equipment
- Explain the use of modern technology in the measurement of properties of fibres and yarns.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Apart from conventional lecture methods various types of innovative teaching techniques through videos, working models, animation films may be adopted so that the delivered lessoncan progress the students in theoretical, applied and practical skills.
2. Hands on training may be arranged for students to learn practical aspects.
3. Encourage the students to learn machinery operations various settings and maintenance.
4. Support and guide the students for self-study.

Module-1

Introduction to textile testing & quality control. Sampling methods and techniques for fibres, yarns and fabrics. Atmospheric conditions and its measurement. Moisture relations of textile materials. Conditioning of Testing lab and textile materials. Moisture regain and its measurement by various Techniques.

Module-2

Fiber dimensions-Fibre length and fineness, importance of these properties, measurement by variousmethods, principle and instruments. Maturity of cotton fibres and its determination. Neps-causes & effects of nep generation. Nep counting.

Module-3

Fibre strength - Technological importance & determination by various conventional methods. Fibre Quality Index (FQI), its importance & calculations. Study of High Volume Instrument (HVI), modules and fibre quality testing parameters. Application of HVI results in spinning mills.

Module-4

Advanced Fibre Information System (AFIS) - working principle, features. AFIS test data analysis. Study of various systems of yarn count & its measurements by various methods & instruments.

Module-5

Yarn twist & its effects on yarn & fabric properties. Importance of twist multiplier. Principles & measurements of single yarn and double yarn twist. Yarn strength & its importance. Methods and principles of yarn strength testing. Instruments and measurement of yarn strength. Yarn friction and its measurement.

Course outcome (Course Skill Set)

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

- Explain the importance and necessity of determination of properties and characteristics oftextile fibres and yarns
- Use of suitable equipment for the measurement of properties of fibres and yarns usingappropriate method, standard and techniques
- Demonstrate the principle and working of testing instruments
- Explain the test parameters and their effects on quality parameters of textile materials
- Analyse the causes for poor quality of fibres and yarns and their effects on quality of end products.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Physical testing of textiles B.P. Soville Wood Head 1999
2. Principles of Textile Testing Booth J. E Butterworth, Wendon III Edition 1996
3. Handbook of Textile Testing and Quality Control Grover and Hamby Wiley Eastern Pvt. Ltd., New Delhi 1969
4. Physical Properties of textile fibres Morton and Hearle The Textile Institute, Manchester. 2008
5. Textile Testing John H Skinkle Tarapurwala sons and co. Pvt Ltd 1949
6. Characteristics of raw cotton E Lord Textile Institute. 1961

ference Books

1. B.I.S. Handbook BIS BIS publications 2000
2. B.S. Handbook G. Weston BS publications 2009
3. Textile Testing James Lomak, Longmans Green and Co. London 2002
4. ASTM standard ASTM USA ASTM publication 1985
5. Cotton assessment and appreciation SITRA Norms and Procedures SITRA, Coimbatore 1017

Web links and Video Lectures (e-Resources):

- NPTEL lecture series
- YouTube simulation videos

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

Practical classes. Seminars in group.

TECHNICAL TEXTILES		Semester	VI
Course Code	**BTX613A**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40-45	Total Marks	100
Credits	03	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

The objective of this Course is to make students understand:

1. Basics of technical textiles
2. Different types of technical textiles
3. Various fibres and fabrics used for production of technical textiles
4. Various applications of technical textiles in industries

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

Module-1

INTRODUCTION TO TECHNICAL TEXTILES- Requirements of fibres, yarns and fabrics for technical textiles. Classification of technical textiles. Study of properties of various fibres used for technical textiles. AGROTECH: Textiles used for agriculture, Horticulture and animal husbandry.

MOBIL TECH - AUTOMOTIVE TEXTILES - Use of textiles in tyres, requirements of fibres used for tyres, various fibres used for tyre cords, tire building, different types of tyres. Upholstery in automobiles: vehicle top covers, seat covers, headliners, carpets etc. Safety devices in automobiles: seat belts, airbags, helmets etc. Textiles used in Aerospace industry.

Module-2

MEDICAL TEXTILES: Medical application of Textiles, requirements, classification, detailed study of application of textiles in implantable, non-implantable, extra corporal devices and health care hygienic products.

GEO TEXTILES: Definition, textile fibres and fabrics used, functions of geo-textiles. Applications of geotextiles and geomembranes in civil engineering i.e. roads, railways, bridge, dam construction, soil erosion etc.

Module-3

TEXTILES IN FILTERATION: Introduction, types of filtration requirements, filtration mechanisms, Effect of yarns and fabric construction on filtration. Methods/types of filtration. COATED FABRICS: Introduction, chemistry of coated textiles, thermoplastic polymers for coating, coating techniques, fusible interlining.

Module-4

SMART TEXTILES: Introduction, concept of smart textiles, various applications of smart textiles. Introduction to nanotechnology in textiles. Application of Nano textiles in various field. Production and properties of Nanofibres. Fibre Reinforced Composites – meaning, classification, brief outline on raw materials, production techniques and applications.

Module-5

TEXTILES IN DEFENSE: Introduction, historical back ground, criteria for modern military textiles, textiles for environmental protection, Ballistic protective materials, water proof materials, application of textiles in camouflage. Application of Textiles in Packing, Power transmission, fish nets, sports.

Course outcome (Course Skill Set)

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

1. This subject helps the student to acquire knowledge of various technical textiles used in industries
2. This subject prepares the student work in technical textile manufacturing industry.
3. Students are exposed to research field in technical textiles and their applications in various industries.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

20. **Hand book of Technical Textiles** -A. R. Horrocks, S.C. Anand Wood Head Pub., England 2000
21. **Hand book of Industrial Textiles** -S. Adanur Lancaster-Basel 1995
22. **Smart Fibres - Fabrics & Clothing** -Xiaoming Tao Wood Head Pub., England 2001
23. **Design of Textiles For Industrial** -P.W. Harrison Textile Institute, Manchester 1977

Reference Books

1. **Hand book of Industrial Textiles** -R. Kaswell Willington, New York 1963
2. **Industrial Textiles** -P.K.Badami
3. **International Seminar on Technical Textiles** -SASMIRA SASMIRA 2000

Web links and Video Lectures (e-Resources):
NPTEL course on technical textiles
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning Visit to technical textile industries, group seminars, survey projects etc.

TQM IN TEXTILE INDUSTRY		Semester	VI
Course Code	**BTX613B**	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40-45	Total Marks	100
Credits	03	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

1. To make the students to understand and acquire the concepts of Total Quality Management tools
2. It helps the Students to apply the TQM concepts in Textile/Garment manufacturing industries
3. Students are exposed to TQM principles and concepts so that they apply these concepts in the actual work environment for maximum benefits.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes:

1. Apart from conventional lecturer methods various types of innovative teaching techniquesthrough videos, may be adopted so that the delivered lesson can progress the students in theoretical and applied analysing skills.
2. Seminars may be arranged for students to develop these subject skills.
3. To encourage the students for group learning to improve their creativity and communicationskills.
4. To support and guide the students for self-study.
5. Encourage students to visit and observe working of TQM concepts in various Textile and Garment Industries.

Module-1

Introduction to TQM. Quality movement in Japan, US & India. Definition of quality. Small q & Big Q, Quality characteristics - Views, Dimensions, Determinants. Quality & Profitability. **PRINCIPLES OF TOTAL QUALITY,** Evolution of total quality and control. **TQM –** Basic concepts & overview. Necessity of TQM. Elements of TQM, benefits of TQM, TQM in services, ISO9000 & ISO 14000 in quality management system.

Module-2

QUALITY & MANAGEMENT PHILOSOPHIES

Deming Philosophy: Chain reaction, 14 points for management, triangle theory of variance, deadly diseases & sins, Deming's wheel.

Juran's Philosophy: 10 steps for quality improvement, quality trilogy, universal breakthroughsequence.

Crosby Philosophy: Crosby's 6 C's, Absolutes of quality, Crosby's 14 points for quality, Crosby triangle. Comparison of 3 major quality philosophies

Module-3

MANAGING QUALITY- Traditional Vs Modern quality management, the quality planning, road map, the quality cycle. Cost of quality- Methods to reduce cost of quality, Sampling plans, O.C. curve. **QUALITY CONTROL** - Objectives of quality control, Strategy & policy. Company wise quality control. Quality Assurance- Definition, concepts & objectives. Economic models for quality assurance. Statistical methodology in quality assurance. Process capability ratio, 6 sigma in quality Assurance.

Module-4

FOCUSSING ON CUSTOMER -Importance of customer satisfaction, Kano's model of customer's satisfaction, customers driven quality cycle, understanding customer's needs & wants, customer's retention.

LEADERSHIP- Introduction, characteristics of quality leaders, role of TQM in leadership. Tools &Techniques of TQM, **Just in time system**-Concepts, objectives, overview, characteristics, benefits.

Benchmarking: Introduction, process of bench marking, benefits, advantages & limitations.

Module-5

SUPPLY CHAIN MANAGEMENT - Objectives, process tools, supply chain management for manufacturing organization & service organization.

World class manufacturing - becoming world class, relevance of TQM in world classmanufacturing.

World class supplier, world-class customer, present global business conditions, world class companies in 21st century.

Course outcome (Course Skill Set)

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

1. Define and explain about basic concepts TQM.
2. Explain about Quality and management Philosophy.
3. Classify and discuss about managing quality and quality control
4. Summarize and discuss the role of TQM in leadership and tools and techniques of TQM.
5. Illustrate and discuss about Supply chain management.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

Text Books

1. **Total Quality Management,** K. Shridhara Bhat, Himalaya Publishing House, 2010
2. **Total Quality Management,** N.V.R. Naidu, K.M. Babu, New age international publishers

Reference Books

1. **Norms For Spinning,** Weaving and Processing, ATIRA Publication, Ahmadabad, 1990

Handbooks manuals, BIS, ASTM, ISO-9000

Web links and Video Lectures (e-Resources):

Web links and Video Lectures (e-Resources):

- https://asq.org/quality-resources/total-quality-management
- www.investopedia.com/terms/t/total-quality-management-tqm.asp
- https://www.youtube.com/watch?v=oMYqqAbsEXo
- https://www.youtube.com/watch?v=SMOQV2CyVQo
- https://www.youtube.com/watch?v=SMOQV2CyVQo&list=RDCMUC640y4UvDAlya_WOj5U4pfA&start_radio=1&rv=SMOQV2CyVQo&t=28
- https://www.youtube.com/watch?v=ksR4Xy6tFcM
- https://www.youtube.com/watch?v=YKwcxjUnots

https://www.youtube.com/watch?v=DJPXQ7OU7qo
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning **Activity Based Learning (Suggested Activities in Class)/ Practical Based learning** • https://www.isixsigma.com/methodology/total-quality-management-tqm/applying-total-quality-management-academics/ https://www.slideshare.net/justinsolin/total-quality-management-56112246

APPAREL QUALITY ASSURANCE		Semester	VI
Course Code	**BTX613C**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40-45	Total Marks	100
Credits	03	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

- To import skills for analysis of garment specification sheets and to translate them into qualityoutput.
- To familiarize students with advanced apparel quality tests and standards.
- To make students to understand the importance of quality assurance in the manufacture ofapparels in apparel industry.
- To enable the students to understand the production planning in garment industry.
- To emphasis on the improved methods of material control in apparel production
- To acquaint student with quality concepts for implementing quality in apparel production

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes:

1. Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adopted so that the delivered lesson can progress the students in theoretical, applied and practical skills.
2. Seminars and Quizzes may be arranged for students in respective subjects to develop skills.
3. Encourage the students for group learning to improve their creativity and analytical skills.
4. Support and guide the students for self-study.
5. Encourage students to observe working of various apparel manufacturing machineries tounderstand quality aspects.
6. Actual production of apparels can be demonstrated to students by taking them to apparelindustries.
7. Encourage students to observe quality control tools used in the apparel manufacturing industries.

Module-1

Introduction to quality control: Definition of quality, importance of quality assurance, evaluation of quality, quality planning, quality control, total quality management, IPQC, AQL, IMIL standard and final inspection.

Module-2

Quality management systems- organising, planning and implementation. Importance of quality assurance in textile and apparel industries, various tools used for quality assurance.Tools for quality assurance

Module-3

Care labelling: Introduction, labelling parameters, fibre content, wash care labels. Labelling systems- Canadian, American, European, Australian, Sweden, UK, Germany, Japan and Indian. Regulations for labelling parameters. Eco-labelling.

Module-4

Accessories testing, inspecting garments using spec sheets, inspecting garments using measuring tapes/without using measuring tapes, Button quality testing, interlining quality testing, packing a shirtand identifying faults.

Module-5

Applying quality assurance programmes in fabric department, cutting department, sewing production department and finishing department. Garment quality tests for dimensions, fabric constructions,weight, stitch lines, seams, special stitches, and finishes.

Course outcome (Course Skill Set)

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

1. Method and principle involved in inspection/testing of fabric, zippers, buttons, sewing threads etc.
2. Understand the quality parameters of textile materials.
3. Understand Production planning in apparel industry
4. Accessories testing and quality control in apparel industry
5. Summarize the applications of quality assurance in apparel industries.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Pradip V Mehta, Quality Control in Apparel Industry, NIFT Publication, New Delhi, 2001.

2. Sara J Kadolph, Quality Assurance for Textiles and Apparels, Fairchild Publications, 2nd Edition,2007.
3. Harold Care & Barbar Latham, The Technology of Clothing Manufacture, Oxford Publication,USA, 1994.
4. Ruth E C, Apparel Manufacturing and Sewn Product Analysis.
5. Pradip V Mehta, Introduction to Quality Control, ASCQ quality Press, Marcel Dekker Inc., New York, 1992.

Reference books:

1. Garry Cooklin, Introduction to Clothing Manufacture, Blackwell Science, UK, 1991.
2. Chulter A J, Introduction to Clothing Production Management, Blackwell Science, UK, 1998.
3. "Apparel Production Handbook", Jacob Solinger., Reinhold Publications, 1998,
4. "Introduction to Clothing Production Management", Chuter A.J., Blackwell ScientificPublications,Oxford, 2001

Web links and Video Lectures (e-Resources):

- NPTEL course on quality assurance: https://nptel.ac.in/courses/
- NPTEL course on total quality management: https://nptel.ac.in/courses/
- NPTEL course on quality control: https://nptel.ac.in/courses/
- Apparel quality control & quality assurance: https://www.slideshare.net/SAMultimedia/apparel-quality-control-quality-assurance
- Apparel quality assurance: https://textilelearner.net/?s=Apparel+quality+assurance

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Collection of apparel quality assurance data from literature and studying their qualityassurance concepts.
- Seminars, quizzes, group discussions, seminars and report writing on various apparel qualityassurance concepts.
- Observing machineries in apparel manufacturing industries and calculating various apparelquality assurance parameters.
- Practical exposure to various apparel quality parameters and demonstration.

INDUSTRIAL ENGINEERING IN TEXTILE AND APPAREL INDUSTRY		Semester	VI
Course Code	**BTX613D**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination nature (SEE)	**Theory**		

Course objectives:

- Understand the importance of Industrial engineers and industrial Engineering department in Textile and Garment Industry.
- This course will enable the students to get familiarized with plant location, layout, work study and time study concepts.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes:

1. State the importance of Industrial engineering through related videos
2. Seminars & Quizzes may be arranged in respective topics to develop skills
3. Arrange Industrial visits to understand practically the duties of Industrial engineer.
4. Support and guide the students for Self study.

Module-1

Importance of Industrial Engineering department in Textile and Garment Industry. Position of Industrial Engineering department in industry. Management, Administration and organization. Professional and scientific Management. Difference between management and administration. Study of different types of organization

Module-2

Plant location and Plant layout. Definition of plant location. Factors influencing the plant location. Types of Plant location and their advantages and limitations. Plant layout. Definition of Plant layout. Objects of Scientific layout. Principles of Layout. Types of layout and their detailed study

Module-3

Work study and its importance definition of work-study. Success of organization through work-study Technique. Objects of work study. Problems of work study. Method study and its objects. Steps of method study and detailed study of each step. Determination of new method to complete each activity in industry.

Module-4

Time study. Definition of Time study and its objects. Detailed study of each steps of Time study. Determination of Normal time, Observed time and Standard time. Study of different types of allowances. Study of Decimal minute stop watch for recording all the activities.

Module-5

PLANNING AND FORECASTING: planning and its concept in industry. Detailed study of TEAM work, SMART and POSDCORB and SWOT analysis. Production planning and Control (PPC). Importance of PPC and its detailed study in Industry. Study of Value of money, Inflation and Deflation currency, Supply and Demand factor and its impact on society

Course outcome (Course Skill Set)

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

1: Explain the importance of Industrial engineers and industrial engineering department in Textile and Garment Industry.

2: Demonstrate Plant location and Plant layout

3: Explain Work study and its importance & Method study and its objects

4: Explain Method study and its objects & Study of different types of allowances

5: Explain the Production planning and Control (PPC).

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Production and Operations Management, R. Paneerselvam Prentice Hall of India 2002
2. Strategic operations Management Robert H. Lowson Vikas Publishing House 2003

Reference Books

1. Production and operations management Thomas E Morton Vikas Publishing House,First Indian reprint 2003
2. Computer Aided Production Management Mahapatra P B Prentice Hall of India 2001
3. Production Management Martand T Telsang S Chand and Company 2003

Technology of Fibre to Fabric		Semester	VI
Course Code	**BTX654A**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40-45	Total Marks	100
Credits	03	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives

- Complete knowledge of textiles will facilitate the ability to distinguish quality in fabrics.
- Students will know how to buy textile product and what to buy.
- Information can be easily understood and consequently very useful to the students in businessand personal life.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Use the related videos of Textile machineries so that student can understand more easily.
2. Show students the different samples of the fabric and ask them to identify the fibres.
3. Inspire the students to have collaborative learning in the class.
4. Support and guide the students for Self-study.

Module-1

FIBRES TO YARNS: Introduction to Fibres. Yarn Formation: Brief introduction of all spinning process including Open end spinning.(No passage of material & calculation).Introduction to count system and calculations .Textured & stretch yarns: comfort, service & appearance.

Module-2

YARNS TO FABRICS: Introduction to weaving with the mechanisms. Brief study about weaves such as Plain, Twill, satin, etc. Different types of selvedge. Introduction to Knitting & Non-woven fabric formation.

Module-3

Fabric preparation for consumer goods: Finishing processes like preparatory, stabilizing & texturizing with their functional effects .Dyeing and Printing.

Module-4

Introduction to Natural fibres: Cotton, Linen, Wool & Hair, Silk, Vegetable and mineral fibres.

Module-5

Introduction to Manmade Fibres: Rayon , Acetate & Triacetate , Nylon , Aramid , Polyester, Acrylic, Modacrylic , Spandex, Polypropylene.

Course outcome (Course Skill Set)

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

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

1. Method and principle involved in fibre to yarn formation and method of yarn count calculations.
2. Understand the method of fabric formations and machineries used for fabric formations.
3. Understand fabric dyeing and printing, finishing of fabrics in industry
4. Types of natural fibres and their end uses
5. Types of manmade fibres and their end uses.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books. TEXTILES ,Fiber to Fabric ,Bernard P Corbman, MC.GRAW-HILL publication

2. Manual of Cotton Spinning Coulson. A.F.W.(Ed.),Vol. I to IV Textile Institute, Manchester,1958
3. Series on Textile processing Zaloski.S ,The Institute of Textile Technology, USA1983
4. Technology of short-staple spinning, Klein. W. Vol .I, II, III and IV, Textile Institute Pub.,Manchester,1989.

Web links and Video Lectures (e-Resources):

- https://youtu.be/7h4MvoZt60E

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Ask the students to collect different fibres, yarns and fabrics having different weaves. Obtain different samples of fabrics used in cotton clothing. Attach to each a record showing the name of the fabric, kinds of yarns, weave, thread count, and finish .State the uses and relative durability of each sample.

POLYMER AND FIBRE SCIENCE		Semester	VI
Course Code	**BTX654B**	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40-45	Total Marks	100
Credits	03	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

This course aims at making engineering students to have knowledge in the fields of polymer and fibres which have wide variety of applications in various fields.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adopted so that the delivered lesson can progress the students in theoretical, applied and practical skills. Seminars and Quizzes may be arranged for students in respective subjects to develop skills. Encourage the students for group learning to improve their creativity and analytical skills. Support and guide the students for self-study.

Module-1

Introduction to polymers. Historical back ground, nomenclature, classification of polymers. Different methods of production of polymers, general applications of polymers.

Module-2

Kinetics of addition polymerization, Carothers equation, polymerization techniques Characterization of polymers for molecular weight, importance of molecular weight of polymers. Copolymerization. Different techniques of processing of polymers.

Module-3

Introduction to textile fibres, requirement of polymers for converting in to fibres, primary and secondary properties of fibres. Brief details on production and properties and applications of cotton, silk, wool, bast, banana and coir fibres.

Module-4

Introduction to manufactured fibres, comparison of manufactured fibres with natural fibres. Outline of various methods of production of manufactured fibres. Production and properties of regenerated cellulosic fibres.

Module-5

Need for production of synthetic fibres, environmental concern related synthetic fibres, Brief outline on production, Properties and applications of PET, Nylon-6, Nylon-66, PP and acrylic fibres, Introduction to high-performance and speciality fibres.

Course outcome (Course Skill Set)

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

1. Recognise the need for polymers, classify the polymers and explain methods of production of polymers
2. Describe kinetics of polymerization, molecular weight determination, techniques of polymerization and copolymerization.

3. Identify the need for textile fibres, classify the textile fibres and explain cotton, wool, silk, bast and coir fibres.
4. Compare natural and manufactured fibres, explain the methods of production of manufactured fibres and regenerated fibres.
5. Summarize the production, Properties and applications of PET, Nylon-6, Nylon-66, PP and acrylic fibres

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. **Text book of polymer Science**, Billmeyer.W., Wiley Int.Sc. New York 1984.
2. **Polymer Science,** Gowarikar V.R., Vishwanathan N.V., Jayadev Sridhara, Wiley EasternLtd., New Delhi,
3. **Book of Textile fibre,** Cook J. Vol.1 & II, Marrow Wat Ford, England.
4. **Textile fibres,** Shenai V.A., Sevak Bombay, 1980.
5. **Manufactured fibre technology,** Gupta V.B, Kothari V.K., Chapman Hall, London1997.

Web links and Video Lectures (e-Resources):

- NPTEL courses on polymer science and textile fibres and manufactured fibre technology

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Few practical classes may be conducted by demonstrating polymer production, fibre production.
- Students may be taken to nearby textile industries to demonstrate processing of textile fibres.

APPLICATION OF NANO TECHNOLOGY IN TEXTILES		Semester	VI
Course Code	**BTX654C**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40-45	Total Marks	100
Credits	03	Exam Hours	03
Examination nature (SEE)	**Theory**		

Course objectives:

- To teach the concept of Nano technology and its application in textiles.
- To educate the production of nano fibres by different process.
- To impart knowledge on Nano composites and their properties.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. State the importance of Nano technology through related videos.
2. Seminars & Quizzes may be arranged in respective topics to develop skills.
3. Inspire the students by giving examples of nano textiles applications in various fields.
4. Support and guide the students for Self-study.

Module-1

Nano fibres: Process: Electro spinning – properties – improvement – fibre morphology – fibre alignment. Bi-component cross sectional Nano fibre.

Module-2

Nanotubes and Nano Composites: Carbon nano tubes: synthesis – characterization techniques – nano tubes – Polymer fibres – structures –production process – properties – fibre morphology. Carbon nano tubes applications.

Module-3

Nanofiller Polypropylene Fibres: Polymer layered silicate nano composites: structure and properties– Nano composites Dyeing of Polypropylene – Modified propylene for improved dyeability.Assessment of dyed polypropylene.

Module-4

Nano Coating of Textiles: Surface modification techniques – anti-adhesive nano coating of fibre and textiles – water and oil repellent coating, self-cleaning. Functional textiles: protection – applications.Applications of nano coated textiles for filtration.

Module-5

Hybrid Polymer Nanolayers: Thin hybrid film – smart textiles – polymer to polymer hybrid layers –polymer to particles hybrid layers. Nanofabrication of thin polymer fibre – "Grafting from" and "Grafting to" techniques for synthesis of polymer films, synthesis of smart switchable coatings.Synthesis of hydrophobic materials.

Course outcome (Course Skill Set)

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

1. Describe the basics of Nano fibres
2. Introduces to production process of Nano composites and their properties
3. Discusses about Polymer layered silicate nano composites: structure and properties and theirDyeing mehods

4. Describe the Surface modification techniques using Nano coating
5. Introduces to Hybrid Polymer Nano layers and Synthesis of hydrophobic material

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Nanofibres and Nanotechnology in TextilesP. J. Brown and K. Stevens Woodhead PublishingLimited, England 2007
2. Springer Handbook of Nanotechnology Bharath Bhushan Springe 2004
3. Synthesis of various forms of Carbon Nanotubes H. Zeng, L.Zhu, G. Hao and R. ShengAC ArcDischarge 1998
4. Carbon Nanofibres for Composites Applications E. Hammel, X. Tang, M.Trampert, T. Schmitt, K.Mauthner, Woodhead Publishing Limited, England 2004

Web links and Video Lectures (e-Resources):

- NPTEL course on Nano technology

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Group seminars.

FASHION DESIGNING		Semester	VI
Course Code	**BTX654D**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40-45	Total Marks	100
Credits	03	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives: Students will have knowledge about fashion designing.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes

1. Seminars & Quizzes may be arranged in respective topics to develop skills.
2. Inspire the students by giving details of different fashion designing concepts.
3. Support and guide the students for Self-study.

Module-1

Fashion: Introduction to fashion and apparel design. Origin of fashion, concept, analysis, trends and creations.
Fashion Theories: Fashion of different eras, French and Greek revolutions, fashion promotion,style-fad-trends.

Module-2

Fashion Design fundamentals: Basic concept of design, elements of art, Definition of line shape, form, size, space, texture and colour. Structural and decorative dress designing, creatingvarieties through designs.

Module-3

Principles of Design: Definition Harmony, Proportion, Balance, Rhythm, Emphasis, meaningtypes and application on apparel psychology of clothing.
Anatomy for designers: Human Proportion and figure construction. Methods of determiningindividual proportions.

Module-4

Psychology of Clothes: First impression, role of socio- psychological and economical aspects.
Display of fashion materials: definition and importance, source technique and window display, classic fashion shows. Important fashion centers of the world and India.

Module-5

Computer aided designing: Fashion sketching, colour matching and computer graphics.
Folios: Creative, Dress, designer.

Course outcome (Course Skill Set)

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

1. Garment is designed by emphasizing the fashion and the fashion and consumer psychology viz. Fashion theories.
2. Study of fashion of different eras.
3. Study of French and greek revolutions.
4. Study of fashion promotion, style-fad-trends.

5. Study of fashion design fundamentals.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

TEXTILE TESTING LAB-I		Semester	VI
Course Code	**BTXL606**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:0:2	SEE Marks	50
Credits	01	Exam Hours	03
Examination nature (SEE)	Practical		

Course objectives:

The students are to learn the testing of various fibres and yarns for their various quality parameters. To learn operating instruments, settings, calibration, tabulation of test data, calculations, analysis of teat results and draw conclusions.

Sl.NO	Experiments
1	Identification of textile fibres by using microscope.
2	Identification of textile fibres by burning and chemical tests.
3	Determination of cotton fibre maturity by Causticaire method.
4	Determination of fibre length parameters by Baer sorter.
5	Determination of fibre fineness by Air-flow method.
6	Determination of moisture content and regain of textile materials.
7	Determination of yarn count.
8	Determination of single and ply yarn twist.
	Demonstration Experiments (For CIE)
9	Determination of fibre strength using Stelometer.
10	Determination of lea strength and CSP.
11	Determination of single yarn strength, elongation and RKM calculations.
12	Determination of tensile strength of sewing threads.

Course outcomes (Course Skill Set):

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

1. Students are able to understand quality of fibres and yarns.
2. Students are able to test the materials using instruments and methods.
3. Students are able to tabulate the test results and learn calculation s involved.
4. Students are able to analyse the test results and draw conclusions

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.

The minimum duration of SEE is 02 hours

PATTERN ENGINEERING AND DRAPING OF GARMENTS		Semester	VI
Course Code	**BTX657A**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	0:0:1:0	SEE Marks	50
Total Hours of Pedagogy	15	Total Marks	100
Credits	01	Exam Hours	01
Examination type (SEE)	**Theory(GENERAL QUESTION PAPER TYPE)**		

Course objectives:

- To provide opportunity for skill development in development of patterns for garment construction.
- To impart knowledge on fashion accessories and creativity.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Conduct seminars and group activities related to the course.
2. Motivate students to take up self-study.
3. Motivate students to take part in various fashion designing activities conducted in the state.

Module-1

Patterns – definition and types- individual and commercial patterns. Pattern making – definition and types of patterns making- drafting, draping, flat pattern techniques, their advantages and Disadvantages. Tools for pattern making. Body measurements – importance, principles, Precautions. Definition and standardization of size chart (ASTM Standards)

Module-2

Basic principles and methodologies used to draft standard basic block patterns for men, women and kids wear- top, skirt and bifurcated garment (pyjama).
Pattern details –pattern name, cut number, on fold details, drill hole marks, darts, Seam allowances, notches, Balances marks and grain lines.

Module-3

Draping - Tools for Draping. Draping skills – preparation of basic blocks- bodice, skirt, sleeve and trouser

Module-4

Dart Manipulation – basic techniques – pivot method, slash and spread, measurement method. Applications of dart manipulation on bodice with darts on shoulder, armhole, side seam and Waistline.

Module-5

Grading – Definition, Principles and types –manual grading and computerized grading for bodice block, sleeve and skirt.

Course outcome (Course Skill Set)

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

- Define and classify the patterns and memorize the steps involved in taking body measurement
- Prepare the basic block patterns for men, women and kids wear based on the principles and methodologies of drafting
- Prepare patterns for basic blocks using draping techniques

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous internal Examination (CIE)

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of the 01 marks. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is **01 hour.** The student has to secure a minimum of 35% of the maximum marks meant for SEE.

OR

MCQ (Multiple Choice Questions) are preferred for 01 credit courses, however, if course content demands the general question paper pattern that followed for 03 credit course, then

- The question paper will have ten questions. Each question is set for 10 marks.
- There will be 2 questions from each module. Each of the two questions under a module may or may not have the sub-questions (with maximum sub-questions of 02, with marks distributions 5+5, 4+6, 3+7).
- The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources:

Books

24. Helen Joseph Armstrong, "Pattern Making for Fashion Design" Pearson Education (Singapore)Pvt. Ltd.,2005
25. Winifred Aldrich, "Metric Pattern Cutting" Blackwell Science Ltd., 1994
26. Amaden-Crawford Connie, "The Art of Fashion Draping (3rd edition)" Om Books International Publications, 2005
27. Hollen Norma R; Kundel Carlyn, "Pattern making by the flat pattern method", 1998
28. Gillian Holman, "Pattern Cutting Made Easy", Blackwell Scientific Publications, 1997.
29. Natalie Bray "More Dress Pattern Designing" Blackwell Scientific Publications, 1986.
30. Gerry Cooklin, "Master Patterns and Grading for Women's Outsizes", Blackwell Scientific Publications, 1995.
31. Gerry Cooklin, "Master Patterns and Grading for Men's Outsize", Blackwell Scientific Publications, 1992.

32. Jeenne Price and Bernard Zamkoff, “Grading Techniques for Modern Design” Fairchild Publications, 1990.
33. Helen J. Armstrong, ―Pattern Making for fashion design‖ Prentice Hal (2000)
34. Winfred Aldrich, ―Metric Pattern Cutting‖, Black Well Science, UK

FASHION ACCESSORIES- LAB		Semester	VI
Course Code	**BTXL657B**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	50
Credits	01	Exam Hours	03
Examination nature (SEE)	**Practical**		

Course objectives:

- To make the students to learn about fashion accessories

Sl.NO	Experiments
1	Sketching and rendering of headgear like headband, hat, headscarves, skull caps, etc., (3 each). Construction of any two designs.
2	Sketching and rendering of handbags for women and girls (theme based).
3	Sketching and rendering of footwear (theme based).
4	Sketching and rendering of ties and bows for men and women (theme based).
5	Sketching and rendering of belts (theme based).
6	Sketching and rendering of different types scarves (theme based).
7	Sketching of accessories on sunglasses and hair accessories
8	Sketching of Indian jewellery – Traditional Indian jewellery.
9	Sketching of Indian jewellery – Modern Indian jewellery.
10	Sketching of Indian jewellery - Fashion jewellery.
	Demonstration Experiments (For CIE)
11	A market survey and report on fashion trends and development of accessories folio.
12	Creation of accessories (theme based) - Earring, hand wear, neck wear, finger wear, anklet and waist wear (one full set).

Course outcomes (Course Skill Set):

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

1.Sketch the fashion accessories

2. Create fashion accessories

3. survey and prepare report on fashion trends.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.
The minimum duration of SEE is 02 hours

COMPUTER AIDED TEXTILE DESIGNING- LAB		Semester	VI
Course Code	**BTXL657C**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	50
Credits	01	Exam Hours	03
Examination nature (SEE)	**Practical**		

Course objectives:

- Make students have knowledge of Computer aided textile design.

Sl.NO	Experiments
1	Types of computer graphics.
2	Colour basics.
3	Tools used for image creation and editing.
4	Construction of simple design.
5	Creating and construction of stripes and checks.
6	Use of yarn options for developing dobby designs.
7	Use of effect menu for dobby designing.
8	Creating fancy yarns using yarn-2000 software.
	Demonstration Experiments (For CIE)
9	Construction of jacquard designs using jacweave 2000 software.
10	Developing of printing designs and layer separation.
11	Designing of garments using TUKA CAD software.
12	3D simulation of fabric on a model.

Course outcomes (Course Skill Set):

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

- Create textile designs
- Illustrate the preparation of design for weaving
- Demonstrate the simulation of fabric design to view the appearance of the fabric

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.

The minimum duration of SEE is 02 hours

TEXTILE RECYCLING AND FASHION UP CYCLING –LAB		Semester	VI
Course Code	**BTXL657D**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	50
Credits	01	Exam Hours	01
Examination nature (SEE)	**Practical**		

Course objectives:

-

Sl.NO	Experiments
1	Conversion of Ladies T shirt into Kids Nightwear.
2	Conversion of Ladies T shirt and tank top into Kid's Frock.
3	Conversion of T shirt and tank top into Kid's a line skirt.
4	Conversion of Nighty and Frock into Kid's Frock
5	Conversion of T shirt into Baby Frock
6	Conversion of T shirt into kid's night pant
7	Conversion of old shawls and turn them into a skirt
8	Turn old jeans into a denim headband.
9	Convert fabric from used garments into throw pillows.
10	Design reusable shopping bag using used garments.
	Demonstration Experiments (For CIE)
11	Illustration based on theme 'reimagine previously used items as wearable designs.
12	Demonstration of all the products developed using fabric obtained from used garments.

Course outcomes (Course Skill Set):

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

- Convert ladies T shirts to useful product
- Create useful products from old denims. Shawls
- Illustrate use of old garments.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero. The minimum duration of SEE is 02 hours
Suggested Learning Resources: 4. Textiles and Clothing Sustainability Recycled and Upcycled Textiles and Fashion, Springer Nature.

VII SEMESTER

TEXTILE TESTING-II		Semester	VII
Course Code	**BTX701**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory + 8-10 Lab slots	Total Marks	100
Credits	04	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

The objective of this Course is to make students to

- Explain the importance of yarn and fabric testing and quality control in textile industry.
- Demonstrate different methods, standards, principles and working of instruments used fortesting of evenness of yarns and various fabric properties.
- Evaluate evenness of yarns and fabric properties, calculate and analyse the test results. Compare and draw suitable conclusions
- Evaluate and analyse the effects of various parameters affecting test results
- Demonstrate various settings and calibration of testing equipment
- Explain the use of modern technology in the measurement of yarn evenness and properties of fabrics.

Teaching-Learning Process (General Instructions)

These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes.

- Apart from conventional lecture methods various types of innovative teaching techniques through videos, working models, animation films may be adopted so that the delivered lessoncan progress the students in theoretical, applied and practical skills.
- Hands on training may be arranged for students to learn practical aspects.
- Encourage the students to learn machinery operations various settings and maintenance.
- Support and guide the students for self-study.

MODULE-1

Evenness of various textile strands such as sliver, roving & yarns – random variation, periodic variation, Index of irregularity, Variance-length curves and their importance, Methods of measurement of evenness, principles of various evenness testers & measurement of evenness. Mass variation diagram & spectrogram & its importance. Causes & effects of irregularity in textile strands. Yarn hairiness and its measurements.

MODULE-2

Determination of fabric length, width, thickness, weight, thread density and crimp. Determination of air permeability, water vapour permeability, thermal conductivity and thermal comforts. Flammability of fabrics-Definitions, parameters and measurement. Fabric shrinkage- importance and measurement.

MODULE-3

Determination of fabric tensile, tearing and bursting strength. Determination of stiffness, crease, drape of fabrics. Fabric hand and its importance, determination and interpretation of fabric hand test results. Measurement of fabric hand by KES and FAST system and its application in apparel production.

MODULE-4

Water & fabric relationship. Study of water penetration, wetting of apparels, water repellence of industrial fabrics. Penetration of fabrics by water under pressure. Serviceability, wear, abrasion resistance and Pilling resistance.
MODULE-5
Apparel testing and quality control - Fabric inspection, estimation of colour fastness of fabrics. Sewability formability, tailor ability of fabrics. Seams, stitches and determination of seam strength and seam slippage and seam efficiency. Quality control in apparel industry and quality management tools.

PRACTICAL COMPONENT OF IPCC

Sl.NO	Experiments
1	Determination of yarn evenness by visual examination.
2	Determination of geometrical properties of fabrics.
3	Determination of Air Permeability of fabrics.
4	Determination of crease recovery property of fabrics.
5	Determination of drape co-efficient of fabrics.
6	Determination of fabric stiffness and its parameters.
7	Determination of fabric strength and elongation.
8	Determination of fabric tearing strength.
9	Determination of fabric bursting strength.
10	Determination of abrasion resistance of fabrics.
11	Determination of colour fastness of dyed and printed fabrics for washing.
12	Determination of colour fastness of dyed and printed fabrics for perspiration.

Course outcomes (Course Skill Set):

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

- Explain the importance and necessity of determination of evenness of yarns and properties of fabrics
- Use of suitable equipment for the measurement of yarn evenness and properties of fabrics using appropriate method, standard and techniques. Demonstrate the principle and working of testing instruments
- Show the calculations, tabulation of test results, and analysis of test data and interpretation of test results.
- Explain the test parameters and their effects on quality parameters of textile materials
- Analyse the causes for poor quality of yarns and their effects on end products and the effect of them on performance of fabrics.

- Evaluate and demonstrate the determination of apparel quality and the parameters involved.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CIE for the theory component of the IPCC (maximum marks 50)

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks)**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
- The laboratory test **(duration 02/03 hours)** after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks.**
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scoredby the student shall be proportionally scaled down to 50 Marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

Suggested Learning Resources:

Books:

1. Physical testing of textiles B.P. Soville Wood Head 1999
2. Principles of Textile Testing Booth J. E Butterworth, Wendon III Edition 1996
3. Handbook of Textile Testing and Quality Control Grover and Hamby Wiley Eastern Pvt. Ltd., New Delhi 1969
4. Physical Properties of textile fibres Morton and Hearle The Textile Institute, Manchester. 2008
5. Textile Testing John H Skinkle New York, N.Y., Chemical Pub. Co. 1949

Reference Books

1. B.I.S. Handbook BIS BIS publications 2000
2. B.S. Handbook G. Weston BS publications 2009
3. Textile Testing James Lomak, Longmans Green and Co. London 2002
4. ASTM standard ASTM USA ASTM publication 1985
5. Cotton assessment and appreciation SITRA Norms and procedures SITRA, Coimbatore 1017

Web links and Video Lectures (e-Resources):

- NPTEL lecture series
- YouTube simulation videos

KNITTING AND NON-WOVEN TECHNOLOGY		Semester	VII
Course Code	**BTX702**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory + 8-10 Lab slots	Total Marks	100
Credits	04	Exam Hours	03
Examination nature (SEE)	**Theory**		

Course objectives:

- The objective of the course gives the knowledge to the students in Production technology of knitted fabric, structure, machines and their parameters.
- It also helps acquire the knowledge in nonwoven fabric, production, uses and processing parameters

Teaching-Learning Process (General Instructions)

These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes.

1. Student can able to work in knitting industry as production engineer, quality controller, industrial engineer, managers etc.

MODULE-1

Knitting industry position in India, basic terms and principles used in knitting technology, knitting elements, fundamentals of knitted structure, comparison between warp and weft knitting. Primary weft knit structures-plain, pearl and interlocks production and their properties.

MODULE-2

Types of knitting machines-circular and flat bed machine. Study of knit, float and tuck stitches- effects and there uses. Ornamentation of basic weft knit structure.

MODULE-3

Double knits, needle selection devices like pattern drum. Knit fabric geometry, tightness factor, robbing back and needle bounce. Types of positive feeders and their importance. Introduction to warp knitting.

MODULE-4

Introduction to nonwoven fabric and other fabric forming methods. Classification of nonwoven fabric, fibres used. Manufacture of nonwoven fabric, needle punched fabric, spun-bonded fabric.

MODULE-5

Applications of nonwoven fabric, stitch bonded fabric and their characteristics, testing of nonwoven fabric.

PRACTICAL COMPONENT OF IPCC

Sl.NO	Experiments
1	Study of passage of material through circular single jersey knitting machine and their important parts
2	Study of knitting elements like needle , sinker, cam positive feeder
3	Driving arrangement to cylinder, positive feeder to calculate the production and efficiency
4	Study of structure and notaions of plain, rib, pural and interlock structure
5	Practice of knit, tuck, float structure with loop diagram
6	Analysis of plain and rib knitted fabric and their geometrical parameters
7	Identification of different nonwoven fabric like needle punched, spun bond
8	Study of bursting strength for knitted and nonwoven fabric

Course outcomes (Course Skill Set):

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

- Explain in depth about knitted fabric and their properties, uses.
- Demonstrate different types of knitting machines.
- Define and explain the basic elements and structures knitting.
- Explain in depth about non woven production methods.
- Summarize and discuss the Applications of nonwoven fabric.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CIE for the theory component of the IPCC (maximum marks 50)

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks)**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated

including viva-voce and marks shall be awarded on the same day.

- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
- The laboratory test **(duration 02/03 hours)** after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks.**
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored by the student shall be proportionally scaled down to 50 Marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

Suggested Learning Resources:

Books

1. Knitting technology- David Spencer.
2. Essentials of knitting- D B Ajagoankar.
3. Nonwovens manufacture – Proof. N N banerjee.
4. Nonwoven manufacture Encyclopedia of Textiles, Textile institute London.

Web links and Video Lectures (e-Resources): NPTEL course on knitting technology

NON MULBERRY SILK AND SILK BY-PRODUCTS		Semester	V
Course Code	**BST703**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	50-55	Total Marks	100
Credits	04	Exam Hours	
Examination nature (SEE)	Theory		

Course objectives:

- To understand the basic concepts of non-mulberry silk rearing and reeling methods to effectively produce various non-mulberry silks.
- To understand various by-products produced in sericulture and silk industry and their utilization in various fields.

Teaching-Learning Process (General Instructions)

These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes.

- Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adopted so that the delivered lesson can progress the students in theoretical, applied and practical skills.
- Seminars and Quizzes may be arranged for students in respective subjects to develop skills.
- Encourage the students for group learning to improve their creativity and analytical skills.
- Support and guide the students for self-study.
- Encourage students to observe different verities of silks, reeling / spinning machineries to understand mechanisms.
- Actual non-mulberry silk and silk by-products can be demonstrated to students by taking them to silk showrooms and industries.
- Students can be taken to research laboratories to demonstrate about modern machineries used for production of non-mulberry silks and silk based by-products.

MODULE-1

Status of silk production in India and world. Scope for non-mulberry silk in India, mulberry Vs. non-mulberry. India's non-mulberry silk potential.

Tasar silk: Tasar sericulture production and distribution in India. Verities of tasar silk, morphology, anatomy and tasar cocoon characteristics of different verities. Tassar cocoon cooking. Tasar silk reeling technologies: dry and wet. Tasar silk reeling machines used, developments in reeling techniques. Applications of tasar silks.

MODULE-2

Muga silk and Eri silk: Muga and Eri sericulture production and distribution in India. Morphology, anatomy & rearing methods for Muga and Eri silkworms. Muga cocoon cooking, muga silk reeling & developments in silk reeling techniques. Eri silk degumming and spinning. Applications of Muga and Eri silks.

MODULE-3

Introduction to by-products of sericulture and silk industry.
Classification of silk waste. Sources & utilization of silk waste – silk worm pupae, basin refuse, cut & pierced cocoons, double cocoons, reeling waste, silk yarn and fabric wastes. Utilization of defective /waste cocoons and silk waste.
Dupion silk: Introduction, reeling, properties and end uses.

MODULE-4

Spun silk manufacturing: Preparatory, spinning, doubling, twisting and finishing processes in spun silk sector. Japanese and Italian technology of spun silk manufacturing. Adoption of Worsted, Woollen, Cotton and rotor spinning systems to manufacture spun silk yarns.
Noil yarns: Types, production and end uses.

MODULE-5

Silk Proteins: Fibroin & Sericin: Extraction into different forms and their characterization.
Application of silk fibroin in biomaterials. Utilization of silk fibroin and sericin in technical textiles and non-textile applications. Introduction to spider silks and their applications in biomedical field.
Silkworm pupae: Drying, oil extraction, application in food products and bio fuel production.
Marketing & entrepreneurship development in silk by-product industry

Course outcomes (Course Skill Set):
At the end of the course, the student will be able to:

- Acquire the concepts of rearing of non-mulberry silks and their production in detail.
- Understand and practice in production of silk yarns, noil yarn sand other fancy silk yarns produced from silk waste.
- Exposed to various by-products of sericulture and silk industry and their utilization in various fields.
- Understand the spun silk manufacturing processes and its applications.
- Relate the structure of non-mulberry silk and silk fabrics with their properties.

Assessment Details (both CIE and SEE)
The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.

Marks scored shall be proportionally reduced to 50 marks.

Suggested Learning Resources:

Books

35. Silk-Processing, properties and Applications, K. Murugesh Babu, Woodhead Publishers (Elsevier Science), Oxford, UK, 2013
36. Advances in Silk Science and Technology, Arindam Basu (Editor), Woodhead Publishers (Elsevier Science), Oxford, UK, 2015
37. Handbook of Silk Technology, T N Sonwalkar, Taylor and Francis, 1993
38. Mulberry Silk Reeling Technology, D. Mahadevappa, V G Halliyal, D G, Shankar, Ravindra, Bhandiwad, Oxford and IBH Publishing Company Pvt. Ltd, 2000
39. Handbook of Sericulture Technologies, S.B. Dandin, Central Silk Board, 2003.

Web links and Video Lectures (e-Resources):

- Central Silk Board: https://csb.gov.in/publications/
- Karnataka State Sericulture Research and Development Institute: https://kssrdi.karnataka.gov.in/english
- Food and Agriculture Organization of the United Nations (FAO): https://agris.fao.org/agris-search/search.do?recordID=XF7601187

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Collection of non-mulberry silk datas from literature and studying their properties, production and end uses.
- Collecting non mulberry cocoons and filaments from silk industries and R&D centres of silk testing lab and understanding the same.
- Seminars, quizzes, group discussions, seminars and report writing on various non mulberry
- Finding out various silk by-products, pupae oil, silk biomaterials, silk based cosmetics and silk proteins in technical textile applications though literature survey, visiting central silk board / dept. of sericulture.

APPAREL MARKETING AND MERCHANDISING		Semester	VII
Course Code	**BTX714A**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40-45	Total Marks	100
Credits	03	Exam Hours	03
Examination nature (SEE)	**Theory**		

Course objectives:

- To make students understand the basics of apparel Industry and Business concepts, understandthe various marketing and merchandising responsibilities and strategies.
- To study about the analysis of garment and its standards, design and understanding aboutexport marketing.
- To acquaint the students of the concepts of business, design merchandising, sourcing and export Documentation.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adopted so that the delivered lesson can progress the students in theoretical, applied and practical skills.
2. Seminars and Quizzes may be arranged for students in respective subjects to develop skills.
3. Encourage the students for group learning to improve their creativity and analytical skills.
4. Support and guide the students for self-study.
5. Encourage students to observe apparel marketing and merchandising in various showrooms, mallsetc.
6. Actual marketing of apparels can be demonstrated to students by taking them to show rooms, retailsetc.
7. Arrange visits to apparel manufacturing industries.
8. Encourage students to observe marketing and merchandising of various apparelsto understandmarket trends.

Module-1

Organization of the apparel business -Nature of Apparel, Organization of the Apparel Industry-Business Concepts Applied to the Apparel Industry-International Issues- Cooperation in Manufacturing and Distribution.

Marketing objectives and strategies-Functional organization of an apparel firm, responsibilities of marketing division strategic plan, marketing objectives & strategies, Retail and Wholesale Strategiesof Merchandise Distribution-Labelling and Licensing.

Module-2

Merchandising strategies & process- Concepts apparel production lines, dimensions of product change, nature & timing of merchandising responsibilities, business & marketing plans, line planning, line development line presentation,

Analysis of garment development- Role of garment analysis, process of garment analysis, professional perspectives on garment analysis.

Module-3

Product standards and specifications: Sources of Product and Quality Standards-Standards for Quality, Fit, and Performance - Use of Specifications-Writing Specifications for Apparel Manufacturing.

Apparel design: Product Development and the Design Function- Role of Product Change in the Design Process- Post adoption Style. Development- Apparel Design Technology.

Module-4

Export marketing: Outlook for export marketing, International agreement & agencies for promoting exports. Export import policy. Export assistance. Current pattern of India's foreign & world trade,Export barriers-tariff & non-tariff.

Module-5

Export marketing channels, physical distribution transportation, packaging & marine insurance for exports. Management of risk & export financing, Quality control& pre-shipment inspection, documents for exports. An Introduction to retail marketing. Consumer behaviour &retail operation. The retail marketing mix. Management of a retail brand. Application of IT in retail marketing.

Course outcome (Course Skill Set)

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

1. Learn about organization of the apparel industry and business concepts of apparel Industry.
2. Gain knowledge about Marketing and Merchandising Strategies.
3. Understand the procedure involved in the export of apparel and will be able to understand thebasics garment.
4. analysis and Standards for Quality, Fit, and Performance.
5. Will be able to understand the apparel design and apply the concept of marketing andmerchandizing in the apparel industry in India.
6. Understand about the apparel export marketing, apply the concept of marketing and merchandizing in the apparel industry in India.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.

Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Apparel Manufacturing - Ruth E. Glock, Grace I. Kunz-, PHI Publication, UK
2. Export Marketing- B.S.Rathore&J.S.Rathore, Himalaya Publishing house,Bombay, 1997
3. "Fashion Merchandising", Elian stone, Jean A samples, McGraw Hill Book Company, NewYork,1985, ISBN: 0-07- 061742-2
4. "Export Marketing" – A Practical Guide to Exporters", Shivaramu S.,Wheeler Publishing,Ohio,1996, ISBN: 81- 7544-166-6
5. "Apparel Manufacturing Sewn Product Analysis" , Ruth E. Glock, Grace I. Kunz FourthEdition,Pearson Prentice Hall, NJ, 2005, ISBN: 81-7758-076-0

Reference books:

1. The Technology of Clothing manufacture-Herold Carr and Barbara Latham
2. Individuality-Mary Kefgan, PhyllissTouchies Specht
3. Apparel Manufacturing and Sewn Product Analysis-Ruth E Clock
4. Quality Control in Apparel Industry-By Pradip V. Mehta
5. Fabulous fit-By Judith Rashand
6. Marketing Management-Phillip Kotler

Retail marketing management – David Gilbert

Web links and Video Lectures (e-Resources):

- Apparel marketing and merchandising :https://textilelearner.net/?s=Apparel+marketing+and+merchandising.
- Apparel Merchandiser & Merchandising: :https://www.slideshare.net/MehediHassanRifat/apparel-merchandiser-merchandising.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Collection of apparel marketing and merchandising data from literature and studying theirmarket trends.
- Seminars, quizzes, group discussions, seminars and report writing on apparel marketing andmerchandising concepts.
- Practical exposure on Marketing and Merchandising Strategies on apparels.

OPERATIONS RESEARCH & RETAIL MANAGEMENT in Textiles		Semester	VII
Course Code	**BTX714B**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40-45	Total Marks	100
Credits	03	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

- The objective of this Course is to make students understand the basic objectives of operation research and phases of operation research technique and its applicability in textile and garmentindustries.
- To highlight the importance of retailing and its role in the success of modern business

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. 1.State the importance of O.R & Retail management through related videos
2. Seminars & Quizzes may be arranged in respective topics to develop skills
3. Inspire the students by giving examples of Retail management in various Textile activities.
4. Support and guide the students for Self study.

Module-1

Definition of OR. Phases of OR technique. Linear programming problem by graphical and simplex method. Assignment problem by Hungarian method. Balanced and unbalanced matrix. Profit and cost matrix. Problems pertaining to these matrix.

Module-2

TRANSPORTATION PROBLEM: Vogel's approximation method – Determination of Optimal solution by MODI method, North west corner Rule and- Least cost entry method.

Module-3

Replacement: . Objects of replacement. Types of Replacement such as Individual replacement, Groupreplacement. Problems pertaining to these types of replacement problems.

Module-4

Queuing theory, queue, Waiting line FIFO and LIFO with examples. Customer's behavior in queue. M/M/I System and its details. Brief study about CPM and PERT.

Module-5

Introduction and Perspectives on Retailing World of Retailing, Retail management, introduction,meaning, characteristics, emergence of organizations of retailing - Types of Retailers (Retail Formats)

– Multichannel Retailing -Customer Buying Behavior, Historical Perspective, role of retailing, trends in retailing, FDI in Retail - Problems of Indian Retailing - Current Scenario.

Course outcome (Course Skill Set)

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

1. Explain the meaning, definitions, scope, need, phases and techniques of operations research. Formulate L.P.P and derive optimal solutions to linear programming problems by graphicalmethod, Simplex method.
2. Solve the Vogel's approximation method and finding solution by different methods.
3. Demonstrate the Replacement theory and accustom to solve different types of

replacementproblems.

4. Solve waiting line problems (Queuing theory) and gains introductory knowledge about CPM &PERT.
5. Explain the Perspectives of Retailing World of Retailing, Retail management

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Operations Research – Theory and Applications – 5th Edition, J K Sharma, MACIN Publisher 2012
   Principles of Operations Research – Theory and Practice. Philips, Ravindran and SolbergJohnWiley &Sons (Asia) Pvt. Ltd,2000
2. Principles, Methodology and Applications of Operations Research, Prof. J. Govardhan JEMConsultants India 2012
3. Operations Research, P.K.Gupta and D.S. Hira, S. Chand and Co 2002
4. Problems in Operations Research (Principles and Solutions) P.K.Gupta and D.S. Hira, ,S. Chandand Co 2010
5. Retail Management Levy and Weitz McGraw Hill

6. Retail Management Chetan Bajaj Oxford University press
Web links and Video Lectures (e-Resources):
• NPTEL Courses on ORT.

Fabric Structure and Design Analysis		Semester	VII
Course Code	**BST714C**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40-45	Total Marks	100
Credits	03	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

- To make the students to learn analysis of fabrics for their various construction particulars, calculation of sample analysis data, manufacturing data and basic designs.
- Students are able to understand the characteristic features and aesthetic qualities of different fabrics.
- They are able to understand various basic designs in order to impart aesthetic value to the fabrics.
- Students are able to understand the raw material requirements and machines required for the production of fabrics.
- Students understand the end uses of different fabrics and their suitability.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Apart from conventional lecturer methods various types of innovative teaching techniques through videos, may be adopted so that the delivered lesson can progress the students in theoretical and applied practical analysing skills.
2. Seminars may be arranged for students to develop these subject skills.
3. To encourage the students for group learning so as to improve their creativity and analytical skills.
4. To support and guide the students for self-study.
5. Encourage students to observe working of various weaving machines in order to understand the construction and manufacturing details for making a fabric with help of design, draft, lifting plan and denting plan.

Module-1

Classification of Plain woven cloths - approximately square, warp faced and weft faced fabrics, examples of
cloths with construction particulars and their applications. Elements of woven fabric structure - weaves and
weave notations. Yarn crimp, cover factor & fabric weight. Repeat, Drawing-in (Draft), Lifting plan and
Denting plan.

Module-2

Ornamentation of Plain fabrics. Modification of plain weaves – Rib and Matt weaves. Hair cord structures. Twill weaves and fabrics. Angle of Twill. Twist & twill interactions. Derivatives of twill weaves Diamond and

Module-3

Simple fancy weaves and fabrics such as Honeycomb, Brighten Honeycomb, Huck – a - back, Mock leno, Crepe & corkscrew weaves. Distorted thread effects. Bed ford cord weaves and fabrics. Introduction to advanced fabric structure and designs.

Module-4

Colour & Weave effects. Classification of colour and weave effects, Examples of simple Colour & Weave combinations. Colour & Weave combinations to construct longitudinal stripes, Cross stripes, Check effects etc.
Various bases of textile design for figured arrangements.

Module-5

Light and pigment colour theory. Classification of colours. Attributes of colours. Modifications of colours. Colour harmony and colour contrast. Mixed coloured effects with the aid of fibre mixture yarns, twist yarn mixtures and combined coloured threads in the fabrics. Various bases of textile design for figured arrangements. Brief study of history of textile design. Brief study of various historical designs with respect to their main features.

Course outcome (Course Skill Set)

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

1. Classify fabrics on the basis of structure of fabrics with examples of various structures, characteristics and
   their end uses. Explain elements of woven structures graphical representation of design aspects.
2. Analyse and distinguish characteristic features various fabrics and their design features such as plain, rib,
   twill, satin etc.
3. Analyse and distinguish various fabric designs in order to impart aesthetic value and fancy effects to the
   fabrics such as huck a back, mock leno, honey comb, crepe etc..
4. Exhibit the possibilities of ornamentation of fabrics by colour and weave combinations.
5. Illustrate basics of colour, colour combination and their effects on appearance of fabrics.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks can be awarded for part questions and should add up to 50 marks.

Suggested Learning Resources:

Text Books

1. Woven Cloth Construction ATC Robinson and Marks Textile Institute Pub, Manchester,1973
2. Watson Design and Colour, Z. J. Grosicki, Universal Pub Corp , 1988.

Reference Books

1. Grammar of Textile Design, H. Nisbet, D. B. Taraporewala and sons, 1985
2. Design of Woven Fabrics, Blinov, Shibabaw Balay, MIR Pub, 1989
3. Modern Textile Design and Production, R. H. Wright, National Trade Press, 1970
4. History of Textile Design- V. A. Shenai, Sevak Pub Ltd, 1974.

Web links and Video Lectures (e-Resources):

- https://www.slideshare.net/sakthidamodaran/fabric-structureanddesign-by-n-gokarneshan
- https://www.slideshare.net/txrockers/fabric-structureanddesign-15667875
- https://medium.com/@zahir110199
- https://textilestudycenter.com/tag/textilestudycenter-com/
- https://www.youtube.com/watch?v=RMXgNrSRVfM

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- https://www.slideshare.net/txrockers/fabric-structureanddesign-15667875
- Seminars, Group discussion, Quiz, analysing and drawing of design, draft, lifting plan and denting
  plan of various fabrics.
- Practical exposure to various design features, aesthetic values, manufacturing requirements of fabrics with various basic designs and to understand the use of colours and colour combinations

Waste Management and Pollution Control in Textile Industry

Course Code	**BTX714D**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40-45	Total Marks	100
Credits	03	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

- Understand environmental management aspects in textile industries.
- Understand the significance of pollution control measures, quality of water and effluent treatment methods.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Use the related videos of textile machineries process so that student can understand more easily.
2. Show students the different samples of the waste fibres, yarns and fabrics and ask them to identify
   different waste
3. Inspire the students to have collaborative learning in the class.
4. Support and guide the students for Self-study.

Module-1

Introduction to Environment Management. Scope and objectives, Benefits. Quality of Water. Water quality requirements for textile wet processing.

Module-2

SEWAGE- DEFINITION- characteristics of sewage, general methods of treatment of sewage, disposal of sewage.

INDUSTRIAL EFFLUENTS: The disposal of industrial effluents in to streams. Characteristics of textile mill effluents, disposal and effect on the receiving streams.

Module-3

Noise pollution, causes of noise pollution, effects of noise pollution, remedial measures. Methods of noise control in textile mills. Brief discussion about different instruments used in analysis of effluents.

Module-4

Brief discussion about different instruments used in analysis of effluents. Sources of pollution and its control. Various methods of industrial waste water treatment. Treatment of effluents received from textile wet processing industries.

Module-5

Filtration and filtration methods. Role of filter fabrics in pollution control. Indian pollution acts, their role and Effectiveness. Recent developments in pollution control in various processes in textile mills and manufacturing plants.

Course outcome (Course Skill Set)

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

- This subject helps the student to acquire the concepts of environmental management for textile industries.
- This subject prepares the student apply environmental concept tools, pollution control norms and effluent control measures in textile/garment manufacturing industries

- Students are exposed to environmental laws, EA systems, effluent treatment methods and concepts so that they apply these concepts in the actual work environment for maximum benefits.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Text Books

40. Water Supply and sewage-Mc Graw Hill Publication
41. Waste Water Treatment- International Publication, M. N. Rao and A. K. Dutta
42. Waste Water Engg. Treatment Disposal Sewage- Tata Mc Graw Hill Publication
43. Pollution and its Control-Chand Publication

Reference Books

1. Efficient use of Fuel- H. M. S. D. Publication London 1958.
2. Energy Resources- Demand and Conservation with Special Reference to India, C. Kashjan.

Web links and Video Lectures (e-Resources):

- NPTEL course on Textile effluent and its measurement: https://nptel.ac.in/courses/
- NPTEL course on Textile finishing, Textile wet processing, Textile printing and natural dye.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning
• Collection of textile processing effluents data's from literature and comparing with the various standards • Collecting textile processing effluents data's from nearby industries (case study) and studying the same • Seminars, quizzes, group discussions, seminars and report writing on eco parameters concepts. • Finding out various textile processing effluents parameters of fibre, yarn and fabrics. • Practical exposure to various eco-friendly dyes and chemicals used for textile processing.

FASHION AND TEXTILES		Semester	VII
Course Code	**BTX755A**	CIE Marks	50

Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40-45	Total Marks	100
Credits	03	Exam Hours	01
Examination nature (SEE)	Theory		

Course objectives: Have knowledge of concepts related to fashion and textiles

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Use the related videos of textile machineries process so that student can understand more easily.
2. Show students the different samples of the waste fibres, yarns and fabrics and ask them to identify
3. different waste
4. Inspire the students to have collaborative learning in the class.
5. Support and guide the students for Self-study.

Module-1

Fashion: Introduction to fashion and apparel design, Origin of fashion, Definition, Terminology, Fashion concepts, Fashion analysis, Fashion trends, Fashion creations. Fashion theories:- Fashion of different eras, French revolution.

Module-2

Fashion promotion:- From design to production. Style, Fad, Trends, Fashion industry. Design, Definition, Structural, decorative, Dress designing and creating varieties, Through designs. Principals of design, Definition, Harmony, Proportion balance, Rhythm, Emphasis, Meaning, Types and application on apparel.

Module-3

Colour:- definition dimension of colour, Hue, Value,Intensity. Colour scheme: - importance, And application of colour in apparel. Psychology of clothing: – First impression, role of socio psychological and economical aspects of clothing. Comfort of the apparel

Module-4

Textiles:- Historical development of textile fibres. Classification of fibres, definition and general properties. Natural fibres- cellulose, cotton, Wool and silk, Minorfibres, Mineral fibres; Physical and chemical properties. Man- made and synthetic fibres, Rayon, Nylon, Polyster, Acrylic fibres, Physical and chemical properties; Identification of fibres.

Module-5

Yarn:- Yarn properties, yarn count, , Yarn twist, yarn types single , plied and cord yarn,Sewing thread, Complex Yarns:- Novelty Yarns, Textured Yarns and metallic Yarns. Fabric: -characteristics, Types, weaves- plain, Twill, Satin and variations. Fancy weaves: - dobby, jacquard, Leno, Lappet, Swiss, double cloth. Knitting:- circular, Tubular, Jersey. Non-woven:-films, foams, felting, braiding, bonding and laminating.

Course outcome (Course Skill Set)

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

1. Describe concepts of fashion.
2. Emphasizing the fashion promotion, fashion designing.
3. Explain theory of colour
4. Illustrate production and properties of fibres
5. Explain the production, characteristics of yarns and fabrics.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Erwin Mabel (1994):- Clothing for Moderns, Macmillan Co. London.
2. Tate (1977) Sharon lee:- "Inside Fashion Design" Farncisco Canfield Press.
3. Bhatacharya Anand:- "Garment Technology" NCUTE, IIT, Delhi(2003).
4. Cooklin Gerry:- "Garment technology for fashion designers" OM Book service, NewDelhi.
5. Bernard P. Corbman :- "Textile- Fiber to Fabric" McGraw –Hill international editions.
6. E P G Gohl and Vilensky :- "Textile Science" CBS Publishers and Distributors, NewDelhi

Web links and Video Lectures (e-Resources):

- NPTEL course on textile fibres, manufactured fibres, spinning technology

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Visit to textile / garment industries
- Collection of various types of fibres, yarns and fabrics.

HIGH PERFORMANCE POLYMERS AND FIBRES		Semester	VII
Course Code	**BTX755B**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40-45	Total Marks	100
Credits	03	Exam Hours	01
Examination nature (SEE)	Theory		

Course objectives:

This course aims at making the engineering students have an idea about general aspects of fibres and polymers, production and properties of high-performance polymeric fibres

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes:

Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adopted so that the delivered lesson can progress the students in theoretical, applied and practical skills. Seminars and Quizzes may be arranged for students in respective subjects to develop skills. Encourage the students for group learning to improve their creativity and analytical skills. Support and guide the students for self-study.

Module-1

Introduction to polymers and fibres. Requirement of fibre forming polymers, classification of polymers and fibres. Brief details on polymerization methods. Importance of molecular weight and thermal analysis of polymers with respect to production of high performance polymers and fibres.

Module-2

Summary of production of manufactured fibres, comparison of properties of natural and manufactured fibres. Introduction to high performance fibres. Need for production of high-performance fibres. Classification of high performance fibres on the basis of mechanical properties, General applications of high performance fibres and polymers. Comparison of high performance fibres and conventional fibres.

Module-3

Concept of liquid polymers. Types of liquid crystal polymers, characteristics of liquid crystal polymers, Polymerization, spinning and properties of aramids, aromatic polyesters, rigid rod and ladderpolymers such as PBZT, PBO, PBI, PIPD

Module-4

Manufacture of carbon fibres from polyacrylonitrile, viscose and pitch precursors, Concept of gel spinning and spinning of UHMWHDPE fibres, Elastomeric polymers and fibres, , Conducting fibres, Thermallyand chemically resistant polymers and fibres. Nano polymers and fibres, Features of Nano-polymers and fibers. Production of Nano fibres, applications OF Nano fibres and Nano polymers.

Module-5

Methods of synthesis, production and properties of: glass and ceramic fibres. Specialty fibres: profile fibres, optical fibers, bicomponent fibres and hybrid fibres, Superabsorbent polymers and fibres.

Course outcome (Course Skill Set)

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

1. Identify need for polymers and fibres, classify polymers and fibres and explain the polymer production methods and importance of molecular weight and thermal properties of polymers and fibres.
2. Summarise the production methods of manufactured fibres, identify the need for high-performance fibres and classify the high-performance fibres.
3. Demonstrate the production organic aromatic high performance fibres.
4. Summarize the production properties and applications of carbon, UHMWHDPE, Nano fibres.
5. Demonstrate the production of glass ceramic and speciality fibres

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

1. **Books Text book of polymer Science**, Billmeyer.W., Wiley Int.Sc. New York 1984.
2. **Polymer Science,** Gowarikar V.R., Vishwanathan N.V., Jayadev Sridhara, Wiley Eastern Ltd., New Delhi,
3. **Manufactured fibre technology,** Gupta V.B, Kothari V.K., Chapman Hall, London, 1997
4. **High Performance fibres**, J.W.S.Hearle, Wood Head,UK-2005.

Web links and Video Lectures (e-Resources):

- NPTEL courses on high performance fibres

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Students may be taken to industries which use high performance fibres for various applications.

INTRODUCTION TO TEXTILE REINFORCED COMPOSITES AND SMART TEXTILES		Semester	VII
Course Code	**BTX755C**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40-45	Total Marks	100
Credits	03	Exam Hours	01
Examination nature (SEE)	Theory		

Course objectives:

- Course aims at making students to learn about concepts of fibre reinforced composites, methods of production applications etc. and various aspects of smart textiles.

Teaching-Learning Process (General Instructions)
These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

Module-1

Introduction to composites. Basic nomenclatures – reinforcing phase, continuous phase, matrix, interface etc. Classification of composites with respect to fibre used, matrix used, limitations of engineering metals.
Meaning of bio composites, advantages of bio composites. Different forms of fibres for composites, 3D fabrics for composites

Module-2

Study of mechanical & thermal properties various fibres Viz. Carbon, glass, silicon carbide, boron, Kevlar, polyethylene,. Used in the production of fibre reinforced composites.
Matrix materials for composites Classification of resins, thermoset, thermoplastic metal matrix **Composites manufacturing techniques-**Introduction-Meaning of interphase, types of bond set interphase, meaning of lamina, laminates, and representation of laminates. Pre-peg technology, Hand lay-up-spray-up -filament winding. Compression moulding, injection moulding, pultrasion techniques

Module-3

Applications of composites: Study of various applications of composites mainly in the field like Aero plane, aerospace, medical, sports, ship building, automobiles and industries. Brief introduction to use of Nano-fibres in composite production and their applications.
Composite mechanics-failure mechanism in composites. Derivations of various equations related to composite structures viz. Axial modulus, transverse modulus

Module-4

Definition of smart and intelligent textiles, Classification of smart textiles Passive and active functionality, Textile with high protection and comfort properties, Extreme winter clothing with low heat transmission, heat absorbing, heat storing systems. Phase change materials, incorporation of PCMs in fibres and fabrics. Breathable textile. Multifunctional textiles with incorporated electronics for integrated communication, music, health monitoring, defence support functions, wearable computers.

Module-5

Environmentally sensitive textiles- photochromic and thermo chromic (chameleonic) fabrics, camouflage (radar shielding) fabrics, variable heat absorption surfaces, stimuli sensitive polymers such as temperature, pH, ionic, magnetic sensitive materials, design and their applications to textile. Fibres as solar cells, Shape memory textiles Recent advances

Course outcome (Course Skill Set)
At the end of the course, the student will be able to :

1. Describe basic concepts of fibre /textile reinforced composite materials and the raw materials for composites
2. Explain the properties of fibres and resins used for composite production and summerize various methods of manufacturing of composites
3. Explain the applications of composites and derive expression for modulus of composites in axial and transverse direction.
4. Identify the need for intelligent textiles, and explain wearable electronics, textiles for extreme heat and cold and change materials

5. Summarize environmentally sensitive textiles stimuli sensitive polymers and Shape memory textiles

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books:

1. **Fibre Reinforced Material Technology-**N.J.Parratt Van Nostrand Reinhold Co, Inc 1972
2. **Composite materials**:- Krishan K. Chawla, Springer 2005
3. **High Performance Fibres:-** J.W.S. Hearle, Woodhead UK 2005
4. **Composites Engineering Hand Book** - Ed. Mallik P.K., Marcell Dekker, N.Y., 1997

Reference Books:

1. Shape memory polymers and textiles by Jinlian HU
2. Smart Clothing: Technology and Applications by Gilshoo Cho
3. Smart fibres, fabrics and clothing. X. Tao. Wood Head-2005
4. Intelligent textiles and clothing. H.R. Mattila . Wood Head-200

Web links and Video Lectures (e-Resources):

- NPTEL course on composites

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Students can be demonstrated for intelligent textiles and may be taken to field visits where composites are extensively used.

INDUSTRIAL TEXTILES		Semester	VII
Course Code	**BTX755D**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40-45	Total Marks	100
Credits	03	Exam Hours	01
Examination nature (SEE)	Theory		

Course objectives:

- This subject helps the student to acquire knowledge of various technical textiles used inindustries
- This subject prepares the student work in technical textile manufacturing industry.
- Students are exposed to research field in technical textiles and their applications in various industries.

Teaching-Learning Process (General Instructions)

1. These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes. Lecturer method (L) does not mean only the traditional lecture method, but a different type ofteaching methods may be adopted to develop the outcomes.
2. Use PowerPoint/Videos/Animations to explain various concepts.
3. Ask some creative and higher-order thinking questions in classes which helps critical thinking.
4. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather thansimply recall it
5. Support and guide the students for self-study.

Module-1

Brief history of industrial/ technical textiles, Growth of industrial/technical textiles. Requirements of fibres, yarns and fabrics for technical textiles. Classification of technical textiles. Study of properties of various fibres used for technical textiles

Automotive Textiles- Use of textiles in tyres, requirements of fibres used for tyres, various fibres usedfor tyre cords, tire building, different types of tyres. Upholstery in automobiles: vehicle top covers, seat covers, headliners, carpets etc. Safety devices in automobiles: seat belts, airbags, helmets etc. Textiles used in Aerospace industry.

Module-2

Geotextiles: Usefulness of geotextiles, Understanding soil characteristics, properties affecting engineering behaviour of soil, identification, classifications, permeability, effective stress and pore water pressure, seepage of soils and design of filter criteria.

Geosynthetics types, functions and application areas of geotextiles, fibres and fabric selection criteria for geotextile applications. Mechanics of reinforcement, filtration and drainage by geotextiles and functions, material construction and manufacturing processes in case of geotextiles, evaluation of geotextiles with and without soil, evaluation of filtration and drainage functions, reinforcement, creep, moisture barrier characteristics, durability and ageing.

Geotextiles and reinforced soil structures: Retaining walls, embankment, foundation. Geotextiles in roads and railways: separation, draining and filtering. Geotextiles in environmental control: covers and liners, landslides, and erosion control.

Module-3

Filtration textiles: Definition of filtration parameters, Dust collection and solid liquid separation, filtration requirements, concept of pore size and particle size, role of fiber, fabric construction and finishing treatments.

Protective Clothing: Brief idea about different type of protective clothing, cut resistant fabric,functional requirement of textiles in defence including ballistic protection materials and parachute cloth, temperature and flame retardant clothing, chemical protective clothing, water proof breathable fabrics.

Module-4

Medical Textiles-Medical application of Textiles, requirements, classification, detailed study of application of textiles in implantable, non-implantable, extra corporal devices and health care hygienic products

Other uses of industrial textile: Cords and ropes, functional requirements and types of textiles used for paper making, agricultural, electronics, power transmission belting, hoses, canvas covers and tarpaulins.

Module-5

Smart Textiles-Introduction, concept of smart textiles, various applications of smart textiles. Introduction to nanotechnology in textiles. Application of Nano textiles in various field. Productionand properties of Nano-fibres.

Fibre Reinforced Composites – meaning, classification, brief outline on raw materials, production techniques and applications.

Course outcome (Course Skill Set)

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

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
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- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Handbook of Technical Textiles", Ed. A R Horrocks and S C Anand, Woodhead Publication Ltd., Cambridge, 2000.
2. "Wellington Sears Handbook of Industrial Textiles", Ed. Sabit Adanaur, Technimic Publishing Company, Inc., Pennsylavania, USA, 1995.
3. ShuklaS K, YinJian-hua, Fundamentals of Geosynthetic Engineering, Taylor and Francis, 2006, UK.
4. "Modern Textile Characterization Methods", Ed. M Raheel, Marcel Dekker, Inc., 1996.
5. Nonwoven Fabrics; Ed. W. Albrecht, H. Fuchs, and W. Kittelmann, WLLEY VCH Publication, 2003, UK.
6. Smart Fibres - Fabrics & Clothing Xiaoming Tao Wood Head Pub., England 2001

Web links and Video Lectures (e-Resources):

• https://www.jasonmills.com/technical-textiles/ • https://nptel.ac.in/courses/116102057 • https://www.sciencedirect.com/book/9781782424581/handbook-of-technical-textiles
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning • Quiz/Group discussion. • Practical demonstration of Technical Textile product application • NPTEL and YouTube videos